A woman with dark hair, wearing a yellow top, is smiling and holding a globe. The globe shows a map of the world with red and yellow highlights. The background is slightly blurred.

# Sweden's Leadership in a Climate Constrained World

An analysis for Sweden of the  
Greenhouse Development Rights framework

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## Executive Summary

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### ***The climate crisis and its implications***

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, risking impacts as profound as the destabilization of the Greenland Ice Sheet (Hansen, 2008). Preserving a *reasonable* likelihood of staying below the widely endorsed 2°C threshold will require global GHG emissions to peak very soon – indeed in the next decade – and decline rapidly enough to bring emission rates down by 80% (relative to 1990 levels) by mid-century and close to zero by the end of the century. Yet even such an ambitious trajectory as this would still exposes us to considerable climate damages, and a worrisome 15-30% chance of exceeding 2°C.

The implications of all this are stark, and should be stated clearly: Carbon-based development is no longer an option, *neither in the North nor the South*. And this means we need nothing less than an emergency program to rapidly decarbonize the entire global economy.

### ***The development crisis and its implications***

This emergency program must, moreover, come while billions of people, primarily but not exclusively in the global South, are still struggling to escape poverty. This is a critical complication and its importance cannot be overstated. For even though the climate crisis is both real and urgent, so too is the development crisis. And, further, it is our misfortune to face the climate crisis in a world where development still requires expanded energy services, which in turn seem inexorably to imply increasing carbon emissions. This seemingly inviolable syllogism is at the very core of our climate predicament.

Critically, however, it is still *physically possible* to reduce global emissions while the world’s poor majority is lifted out of poverty. We have the knowledge and the technology and the wealth necessary to rise to the occasion. The climate crisis, in other words, is a political one – a decisive fact that is strangely easy to overlook.

### ***A politically viable resolution:***

#### ***The Greenhouse Development Rights Framework***

Politically, the bottom line is that the South will not prioritize rapid emissions reductions above its goal of human development for its people. Any strategy that even implicitly attempts to force such a prioritization will be futile. As a matter of realism, the right to such development must be recognized and protected by any climate regime that has even a hope of being viable.

Accordingly, the Greenhouse Development Rights framework puts the right to development at its core, even as it conforms to the prescriptions of a true global emergency climate program (Baer, Athanasiou, and Kartha, 2007). It does so by honestly specifying the global emission constraints consistent with the stabilization of the climate, but framing them within a burden-sharing framework that explicitly shields from their costs the poor global majority that is still striving for a decent standard of welfare.

More particularly, the GDR framework starts from the core principles of *capacity* and *responsibility* underlying the United Nations Framework Convention on Climate Change, and then transparently defines and quantifies the burdens that should properly be borne by the relatively well-off populations within countries. To do so, it assesses capacity and responsibility at the level of individuals, in a manner that takes explicit account of the unequal distribution of income within countries. It then defines national obligations under a climate regime accordingly.

### ***Sweden's role as a global leader***

Sweden is poised to take a global leadership role in the climate arena. It has strongly reaffirmed the global objective of keeping temperature rise below 2°C, and its Climate Committee has added rigor and helpful specificity to that goal by first identifying 400 ppm CO<sub>2</sub>e as a maximum acceptable level for stabilization of GHG concentrations and then going on to recommend near-, medium-, and long-term national targets. No less critically, Sweden has embraced its further obligations to the international community. Recognizing that “in the period up to its EU Presidency and beyond, Sweden has a key role to play in the international negotiations on a new climate regime for the post-2012 era,” the Climate Committee has underscored the importance of Sweden’s “ability to support proactive measures in rapidly growing developing countries.” (Climate Committee *Svensk klimatpolitik*, 2008.) All this reflects Sweden’s desire to be a strong and conscientious leader in the global struggle against climate change and for sustainable development.

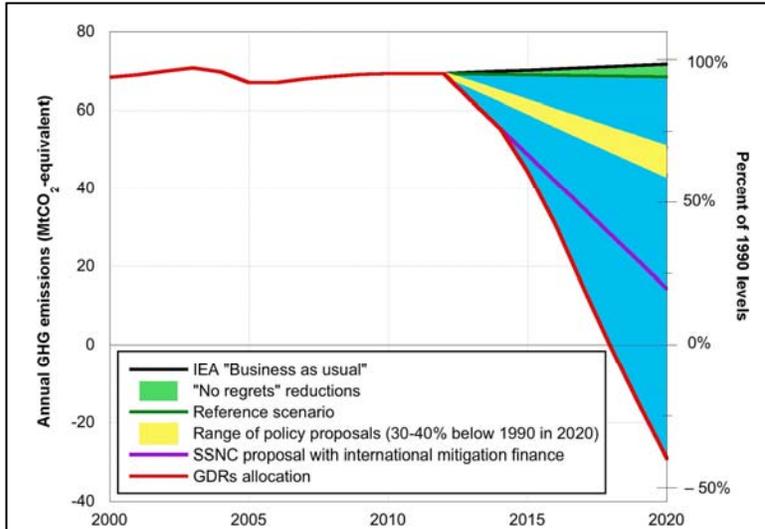
### ***Fulfilling Sweden's climate obligations***

This report presents an analysis of the Greenhouse Development Rights framework applied to the case of Sweden. Its objective is to provide useful quantitative guidance on Sweden’s role as a leader in our climate constrained world. It presents guidance that is rigorous from the standpoint of climate science and framed in the context of a right to development for the world’s poor.

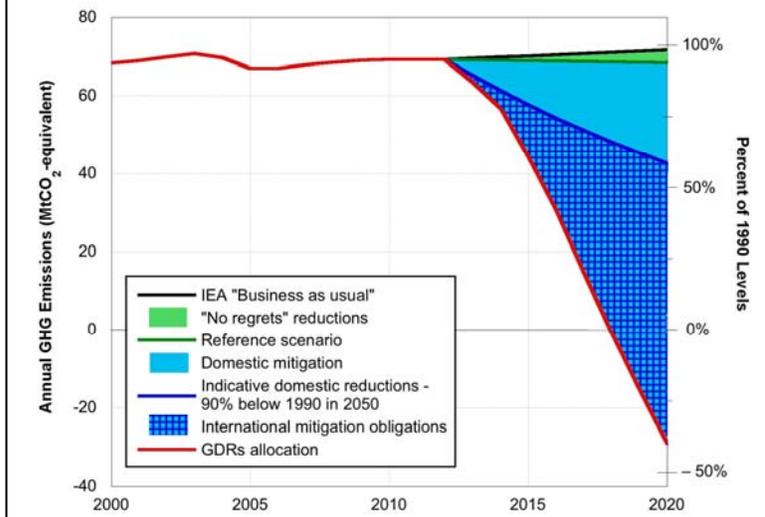
Sweden, obviously, is a country with tremendous capacity and a good deal of responsibility. This analysis fully accounts for Sweden’s true responsibility, by looking beyond territorial emissions alone, and reckoning emissions in terms of Sweden’s net “carbon footprint.” Accounting for carbon embedded in imports, exports and international transport reveals that Sweden’s responsibility is 17% larger than would be inferred by considering Sweden’s territorial emissions alone (Minx *et al*, 2008).

Sweden will naturally have significant obligations under any burden-sharing regime that is based on capacity and responsibility, and only more so under a regime that honors a right to development. Under the GDR framework, our indicative quantification suggests that Sweden’s share of responsibility and capacity, and hence its obligation under a politically viable climate regime, will be approximately 0.51% of the global total. This can be compared to the US’s 32%, the EU’s 25%, Japan’s 7.4%, China’s 6.6%, and India’s 0.8%. Sweden’s share of the global total is thus not large in absolute terms, though it is considerable relative to its size, at nearly four times its small population (0.14% of the global total).

This quantification of Sweden's obligation is useful in two complementary contexts. First, if the total global costs of an emergency climate program – one that must include adaptation as well as mitigation – were to be quantified, the GDR-based assessment of national obligation provides a reasonable estimation of each nation's obligatory financial contribution. For example, if we assume that the total costs of such a program were one trillion dollars annually (about 1.5% of current Gross World Product, which is within the broad range of published cost estimates), Sweden's contribution to the global effort would amount to about 0.5% of that sum, or about \$5 billion per year. This amounts to annual "tax" of approximately \$555 per person.



**Figure 1: Various proposed emission reduction targets and Sweden's "two-fold obligation".** The yellow band corresponds to the 30-40% range of reduction proposals put forward by the major political parties. The purple line corresponds to the SSNC proposal for 40% domestic reduction plus support for a roughly similar quantity of reductions internationally through climate-friendly investments in developing countries. The red line shows Sweden's GDR allocation, reaching a 140% reduction by 2020 relative to 1990 levels. In the lower panel, this reduction obligation is divided into a light blue wedge of ambitious domestic reductions, and a blue hatched wedge of ambitious international reductions.



Second, the GDR-based assessment of national obligation can be used to indicate emission reduction obligations for each country. Based on our estimate that approximately 19,000 MtCO<sub>2</sub>-eq of emissions reductions will need to be implemented globally in 2020, Sweden's obligation to achieve a 0.5% share of that amount comes to roughly 100 MtCO<sub>2</sub>-eq of reductions. As is strikingly clear from figure 1, Sweden's GDR allocation declines all the way to zero and beyond, reaching *negative* 30 MtCO<sub>2</sub>-eq by 2020. This implies a reduction target of 140% below 1990 levels.

Clearly, a reduction target of this magnitude is only meaningful if it is understood to signify a combined obligation to make reductions domestically and to invest in reductions internationally. The implied "two-fold obligation", which is ambitiously large on both the domestic and international sides, is shown in the lower panel of figure 1.

This reduction obligation obviously challenges conventional assumptions about the magnitude of Sweden's obligation. It exceeds by a large margin the emission reduction targets (which range

from 30% to 40% below 1990 levels) under consideration by Sweden's political parties. It exceeds even the Naturskyddsforeningen proposal to adopt both a 40% domestic emission reduction target and a roughly equivalent volume of reductions realized by way of climate-friendly investments in developing countries.

This very demanding GDR allocation for Sweden is by no means an anomaly or methodological quirk, but rather a direct outcome of the principles underlying the GDR framework. Like any country with high capacity and responsibility, Sweden is assigned a very large obligation – large enough to necessitate extremely ambitious reductions both domestically and internationally. Indeed, this two-fold obligation is large enough to seem implausible by today's standards of political realism.

Nevertheless, obligations of this scale for countries with high capacity and responsibility are, in the final analysis, quite unavoidable. It is only through explicit obligations of this magnitude that a climate regime can effectively bring about two vital outcomes. First, by driving ambitious domestic reductions, they ensure that the wealthier countries free up sufficient environmental space for the poorer countries to develop. Second, by driving equally ambitious international reductions – enabled by technological and financial support from the wealthier countries – they ensure this development occurs along a decarbonized path.

In other words, it is by accepting this *two-fold obligation* that the wealthy countries can make the climate regime genuinely consistent with a right to development.

### ***Realism of a new kind***

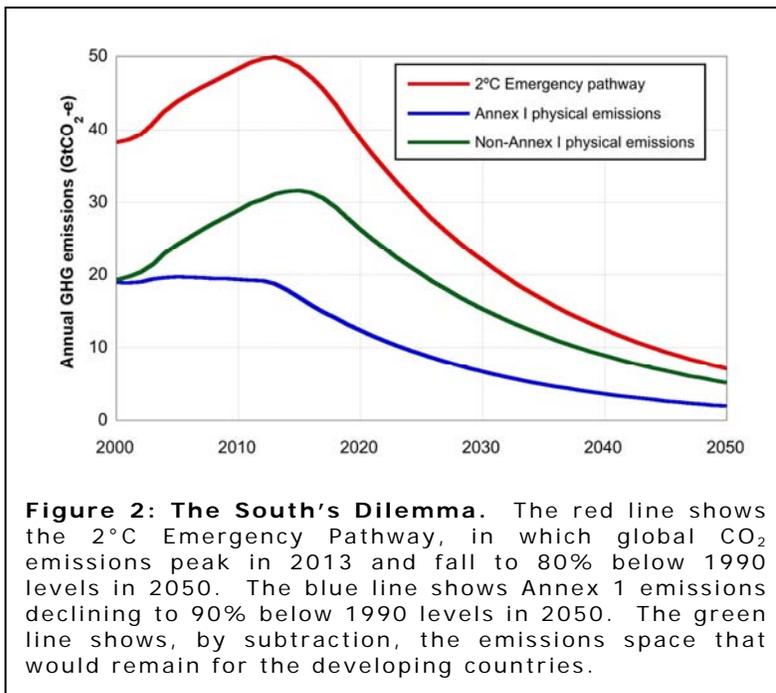
Finally, as nicely as our focus on the right to development may accord with basic principles of equity and justice, all this is really about hard-nosed politics. It is about realism of a new kind. Because climate change is a problem, perhaps humankind's first such problem, where the survival of the wealthy depends on their solidarity with the poor. If we, in Sweden, in the rest of the North, and in the growing middle class enclaves of the South, want to safeguard our own futures, then we must engage with the poor in a way that recognizes and honors their legitimate needs as fellow humans on this shared, finite planet.

# 1 The right to development in a climate constrained world

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A warming of 2°C over pre-industrial has been widely endorsed as the maximum that can be tolerated or even managed. Even 2°C is by no means safe, as the IPCC's Fourth Assessment Report makes quite clear. In fact, there is a significant if not readily quantifiable risk that even a less than 2°C warming could trigger the irreversible melting of the Greenland Ice Sheet. And, quite disturbingly, with a manifest warming of only 0.8°C, we are already seeing effects – such as the precipitous receding of the Arctic sea ice – that are not only dangerous in themselves but also producing positive feedbacks and increasing future warming.

Yet even as the emerging science<sup>i</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 keeping warming below 2°C, and then setting out to straightforwardly assess the strategies and accommodations that will be necessary if we're to hold to it. 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 twice-divided world, one sharply polarized between North and South and, on both sides, between rich and poor.



A simple thought experiment, illustrated in this figure, makes this 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 1 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 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% below 1990 levels by 2050, such that CO<sub>2</sub> concentrations can peak below 420 ppm and then start to fall<sup>ii</sup>. Yet even this would hardly mean that we were “safe.” We would still suffer considerable climate impacts and risks, as well as a roughly 15-30% probability of overshooting the 2°C line.<sup>iii</sup>

- The Annex 1 emission path shown here is more aggressive than even the most ambitious of current EU and US proposals. It has emissions declining at nearly 6% annually from 2010 onwards, and ultimately dropping to a near-zero level. It's a tough prospect, and if it is politically plausible at all, it is just barely so.
- And, still, the atmospheric space remaining for the developing world would be extremely constrained. In fact, developing country emissions would have to peak only a few years later than those in the North – still before 2020 – and then decline by nearly 6% annually through 2050. And this would have to take place while most of the South's citizens were still struggling out of poverty and desperately seeking a meaningful improvement in their living standards.

It is this last point that makes the climate challenge truly daunting. For the only proven routes to development – to water and food security, improved health care and education, secure livelihoods – involve expanding access to energy services, and, consequently, a seemingly inevitable increase in fossil fuel use and thus carbon emissions. From the standpoint of developing countries, this pits development squarely against climate protection. And with even the minimal *Millennium Development Goals* being treated as second-order priorities, the level of international trust is desperately low. Indeed, the developing countries are quite manifestly justified in fearing that, as the wealthy countries finally admit the severity of the climate crisis, the development crisis will be treated as secondary to its immediate imperatives. All told, the situation invites global political deadlock.

And, to be frank, progress towards a viable climate regime is already quite nearly deadlocked. And so it will remain, until we openly face up to 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 its access to energy services in its ongoing fight against endemic poverty and for human development?*

## 2 The Greenhouse Development Rights Framework

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Development is more than freedom from poverty. The real issue is sustainable human development, and the right to such development must 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 emissions reductions, not while it must also seek an acceptable level of human development for its people. And that the key to climate protection is, therefore, the establishment of global burden-sharing regime in which it is not required to do so.

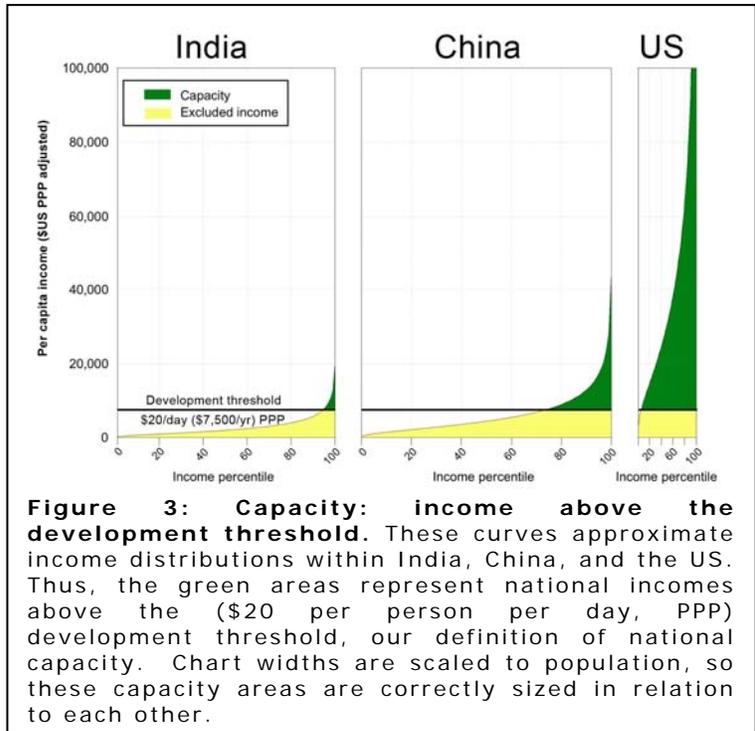
The *Greenhouse Development Rights*<sup>iv</sup> framework is, accordingly, designed to protect the right to sustainable human development, even as it drives rapid global emissions reductions. It proceeds in the only possible way, by operationalizing the official principles of the UN's *Framework Convention 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 GDR 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. People below this threshold have development as their proper priority. As they struggle for better lives, they are not obligated to expend their limited resources to keep society as a whole within its sharply limited global carbon budget. They have, in any case, little responsibility for the climate problem 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 towards and then above it, they are able to do so along sustainable, low-emission paths. These obligations, moreover, 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, one that we would welcome. It is, however, 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." For the purposes of our analysis here, we argue that this threshold should be at least modestly higher than a global poverty line, to reflect a level of welfare that is beyond basic needs, though well short of today's levels of "affluent" consumption. It turns out that a figure of \$16 per day (PPP adjusted) emerges 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. This reflects a level at which people typically achieve acceptable levels of the Millennium Development Goal indicators. Taking a figure 25% above this global poverty line, we do our indicative calculations relative to a development threshold of \$20 per person per day (\$7,500 per person per year). Not coincidentally, this income correlates well with the level at which the southern "middle class" begins to emerge.

Once a development threshold has been defined, logical and usefully precise definitions of *capacity* and *responsibility* naturally follow, and these can then be used to specify and calculate national obligations for shouldering the climate challenge.

Capacity, by which we mean income not demanded by the necessities of everyday life, and thus available to be "taxed" for investment in climate mitigation and adaptation, can be straightforwardly interpreted as total income, *excluding income below the development threshold*. 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. “Development emissions,” like “development income,” 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 development

urgency 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: a “Responsibility Capacity Index” (RCI). This calculation is done for 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 development threshold and the year in which national emissions begin to count towards responsibility (we use 1990, but different starting dates can be defended). What is important is that the GDR framework lays out a straightforward operationalization of the UN’s official differentiation principles, and that it does so in a way that preserves a right to development. Beyond that, the specific parameters that we have chosen to illustrate this approach can be easily adjusted and should certainly be debated; and all of them, of course, would have to be negotiated.

By our indicative calculations (shown in the Table 1, below) the United States, with its exceptionally large population of people with incomes above the \$20 per day development threshold (capacity) and the world’s largest share of cumulative emissions since 1990 (responsibility), is the nation with the largest share (32%) of the global RCI. The EU follows with a 25% share. China, despite being relatively poor, is large enough to have a rather significant 6.6% share, which puts it not far behind Japan with its 7.4%. India is also large but even poorer, placing it far behind with a 0.8% share. Sweden’s share of the global total obligation, 0.52% is not large in absolute terms, though it is considerable relative to its size, at nearly four times its small population (0.14% of the global total).

As a basis for differentiating national obligations, this approach can potential reframe the entire debate. For one thing, it allows us to objectively and quantitatively estimate national obligations to bear the burdens 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 allows us to gauge the “comparability of effort” across countries. Another way of putting this is that it allows us to escape the UNFCC and Kyoto Annexes, which have become significant obstacles to progress. For example, in a GDR style system, debates about whether Saudi Arabia or Singapore should “graduate to Annex 1”

would be unnecessary, and even meaningless; both would simply be countries with obligations of an appropriate scale, as specified by their RCIs.

	Percentage of global total					
	population	income	Capacity	cumulative emissions (1990-2010)	Responsibility	Obligation (RCI)
<b>United States</b>	4.6	20.7	<b>29.7</b>	23.3	<b>33.9</b>	<b>31.8</b>
<b>EU (27)</b>	7.2	21.6	<b>27.9</b>	15.9	<b>20.5</b>	<b>24.8</b>
Germany	1.2	4.1	<b>5.6</b>	3.4	<b>4.6</b>	<b>5.2</b>
United Kingdom	0.9	3.1	<b>4.2</b>	2.1	<b>2.9</b>	<b>3.6</b>
Sweden	0.14	0.48	<b>0.65</b>	0.25	<b>0.34</b>	<b>0.51</b>
<b>Japan</b>	1.9	6.1	<b>8.1</b>	4.6	<b>6.2</b>	<b>7.4</b>
<b>Russia</b>	2.0	3.2	<b>2.9</b>	6.3	<b>5.9</b>	<b>3.9</b>
<b>Brazil</b>	2.9	2.8	<b>2.3</b>	1.4	<b>1.2</b>	<b>1.8</b>
<b>China</b>	19.7	12.5	<b>5.9</b>	15.7	<b>7.5</b>	<b>6.6</b>
<b>India</b>	17.2	5.2	<b>0.8</b>	4.2	<b>0.7</b>	<b>0.8</b>
<b>South Africa</b>	0.7	0.7	<b>0.6</b>	1.6	<b>1.4</b>	<b>0.9</b>
<b>LDCs</b>	12.5	1.5	<b>0.1</b>	0.6	<b>0.0</b>	<b>0.1</b>
<b>Annex 1</b>	18.8	57.2	<b>75.1</b>	56.5	<b>73.4</b>	<b>74.6</b>
<b>Non-Annex 1</b>	81.2	42.8	<b>24.9</b>	43.5	<b>26.7</b>	<b>25.4</b>
<b>All high income</b>	15.1	55.2	<b>75.6</b>	50.9	<b>71.4</b>	<b>74.3</b>
<b>All middle Income</b>	46.7	36.4	<b>23.4</b>	42.2	<b>27.8</b>	<b>24.8</b>
<b>All low Income</b>	38.2	8.5	<b>1.0</b>	6.9	<b>0.9</b>	<b>0.9</b>
<b>Global Total</b>	100%	100%	<b>100%</b>	100%	<b>100%</b>	<b>100%</b>

**Table 1: Percentage shares of total global population, income, capacity, cumulative emissions, responsibility, and RCI for selected countries and groups of countries.** Based on projected emissions and income through 2010. (High, Middle and Low Income categories are based on World Bank definitions.)

What might those obligations look like? We can consider two complementary examples. First, imagine a single grand international fund through which all mitigation and adaptation were to be financed – such as, say, a greatly expanded version of 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 instance, if the annual funding requirement amounted to one trillion dollars (about 1.5% of Gross World Product, which is well within the range of published estimates of the cost of a global climate transition), the US, with its 31.8% of the global RCI, would be obligated to pay \$318 billion. Similarly, the EU’s share would be \$248 billion (24.8% of the global RCI) of which Sweden’s would be about \$5.1 billion. China’s share would be \$66 billion (6.6%), India’s share would be \$8 billion (0.8%), and so on, as shown in Table 2, below. 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.

We can make the scale of these national obligations more tangible by considering them in terms of the average annual “tax” that they imply, as shown in Table 2 below.

But first note that national obligations derived from a progressive international framework such as GDR approach should, in principle, be fulfilled within nations in a similarly progressive manner. Above all, individuals below the development threshold – who contribute nothing to national

capacity and responsibility and hence nothing to national obligation – should similarly pay nothing toward fulfilling that obligation. Indeed, it would contradict the underlying principles of the GDR framework to pass the national obligation down to them. Thus, the average “tax” shown in Table 2 is calculated by dividing the national obligation among only that subset of the population above the \$7,500/year development threshold. Of course, those just above the threshold should similarly bear a much smaller burden than those far above it. Still, for simplicity’s sake, Table 2 presents the personal “tax” as an average obligation for those above the development threshold.

These figures, again, are derived by assuming a total annual global cost, for both mitigation and adaptation, of one trillion dollars. If it turned out that these costs were instead, say, two trillion dollars (about 3% of current GWP), the national and personal obligations would come to twice the figures shown.

	National Income  (Billion \$ )	National Capacity  (Billion \$)	National Obligation  (Billion \$)	Population above the development threshold  (%)	Average “tax” (for people above the development threshold)  (\$ per person)
<b>United States</b>	14,298	11,970	318	94.7	1,065
<b>EU (27)</b>	14,920	11,249	248	95.5	525
UK	2,149	1,688	37	98.5	608
Germany	2,854	2,240	52	99.2	641
Sweden	333	262	5	99.9	555
<b>Japan</b>	4,227	3,271	74	98.8	587
<b>Russia</b>	2,184	1,172	39	85	331
<b>Brazil</b>	1,900	931	18	37	242
<b>China</b>	8,611	2,357	66	27	180
<b>India</b>	3,559	322	8	6.7	95
<b>South Africa</b>	504	258	9	39.8	465
<b>LDCs</b>	1,023	36	0.7	0.9	83
<b>Annex 1</b>	39,556	30,265	746	89	650
<b>Non-Annex 1</b>	29,550	10,024	254	19	245
<b>All High Income</b>	38,147	30,471	743	97	744
<b>All Mid. Income</b>	25,120	9,432	248	15	505
<b>All Low Income</b>	5,839	387	9	3.8	91
<b>World</b>	69,106	40,289	1000	32	458

**Table 2: National income, capacity, and obligation and average “tax” (i.e., national obligation divided among the population above the development threshold).** These figures are based on an assumed total cost of the global climate program of \$1 trillion (approximately 1.5% of GWP). (All dollar figures are PPP-adjusted 2005 dollars.)

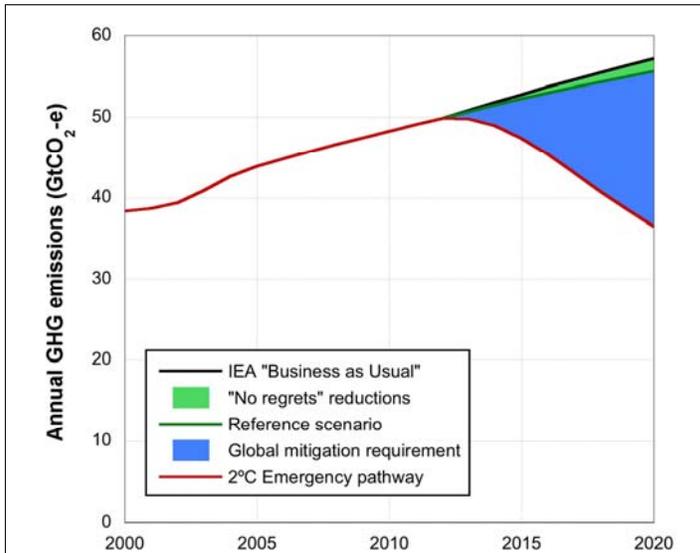
As shown in this table, Sweden’s average personal obligation (\$555 per year) is close to the EU average. This is intuitively reasonable; Sweden’s capacity is somewhat higher than the EU average (relative to its size), but its responsibility is somewhat lower.

What is most useful about this analysis is the confidence it gives us to reason that equity, a virtue usually dismissed by self-styled “realists” as irrelevant to geopolitics, is in fact a matter of great pragmatic significance. Even if costs of a rapid climate transition are assumed to be quite high

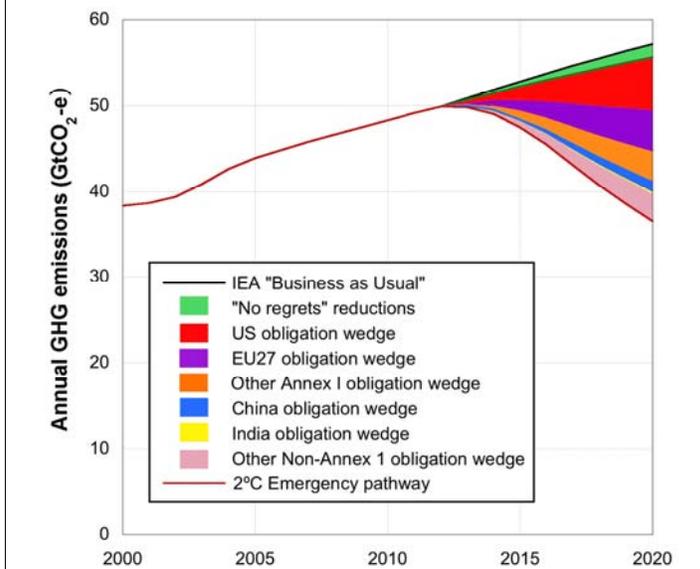
(e.g., one trillion dollars per year), and even if these costs are deemed to be the obligation of the minority of people with incomes above the development threshold (less than one third of the global population), they would still be quite bearable. The relatively well-off can afford to shield the poor from the costs of combating climate change. They can, in other words, afford to honor a right to development.

### 3 The GDR framework and national reduction targets

A second perspective on burden sharing, one that is absolutely central to the ongoing UNFCCC negotiations, expresses post-2012 obligations in terms of emission reduction obligations and Kyoto-style national targets. These we approach by comparing a global “business-as-usual” trajectory to the rapidly declining 2°C emergency pathway, a comparison that allows us to



**Figure 4: Total global mitigation requirement divided into “national obligation wedges”.** The business-as-usual scenario, minus no-regrets mitigation options, yields the global reference scenario. The remaining global mitigation requirement (light blue, upper panel) is divided (colored wedges, lower panel) into national obligations wedges that show the shares of the global mitigation requirement that would be borne by particular nations (or groupings of nations) in proportion to their share of the total global RCI.



straightforwardly calculate the total amount of mitigation needed globally in any given year.

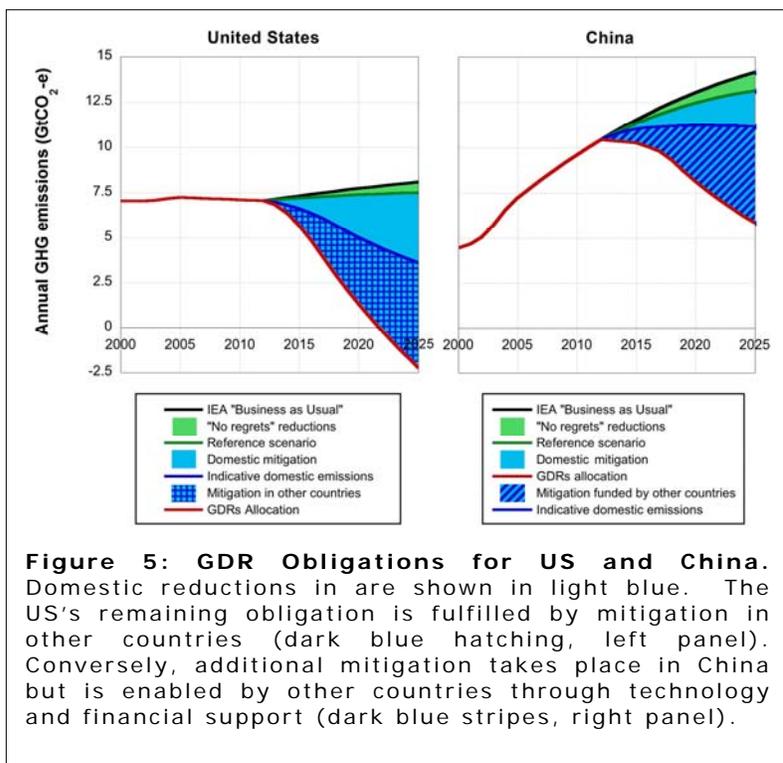
Figure 4 (upper) shows this rapidly growing gap divided between “no regrets” reductions (green), which have zero or net negative costs, and the much larger “global mitigation requirement” (blue). The business-as-usual scenario in this analysis is taken from the International Energy Agency (IEA, 2007); the size of the no-regrets reductions potential is derived from McKinsey Company analysis (Enkvist et al., 2007), and the emergency pathway is the same as that presented in figure 2. As shown, the calculated global mitigation requirement, excluding the no-regrets opportunities, grows to approximately 19 GtCO<sub>2</sub>-eq in 2020.

Within the GDR framework, national reductions obligations are shares of the global mitigation requirement, which is allocated among countries in proportion to their RCI. Figure 4 (lower) shows this allocation into national obligations with, for example, the US’s share (32%) of the total mitigation requirement appearing as the large red wedge and China’s share (6.6%) appearing as the much smaller blue wedge. Sweden’s share (0.51%) is too small to show separately, and is simply included in the orange “Other Annex 1” wedge. Thus, for example, the US mitigation obligation is 32% of the 19 GtCO<sub>2</sub>-eq global mitigation requirement in 2020, or about 6 GtCO<sub>2</sub>-eq.

This is illustrated in figure 5, which shows US emissions and

obligations projected out to 2025. If the US reduction obligation were interpreted literally and achieved entirely through domestic mitigation, it would imply reductions of nearly 140% below 1990 levels by 2025, and a US emission level of *minus 2 GtCO<sub>2</sub>-eq* by 2025. Obviously, for a mitigation obligation of this magnitude to make sense, the US must not be expected to meet its entire obligation through domestic reductions. Whatever is not accomplished domestically, the US would need to fulfill internationally, by way of reductions in other countries that are “supported and enabled by technology, financing and capacity-building, in a measurable, reportable and verifiable manner.”<sup>v</sup>

Figure 5 shows the total US reduction obligation with an indicative division into a domestic mitigation effort (light blue) and an international mitigation effort (dark blue hatched). The domestic mitigation effort is defined so as to match the rapid decline needed to put the US on course toward 90% reductions relative to 1990 levels by 2050, consistent with the emission trajectory for Annex 1 countries presented in figure 2 above. It achieves physical domestic reductions by 2025 of more than 40% below 1990 levels. Even this ambitious rate of reductions satisfies well less than half of the US’s total obligation. The remainder must be made in other



countries, and amounts to nearly 6 GtCO<sub>2</sub>-eq of reductions in 2025. This means, above and beyond its domestic reductions of more than 40%, the US is obligated to make additional reductions internationally that amount to more than 90% of 1990 US emissions.

This very demanding GDR allocation for the US is by no means an anomaly or methodological quirk, but rather a direct outcome of the principles underlying the framework. Like any country with high capacity and responsibility, the US is assigned a very large obligation – large enough to necessitate extremely ambitious reductions both domestically and internationally.

China, in contrast, is obligated to reductions of about 2 GtCO<sub>2</sub>-eq in 2025 (light blue shading), all of which could be made domestically. At the same time, a much larger quantity of reductions within China, more than 5 GtCO<sub>2</sub>-eq in 2025 (blue striped shading), would be enabled and supported by other countries, those with higher capacity and responsibility.

The examples of the US and China illustrate a robust and striking conclusion. The national mitigation obligations of the countries with high capacity and responsibility vastly exceed the reductions they could conceivably make at home. In fact, their mitigation obligations will typically come to exceed even their total domestic emissions. Which is to say that, under a GDR burden sharing framework, countries with high capacity and responsibility ultimately receive “negative allocations”<sup>vi</sup>.

Obligations of this scale may seem simply implausible by today’s standards of political realism, even for countries with high capacity and responsibility. Nevertheless, they are, in the final analysis, quite unavoidable. It is only through explicit obligations of this magnitude that a climate

regime can effectively bring about two vital outcomes. First, by driving ambitious domestic reductions, they ensure that the wealthier countries free up sufficient environmental space for the poorer countries to develop. Second, by driving equally ambitious international reductions – enabled by technological and financial support from the wealthier countries – they ensure this development occurs along a decarbonized path.

These examples thus show, with startling clarity, that a major commitment to North-South cooperation – including financial and technological transfers – is an inevitable part of any viable climate stabilization architecture. This situation reflects the nature of national obligations and the obvious truth of the greenhouse world: even if the wealthy countries reduce their domestic emissions to zero or near-zero levels, they must still enable large emissions reductions elsewhere – in countries that lack the capacity (and responsibility) to reduce emissions fast enough and far enough without significant assistance from others.

In other words, it is only by accepting this *two-fold obligation* can the wealthy countries make the climate regime genuinely consistent with a right to development.

## 4 Examining Sweden's Obligations

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### 4.1 Sweden's responsibility: a footprint approach

As noted above, Sweden's share of the total global obligation is 0.52%, reflecting its capacity and its responsibility. In assessing responsibility, the results reported here have considered not simply Sweden's domestic "territorial" emissions, but rather its total "carbon footprint." That is, we have drawn on a detailed analysis that accounts for the emission impact of Sweden's total consumption, by including carbon emissions embodied in products consumed in Sweden but produced in other countries (Minx et al, 2008). In a fully consistent manner, it conversely excludes carbon emissions embodied in products which are produced in Sweden, but exported and consumed in other countries, and also accounts for the related transport emissions. In Sweden, as in most industrialized countries, imported carbon exceeds exported carbon. Consequently, Sweden's net carbon footprint is 17% larger than would be inferred based on its territorial emissions alone.

In total, Sweden's emissions corresponding to consumption of domestically produced goods comprise 49.7% of its carbon footprint, while emissions corresponding to consumption of internationally produced goods comprise 50.3%.

### 4.2 Sweden's goals and targets

Sweden is poised to take a global leadership role in the climate arena. It has strongly reaffirmed the global objective of keeping temperature rise below 2°C, and its Climate Committee has added rigor and helpful specificity to that goal by first identifying 400 ppm CO<sub>2</sub>e as a maximum acceptable level for stabilization of GHG concentrations, and then going on to recommend near-, medium-, and long-term targets for Sweden. (Climate Committee, *Svensk klimatpolitik*, 2008)

The near-term target is to unilaterally adopt a laudable emission objective 4% below 1990 levels for the first Kyoto commitment period of 2008-2012, which is well beyond Sweden's official obligation under the EU burden sharing agreement of 4% above 1990 levels. Moreover, the Climate Committee has recommended that Sweden fulfill this target entirely through domestic measures, without recourse to carbon sinks, sequestration, or flexible mechanisms.

In the medium-term, the various proposals facing serious consideration by the major political parties as 2020 emission targets span a range from 30% to 40% reductions relative to 1990 levels. (See Figure 6, upper panel.) The Climate Committee recommended a 35% reduction target, but noted that full implementation of its mitigation action plan is provisionally estimated to yield a reduction of 38%. It specified that the intention was not to meet this target solely through domestic measures, but with the inclusion of EU ETS and CDM/JI exchanges.

In the longer term, the Climate Committee recommended an indicative target of reducing emissions to at least 75-90% below 1990 levels by 2050, and to close to zero by 2100.

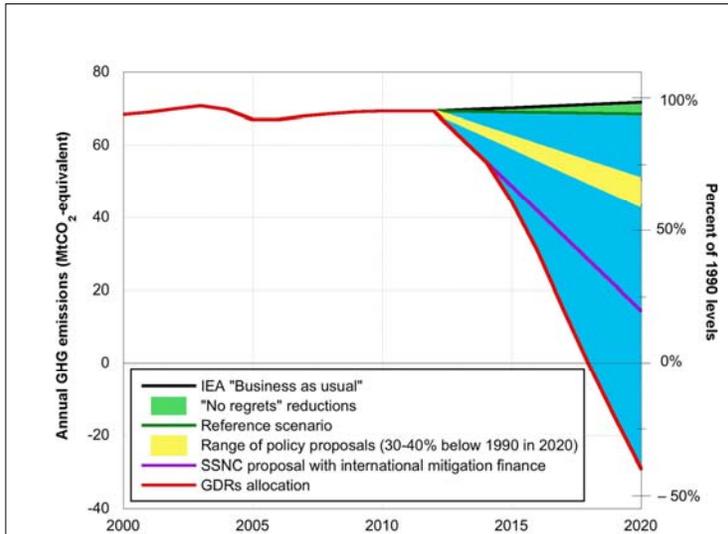
No less critically, Sweden has embraced its further obligations to the international community. Recognizing that "in the period up to its EU presidency and beyond, Sweden has a key role to play in the international negotiations on a new climate regime for the post-2012 era," the Climate Committee underscored the importance of Sweden's "ability to support proactive measures in rapidly growing developing countries." All this reflects Sweden's willingness to be a conscientious leader in the global struggle against climate change and for sustainable development.

The Naturskyddsföreningen (Swedish Society for Nature Conservation) has proposed a more expansive objective that explicitly encompasses the need for supporting mitigation in developing countries. In addition to recommending a 40% emission reduction relative to 1990 levels by 2020 (to be achieved wholly domestically), it has further recommended that Sweden make substantial investments in developing countries to simultaneously support development and mitigation. The SSNC recommended that investments rise to 3 billion kronor per year by 2020, estimating this to be sufficient to generate reductions internationally that were very roughly equivalent in magnitude

to the reductions required domestically. In aggregate, the recommended reduction target of SSNC thus amounts to 40% domestic mitigation plus a further indicative 40% international mitigation. Figure 6 shows this combined objective in a very approximate way as an indicative combined reduction target (purple line, upper panel) reaching 80% in 2020.

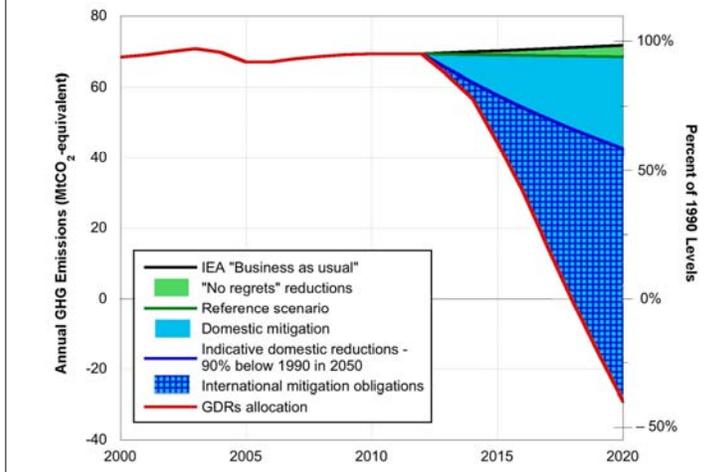
### 4.3 Sweden's GDR obligations

As with every country, Sweden's obligations under the GDR framework are calculated as its share of the estimated global mitigation requirement. By 2020, for example, Sweden's share



**Figure 6: Various proposed emission reduction targets and Sweden's "two-fold obligation".**

Sweden's reference trajectory is determined by its business-as-usual trajectory minus no-regrets options. The yellow band corresponds to the 30-40% range of reduction proposals. The purple line corresponds to the SSNC proposal of 40% mitigation reductions plus an indicative 40% international mitigation by 2020. The red line shows the GDR allocation, reaching a 140% reduction by 2020 relative to 1990 levels. Below, domestic mitigation is shown achieving reductions of 41% by 2020 relative to 1990 emissions, and international mitigation amount to more than an additional 90% in reductions.



(0.51%) of the global total (19,000 MtCO<sub>2</sub>-eq) reaches roughly 100 MtCO<sub>2</sub>-eq. Figure 6 shows the resulting reduction obligation (red line), relative to Sweden's reference scenario. As is strikingly clear, Sweden's GDR allocation declines all the way to zero and beyond, reaching *negative* 30 MtCO<sub>2</sub>-eq by 2020. This implies a reduction target of *140% below 1990 levels*. This sharply contrasts with the 30-40% range of targets being discussed by the political parties, and even with the SSNC's indicative target of 80%.

Clearly, a reduction target of this magnitude is only meaningful if it is taken to signify a combined obligation to make reductions domestically and to invest in reductions internationally. The implied *two-fold obligation* is rather ambitious on both the domestic and international fronts, is shown in the lower panel of figure 6.

In this figure, Sweden's GDR obligation is shown with an indicative division into a domestic mitigation effort (light blue), and an international mitigation effort (dark blue hatched). The domestic mitigation effort is defined so as to match the rapid decline needed to put Sweden on course toward 90% reductions relative to 1990 levels by 2050. By 2020, domestic emissions are 41% below 1990 levels. The international mitigation effort is more ambitious still, implying mitigation efforts abroad that equate to an additional 90%

reduction relative to 1990 levels. This international effort would be undertaken in countries with mitigation potential available in excess of that needed to meet their own domestic mitigation obligations.

As does the US, and all other countries with high capacity and responsibility, Sweden has a two-fold obligation, to both ensure deep domestic reductions as well as to rapidly catalyze reductions in developing countries through financial and technological support.

#### **4.4 Domestic action vs. international action?**

The Greenhouse Development Rights framework in and of itself doesn't specify what portion of Sweden's obligation must be met domestically. It is clear from the sheer scale of its obligation, though, that some portion must be met internationally. And indeed, this is as it should be. It is by paying for reductions in developing countries that the wealthy subsidize global decarbonization and leapfrogging.

But can this option be abused? What if a wealthy country tries to "buy its way out" of the climate problem, by pursuing all or even most of their reductions internationally? To some degree, any true emergency climate program will contain 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 increase and reduction opportunities in the South become more and more costly. But what if this isn't enough? After all, any emergency program must, at some point, require significant structural and socio-cultural adjustments on top of major technological changes, and wouldn't wealthy northerners be willing to pay quite a premium to avoid the discord associated with 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, which requires deep infrastructural change to start as soon as possible, some aspects of which might be costly or politically challenging. (For example, it will take a serious and sustained effort to evolve more compact and transport-efficient urban forms.) Internationally purchased reductions, while more tempting in the short-term, could be excessively costly in the long term and perhaps even fatal to an international agreement if overexploited. They will almost certainly continue to rise in price, and countries that maintain their dependence on such reductions risk waking at some point to find that they've simply become unaffordable. At that point, having failed to take the necessary early, incremental actions, they would find further reduction obligations increasingly difficult to fulfill. In the worst case, they would simply defect from the regime.

Second, politics matters a great deal. High levels of global cooperation will be essential to any emergency transition, 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. Indeed, the current level of North / South distrust is so high that it may simply prove impossible to establish any global climate regime that does not include safeguards against wealth-based free riding. Such safeguards, in any case, make good structural sense. It's unlikely that technological changes will alone deliver the necessary rates of emissions reductions, which implies that the historically wealthy and high-emitting countries will have to earnestly help pioneer new kinds of low-impact lifestyles, of kinds that can be scaled up and be at least potentially adoptable by the growing global population. And any regime that allows them to escape this necessity will be quite fatally flawed.

Finally, important problems arise from the operation of markets in an unequal world. Transactions in the real world do not always reflect the idealized view of carbon markets, in which the sellers of permits are assumed to be acting voluntarily, and perhaps even reaping handsome profits. In fact, market transactions engage actors with widely disparate levels of power. It's already difficult to ensure that the permits being sold by actors in 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.

These are not by any means decisive arguments against international action, which is ultimately

an absolute necessity. But they are cautions, and challenges, and they should be taken seriously. The climate transition is going to be one of the most difficult challenges that our civilization has ever confronted, and we should not pretend that these challenges will be small and easily surmounted. Accepting the two-fold obligation, as difficult as it may seem, is only a beginning. There will be other rivers to cross.

## 5 Conclusion

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*“We are all in the same boat. The challenge ahead of us all is to develop our societies and economies in a sustainable manner that can save the earth’s climate. In short: the global agreement that we will sign in 2009 should enable developing countries to make a shortcut to fossil-free, green economies that grow and flourish in a sustainable way - as we all have to!”*

Andreas Carlgren  
Minister of Environment, Sweden  
February 2008

Addressing the Summit on Sustainable Development in Delhi, Minister of Environment Andreas Carlgren spoke with refreshing clarity about the climate and development challenges that now urgently confront us. It echoed his passionate commitment to climate leadership, a commitment that is abundantly evident throughout Sweden. “We in Sweden need to do everything we can to save the world’s climate,” the Minister bluntly stated, recognizing as well that “we cannot save the world’s climate here in Sweden. What we do and the role we fulfill have to be viewed from an international perspective.”

Genuine leadership indeed calls for an international perspective. It requires acceptance of the profound and immutable fact that the climate crisis, dire though it may be, confronts us in the midst of a development crisis.

In such a world as this, leadership demands that we recognize and reject any path that would address the former crisis by worsening the latter. Leadership, indeed, can mean nothing less than the willingness to accept one’s true obligations. And as long as the majority of humanity still struggles to realize its right to development, Sweden’s true obligations will be, unavoidably, large. These are presented rather faithfully by the Greenhouse Development Rights analysis presented in this report.

We use this phrase – “Sweden’s true obligations” – advisedly, but we use it nonetheless. For, if you accept the venerable UN principles that are enshrined in the Framework Convention, with its call upon “all countries” to act “in accordance with their common but differentiated responsibilities and respective capabilities,” then you have accepted a perspective that, we believe, legitimates and even necessitates the conclusions reached by this analysis. Not that they are immutable in all their details. There is much here that can be examined further, much that can be made more precise and specified more exhaustively. But accept the premises here, of *responsibility*, *capacity*, and a *right to development*, and the results follow naturally.

What then can we conclude? Only that Sweden has a great opportunity. With the climate negotiations being driven by short-term national interests, the current international impasse is only to be expected. But it need not be endured, nor the profound climate disruption to which it would condemn us. Which is to say that Sweden can be the first nation to step forward to accept its fair share of the climate burden. The bill would be significant, but it would not be arbitrary, and it would not be onerous. It would be a fair price for a pivotal step toward true sustainable development.

For Sweden to take that step would make a profound difference in Copenhagen.

And it would come not a moment too soon.

*“Should not the great climate change treaty that we have to sign 2009 be a treaty, not just about climate change, but about climate change and sustainable development?”*

Andreas Carlgren  
Minister of Environment, Sweden  
February 2008

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<sup>i</sup> See, for example, Lenton, et al., (2008).

<sup>ii</sup> For the most recent evidence that concentration ratios need to drop even below 350 ppm CO<sub>2</sub>, see Hansen (2008).

<sup>iii</sup> For details, see Baer and Mastrandrea (2006) and Meinshausen (2006).

<sup>iv</sup> For further information, including detailed calculations and assumptions as well as some sensitivity analyses to key parameters, please see to the most recent published version of the Greenhouse Development Rights framework (Baer et al., 2008)

<sup>v</sup> The Bali Action Plan, Decision 1/CP.13 para 1(b) ii.

<sup>vi</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.