

Cutting the Knot

Climate Protection, Political Realism and Equity as requirements of a Post-Kyoto regime

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Abstract

With climate science now maturing, and indicating that rates of decarbonization that are considered “realistic” will almost certainly fail to prevent catastrophic global warming, it is instructive to return to first principles. In this spirit, we propose to take Southern diplomats at their word when they tell us that they must, and will, “put development first.” Doing so, we straightforwardly conclude that developmental equity is essential to any adequately stringent climate stabilization regime.

But what does developmental equity demand?

Looking forward, we propose a concrete framework designed to reconcile the logic of developmental equity with the demands of climate protection. In the first section of this paper, we introduce this framework – Greenhouse Development Rights – which we take as an “equity reference framework.” In the second, we explore some of the challenges that would have to be faced in putting Greenhouse Development Rights into practice.

1 Mapping the Knot

Despite the almost impossible complexity of the climate deadlock, it is possible to map its most profound contours. They range, unsurprisingly, outside the traditional domains of climate politics, across lands defined by post-Cold War geopolitics, the struggle for development, the challenges of sustainability. For all this, however, they define a tangle in which three principle strands may be clearly discerned: climate adequacy, climate equity, and political realism.

We do not claim to know how to untangle the knot. We are, however, convinced that each of its three strands demands concentrated attention, and, more controversially, that none of them may be deferred. As the science becomes increasingly clear, any honest appraisal of what adequate climate protection will require shows the need for rapid and potentially expensive actions. This means that the key question – who will pay for adequate mitigation? – is no longer avoidable. In answering this question, political realism as we know it today appears to directly conflict with the demands of climate equity.

To help map the way forward, we propose the concept of an "equity reference framework" -- a framework that allows us to ask, before we prejudge what is and isn't acceptable to various parties, what would actually be fair. We do so because we believe that there is in fact no adequately precautionary way forward that does not involve a radical redefinition of realism, and that, with some actual clarity about the demands of equity, this problem becomes quite undeniable.

But before we discuss equity and realism, we must address the central question of the climate regime: what will it take to avoid climate catastrophe?

1.1 Climate adequacy: Avoiding climate catastrophe

Because of the inevitable uncertainty in the climate system and today's climate science, adequate climate protection requires a precautionary approach. This means not only the magnitude but the distribution of risk must be considered. Thus, a valid evaluation of whether any proposed policy regime is or is not adequately precautionary requires that its authors specify the impacts that they are trying to avoid, and the risks of failure that they are willing to accept – and (here's the hard part) that they do so on behalf of those people and communities who would suffer the impacts.

Clearly climate adequacy is a value-laden concept, and we cannot straightforwardly appeal to science alone to tell us what does or does not qualify as adequate precaution. However, we actually know a fair bit more about the risks of dangerous climate change than we did even eight years ago when the Kyoto Protocol was negotiated. In fact, we are now in a position to draw some quite strong, and quite unsettling, conclusions. To do so we need only start with one very basic premise: there are some globally catastrophic climate impacts – such as the melting of ice caps and interference with the thermohaline circulation – that *really must be avoided*.¹ Climate adequacy therefore requires, at a minimum, preventing not *dangerous* but *catastrophic* anthropogenic interference with the climate system.

¹ See for example Oppenheimer and O'Neill (2002), Hansen (2004) and Rahmstorf and Jaeger (2004) for cogent descriptions of catastrophic climate impacts.

This is a problematic requirement, not because most people wouldn't agree that catastrophic climate change should be prevented, but because it seems to grant the inevitability of severe harms, particularly to people in developing countries and to sensitive ecosystems, harms that will become extreme long before temperatures rise to a level that threatens global climate catastrophe.² Indeed, with recent droughts, heat waves and storms consistent with the anticipated impacts of a warming climate, and particularly with new evidence of drastic impacts in the Arctic³, it is quite clear that, even with the global mean surface temperature increase still less than 1°C, some regions are already experiencing dangerous, and even locally catastrophic, climate change. Still, despite all this, we have unenthusiastically adopted a modest definition of an adequately precautionary climate policy – one that at least ensures a high probability of preventing catastrophic *global* climate change.

A broad consensus is emerging around “the 2°C line,” and increasingly politicians, scientists, and activists are deeming greater warming as unacceptably dangerous. But this hardly means that a warming of 2°C would be safe; far from it. For some people and ecosystems, it would clearly be catastrophic. It would be globally dangerous, and it might even, if we are unlucky, be globally catastrophic.⁴ However, following the political consensus we will for the sake of this analysis take to be “adequately precautionary” any climate policy that preserves a high probability of keeping the temperature increase below 2°C. The kicker is that, because of the substantial range of estimates of the *climate sensitivity* (the equilibrium temperature increase resulting from an equivalent doubling of CO₂), ensuring a high probability of staying below 2°C means that the allowable remaining greenhouse-gas budget is extremely small.

This is not a technical paper, so we will only briefly relate the results of more detailed analyses provided elsewhere.⁵ Recent climate modeling gives us good reason to believe that there is at least a 10 percent chance that the climate sensitivity is greater than 4°C.⁶

² See Volume II of the IPCC's Third Assessment Report (McCarthy et al., 2001); also Grassl et al. (2003) and Hare (2003) for reviews covering more recent research.

³ *Impacts of a Warming Arctic: Arctic Climate Impact Assessment*. Cambridge, UK: Cambridge University Press.

⁴ See Note 1 *supra*, also Grassl et al. (2003), Hare (2003) for helpful summaries.

⁵ The calculations are spelled out in some detail in the technical notes to Baer and Athanasiou, *Honesty About Dangerous Climate Change*, (2004), at www.ecoequity.org/ceo/ceo_8_2.htm. See also Wigley (2004) and Hare and Meinshausen (2004).

⁶ In fact, several recent studies suggest that the climate sensitivity has a 20% or greater chance of exceeding 4.0°C (Andronova and Schlesinger 2001, Forest et al. 2002, Gregory et al. 2002, Knutti et al. 2002). Note that measuring the climate sensitivity is not like rolling dice, with the outcome represented by a single, well-defined probability distribution (the distribution of outcomes as the number of trials approaches infinity). While it is likely that the chaotic nature of the climate system would imply that the “realized” climate sensitivity would vary if “the experiment” of doubling CO₂ could be done many times on many identical planets, this is not the primary basis of our uncertainty, which rather reflects our ignorance about the causal processes in the system and our inability to model them convincingly, or to run the experiment against a control. However, for the purpose of policymaking, it is possible – and arguably necessary – to consider the climate sensitivity in the same way one would think about a die roll, in terms of a probability distribution. Doing so allows one to estimate the likelihood of a given greenhouse-gas scenario staying under a desired temperature threshold, given the current limitations of our knowledge of the climate system's response to human disturbance.

If we allow ourselves the optimistic assumption that there is indeed only a 10 percent chance of this being the case, then, to preserve a 90 percent chance⁷ of staying below 2°C, greenhouse-gas concentrations must be stabilized at or below 400 ppm CO₂-equivalent.⁸

Given this, it is unsettling that the current concentration of CO₂ (~380 ppm) together with other well-mixed greenhouse-gases *already* amounts to about 460 ppm of CO₂-equivalent. Thankfully, the effective concentration is somewhat lower, roughly 360 to 400 ppm CO₂-equivalent, because of the negative radiative forcing⁹ (cooling effect) of sulfates and other aerosols.¹⁰ In the future, though – and this is a key, still underappreciated problem – we will benefit less and less from the cooling effect of these short-lived aerosols, as their short lives in the atmosphere, coupled with efforts to regulate both traditional air pollutants and greenhouse gases, will inevitably cause their concentrations to decline.

In any case, we are left finally with this: to have a high probability of keeping the temperature increase below 2°C, the total global 21st century carbon budget must be limited to about 400 Gigatonnes, with the precise figure depending on how much one allows for non-CO₂ gases. But all things considered, 400 GtC is a reasonable estimate, perhaps even a bit generous, as it assumes the oceans and terrestrial biosphere will endure as an undiminished carbon sink.¹¹

A budget of 400 GtC is *very* small. To stay within this budget, global emissions would almost certainly have to peak before 2020 and decline fairly rapidly thereafter. If emissions were to continue to grow past 2020, so much of the 400 GtC budget would be rapidly used up that holding the 2°C line would ultimately require extraordinary rates of emission reduction, rates corresponding to such large and historically unprecedented rates of accelerated capital-stock turnover that, frankly, it's difficult to imagine them occurring by virtue of any normal, orderly economic process.

Time, in other words, is running out.

The danger of delay can be simply illustrated. Figure 1 shows two global emission trajectories, both designed to peak and then decline so as to keep within a 400 GtC budget. The difference between them is that in the first case the decline starts in 2010, while in the second it starts in 2020. It is a difference that makes a difference. In the first

⁷ The necessary public discussion how high the probability of preventing catastrophic climate change would have to be before it was acceptable is only just beginning. We use 90 percent here to make our argument concrete, and also because we believe *prima facie* that it is a reasonable definition.

⁸ To be more precise, the total radiative forcing of all forcing agents, both positive and negative, must be at or below 400 ppm CO₂-equivalent. See the next paragraph for a discussion of aerosols, etc.

⁹ Radiative forcing measures the change in the earth's energy balance from changes in GHG concentrations, and is measured in Watts per square meter (W/m²). Doubling of CO₂ would result in a positive radiative forcing of about 3.7 W/m².

¹⁰ See Working Group I of the IPCC's Third Assessment Report (Houghton et al. 2001), for the canonical discussion, or Baer and Athanasiou (2004) for a quick tour of aerosols and other forcings.

¹¹ A 400 GtC carbon budget from 2000-2100 is consistent with stabilization at about 370 ppm CO₂ if the combined oceanic and terrestrial sink averages about 4GtC over the century. Net non-CO₂ forcings would need to be held to 30 ppm CO₂-equivalent, which is difficult but probably achievable.

case, the rate of decline needed to remain within the 400 GtC budget is about 2.6% percent per year; in the second, it increases dramatically – to 6.7% percent per year. This latter rate of decrease is dramatic indeed. For comparison, note that even with the energy intensity improvements that followed the oil shocks of the 1970s, US total emissions grew at a rate of about 1% annually over the decade (vs. GDP growth averaging about 3% annually).

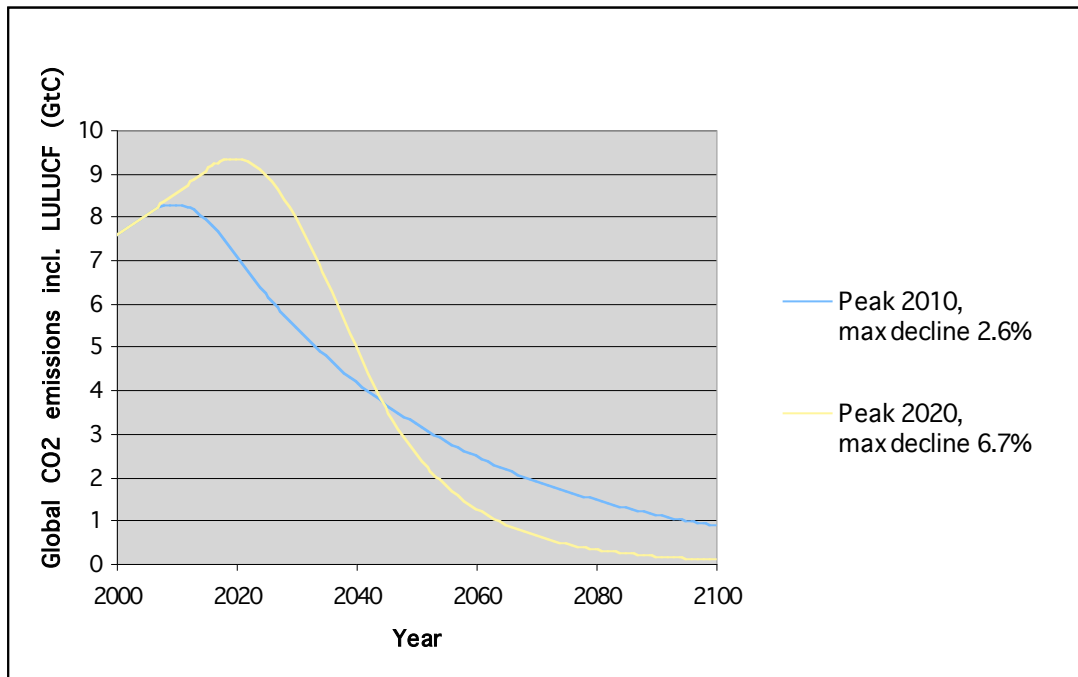


Figure 1: Two trajectories totaling 400 GtC total emissions between 2000 and 2100. Both grow initially at 1.2% annually; one peaks in 2010 and then must decline at a rate of 2.6% annually to keep within the 400 GtC budget; the other peaks in 2020 and thereafter must decline at a rate of 6.7% annually. Note that 2000 emissions use estimate of 1 GtC annual CO₂ emissions from land use change, based on Achard et al. (2004).

The implications are clear and compelling, particularly because the 400 GtC budget on which these curves are based actually embodies *conservative* parameter choices for both climate sensitivity distribution and the size of global carbon sinks.¹²

1.2 Realism (or at least acceptability)

Realism is the second thread in the climate policy knot. Its demands, too, must be satisfied, but not without first identifying and examining the roots of those demands. To assume them immutable is to risk sacrificing either climate adequacy or equity in order to satisfy some strongly held prejudice about what is realistic and acceptable.

In the climate context, judgments about realism are first of all judgments about what commitments various countries will accept. The strongest version asserts that countries

¹² As mentioned above, several published probability distributions for the climate sensitivity have 20% or more of the distribution over 4.0°C, and one carbon-cycle model (Kheshgi and Jain 2003) estimates that the average sink over the century may be as low as 1.75GtC/yr for low-emissions scenarios (compared to approximately 4 GtC annually assumed in our estimate of a 400 GtC budget).

will only accept international treaties that are in their own narrow economic self-interest. A somewhat more qualified definition allows that countries have a broader definition of self-interest than, say, simply maximizing GDP growth, and this one is, perhaps, more true to the mainstream of realist theory. Still, the key premise of the realist stance is that countries will pursue their narrow self-interest in the international arena, with, at best, secondary regard for their impact on other countries.

1.2.1 Realism and the North: Willingness to pay for mitigation

The issues here are many, and tangents beckon, but the central challenge of climate realism is simply that today's "willingness to pay" for climate mitigation is extremely limited, and incommensurate with the scale of the threat. Thus, and inevitably, the economic acceptability of any given regime proposal is the key determinant of its realism. Certainly this is how negotiators are compelled to think about the matter, and anyone who imagines him- or herself to be thinking seriously about the ongoing climate regime negotiations must do the same.

Yet the underdeveloped nature of the discussion about who pays the costs of global decarbonization is one of the most striking features of the climate debate.¹³ And it is impossible to imagine that any adequately precautionary regime – let alone an equitable one – can be created while this remains the case. Unfortunately, because of the current low level of willingness to pay, it is quite easy to imagine a series of nominal climate agreements that create the appearance of progress, while actually deferring real action. This is, in fact, a real and present danger.

However, it would be defeatist to accept the current level of willingness to pay as inherent or immutable, and doing so would require us to abandon the goal of preventing catastrophic climate change. Yet unless we are very clear that the necessary willingness is presently lacking, we cannot expect to conduct a coherent debate on the post-2012 regime. The question then is: Can willingness to pay be increased, and if so, how? There are many reasons to believe it can be increased. Here, briefly, are a few of the most important:

- The current lack of willingness to pay is not a monolithic, uniformly shared sentiment. There are clearly sub-populations who are deeply concerned about climate change and the communities who will be harmed. Even the US is not a single society unanimous in its opposition to paying for serious mitigation, and we see action at the state level, within corporations, and by individuals that are frustrated by the unwillingness at the federal level, where international treaty law is made.
- Technically and economically, it is still possible to protect the climate. Technologically feasible options include energy efficiency, low-carbon and renewable energy sources, and curbing deforestation (Pacala and Socolow, 2004). Putting these measures in place would by no means be economically disastrous. The IPCC's Third Assessment Report includes the very mainstream economic assessment that stabilizing atmospheric carbon dioxide at twice pre-industrial

¹³ For example, both the CAN and South-North multi-stage proposals (see Section 2) go right to the brink of discussing financing, then stop short, in spite of the dependence of their proposals on Northern financing for decarbonization in the South.

concentrations by 2100 would cost between \$1 trillion and \$8 trillion. It sounds like a lot of money, but compare it to world economic growth, as predicted by these same economists and compounded over the century, and it becomes all but invisible. At such a rate, the world as a whole will be ten times as rich by 2100, and people on average will be five times as well off. According to energy economist Christian Azar and climatologist Stephen Schneider, two highly respected analysts, adding the costs of tackling warming, even if they come to as much as 5 percent of global income (an implausible but typical estimate), would postpone this economic growth target by a mere two years, from 2100 to 2102.¹⁴

- More and more people will be willing to pay to protect the climate as the impacts of climate change mount, and as the high cost of inaction grows increasingly evident. It would be dangerous, however, to count on climate impacts to be the main impetus for increasing willingness to pay for climate protection. The inertia inherent in the climate system would mean that by the time that serious impacts are already felt, devastating impacts are inevitable.
- Willingness to pay is, in the language of the SRES scenarios, storyline dependent. It depends, that is, on the cultural and political priorities of the moment. Today, for example, the people of the United States are, it seems, willing to pay for a fantastically expensive missile defense system that is entirely irrelevant to the principal security threats (e.g., dirty nukes in cargo containers) which they as a nation confront. Why? Whatever the reason, it has little to do with a documented and rationally debated cost/benefit analysis.
- If the hidden costs of business-as-usual were made more visible, there would be a greater willingness to chart an alternate course. Indeed, a great deal could be accomplished by drawing attention to the high cost of counter-productive fossil-fuel subsidies. More generally, replacing standard macroeconomic indexes like GDP with more holistic indexes that take social and environmental factors into account (from natural resource stocks to childhood mortality to the military political costs of oil dependency) would help make the costs of BAU more apparent.
- People will be more willing to embrace change, and to accept the costs of change, if these costs are distributed fairly. Such fairness must necessarily have two components. First, the global burden-sharing agreement must be seen to be equitable, with nations and populations doing their fair share. It is much easier to imagine people of the North being willing to pay the incremental costs of decarbonization in the developing world if they are convinced of the justice in doing so. Second, to borrow the language of the US Environmental Justice movement, is that people must be afforded a “just transition,” one that avoids burdens so immediate, and extreme as to be manifestly illegitimate, and ultimately unacceptable. The challenge of providing a just transition arises especially with regard to particular sectors or professions, such as coal miners, and with respect to countries that have become heavily dependent on fossil fuel resources¹⁵, but the rule is a general one.

¹⁴ Azar, Christian, and Schneider, Stephen, “Are the economic costs of stabilizing the atmosphere prohibitive?”, *Ecological Economics* 42 (2002), pp. 73-80.

¹⁵ A less justifiable position is that countries should be compensated for the declining value of their fossil reserves as the climate regime makes them increasingly unneeded. The initial distribution of fossil reserves was inequitable, so they have no equity-based claim to receive compensation as decarbonization renders

To be sure, appeals to justice will not sway everyone, and may not even be decisive – that role is probably reserved for necessity – but the climate regime must at least be defensible in clear ethical terms.

- Finally, the climate regime must provide incentives for countries to join, and to earnestly participate. And these must come as both carrots and sticks. This, really, is the challenge, and it applies to countries of all levels of development. As the developing countries must be motivated to decarbonize as rapidly as possible, the developed countries must not benefit from defection or free riding. Beyond a certain point, free riding will not only cripple, but will actually destroy, the climate regime.

Conventional realist wisdom has it that, given the nature of national sovereignty, international environmental agreements must be self-enforcing; that is, the gains from participating must outweigh the gains from defecting, since no country, it is said, can be compelled to participate. Yet sovereignty is not absolute, and there is no reason that free riders could not be subjected to trade-related sanctions and border charges against embodied carbon. Such measures might, in fact, be invaluable, since competition is a favorite justification for weak mitigation policies, particularly on the part of EU, Japanese, and Canadian Parties concerned about unfair US competition. States have agreed to cede sovereignty to some international instruments, such as the WTO, because they (rightly or wrongly) saw it as in their interests to expose themselves to the associated carrots and sticks. They may well do so again, for there is no good reason to suppose that an effective global climate regime can be otherwise put in place.

Willingness to pay, the key term in the realist equation, can be increased.

1.2.2 Realism and the South: Willingness to engage on commitments

The other half of the question, of course, is what would be acceptable to the South.¹⁶ And here, while there is some value to considering willingness to pay, the practical matter is somewhat different. For, as we will discuss in the Equity section below, there is little legitimate ground for asking any but the richest countries in the South to pay for climate mitigation in the short run. It is no accident that most serious proposals for a post-Kyoto climate regime involve forms of commitments for developing countries that protect them from incurring substantial costs, at least in the near term.

In spite of this, the G77/China negotiating block, and the most powerful individual countries within it (especially China and India), have refused to engage in any serious discussion of Kyoto-style mitigation targets. Indeed, and far less justifiably, they have

that inequitable distribution irrelevant. The climate problem raises high stakes, for it involves allocating a resource which *prima facie* should be distributed equally (i.e., the atmospheric commons) and additionally revalues other resources which are not distributed equally and whose unequal distribution is largely unquestioned (i.e., fossil fuels).

¹⁶ It is important to realize that the South, like the North, is quite heterogeneous, and thus what individual countries want or would accept in a climate treaty will actually vary widely. We nevertheless plunge ahead with the usual simplistic North/South model because it allows us to make our points quickly, as befits this brief paper.

actively rejected even the long-overdue review of adequacy¹⁷, and opposed any UNFCCC-official discussion of the scientific evidence, knowing that it would inevitably draw attention to the need for mitigation in developing countries.

To say that the South has not engaged on discussions of commitments is not by any means to accuse it of not engaging in other ways. Southern countries have devoted valuable scientific resources to the climate problem and political resources to the climate negotiations. They have worked to fulfill their obligations under the Climate Convention, and are keen to collaborate on the Kyoto flexibility mechanisms. Most importantly, many have taken impressive strides toward implementing policies to promote energy efficiency, support renewable energy, and slow deforestation¹⁸. Still, when it comes to engaging on discussions of commitments, the South has been reluctant to the point of obstinacy.

Given the likelihood of disproportionate climate impacts on developing countries, this position may seem counter to their self-interest. But notwithstanding the immediate and extraordinary risks to small island states and low-lying countries like Bangladesh, it is not hard to see why most developing countries see mitigation, rather than climate change, as the greater threat to their most immediately pressing objectives: economic growth and the reduction of poverty.

And yet the South's policy of non-engagement is not a species of self-defeating obstinacy, as so many Northern environmentalists think, but rather a species of realism. Unconstrained emissions in the South will soon no longer be consistent with an adequately precautionary trajectory, and this is clearly obvious to Southern negotiators. They seem particularly insistent on noticing that Northern proposals for growth targets and other apparently no-regrets options, proposals that appear to promise room for Southern emissions growth, are only going to be able to honor that promise in the very short term. After that, the space will be gone.

The size and shape of this problem are shown in Figures 2 and 3 below. Figure 2 shows a trajectory for annual global CO₂ emissions in GtC per year that is consistent with a 400 GtC budget and achieved via a global decline starting in 2020 (this trajectory is one of those shown in Figure 1, above). In the scenario illustrated, the global trajectory is divided between North and South in a manner that is *implausibly generous to the South*, allowing Southern emissions to grow at a rate of 2% annually (in fact well below their recent historical growth rate). This requires emissions in the North to decline extraordinarily rapidly, reaching zero by 2028. The entire remaining portion of the carbon budget is allocated to the South.

¹⁷ Article 4.2(d) of the UNFCCC calls for a second review of the treaty's commitments no later than 1998. In spite of this, in part because of opposition from the G77/China (as well as situational allies in the North), this agenda item has rolled over from COP to COP without ever being addressed.

¹⁸ See for example, Chandler et al., 2002

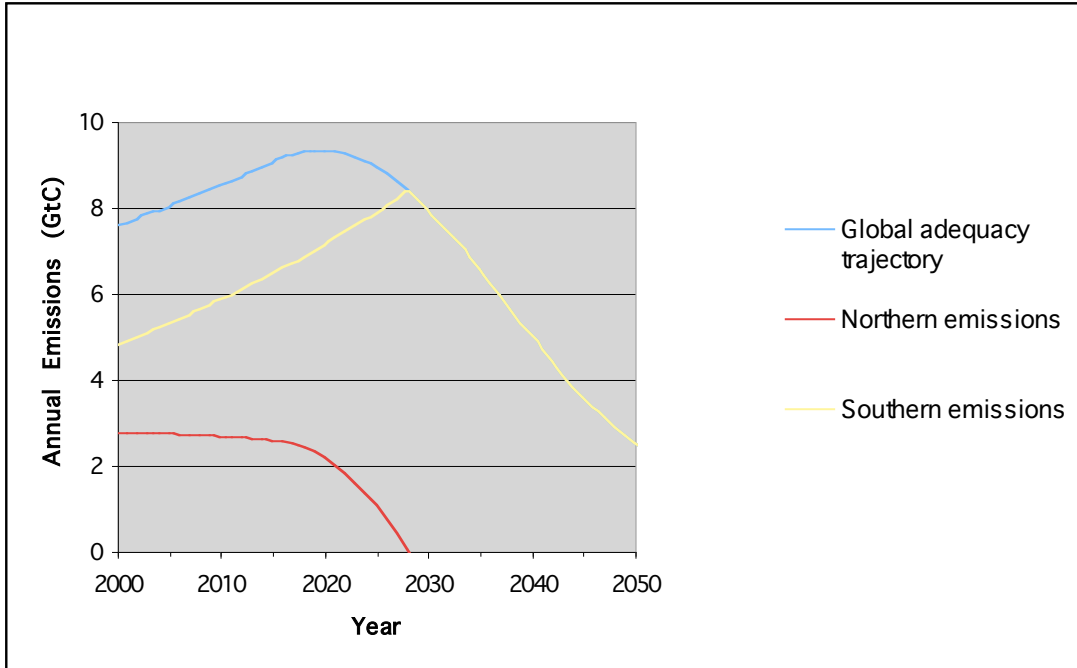


Figure 2: Global emissions under a 400 GtC scenario peaking in 2020. Southern CO₂ emissions (inc. 1 GtC from deforestation in 2000) rise at 2% annually until 2028.

But even in this unrealistic scenario, in which Northern emissions rapidly go to zero, Southern emissions would have to drop precipitously starting by 2030. And even with an optimistic economic growth projection of 3 percent annual increase in per-capita income, the South will still be far from wealthy when emissions rates must begin their steep decline. Per-capita income would in this scenario have risen from today's average of a little over \$4000 (PPP adjusted) to around \$8500 (compared to today's average for Annex I nations of about \$24,000).

Put simply, in this scenario (which, again, is as generous as physically possible to the South while still respecting the limited 400 GtC budget), the South still "hits the wall" while it is still poor. And per capita emissions in the south never exceed 1.5 tons annually, well below the levels which today's rich countries reached during their industrialization.

Plainly, this scenario requires large investments in mitigation in the South, and requires them when average incomes are still quite low. These investments are of a scale that would likely affect economic growth severely if not overwhelmingly funded by the North. So, would they be thus funded? Given the evidence that the North, including Europe, currently has little willingness to pay even for domestic mitigation, the South has ample reason for skepticism.

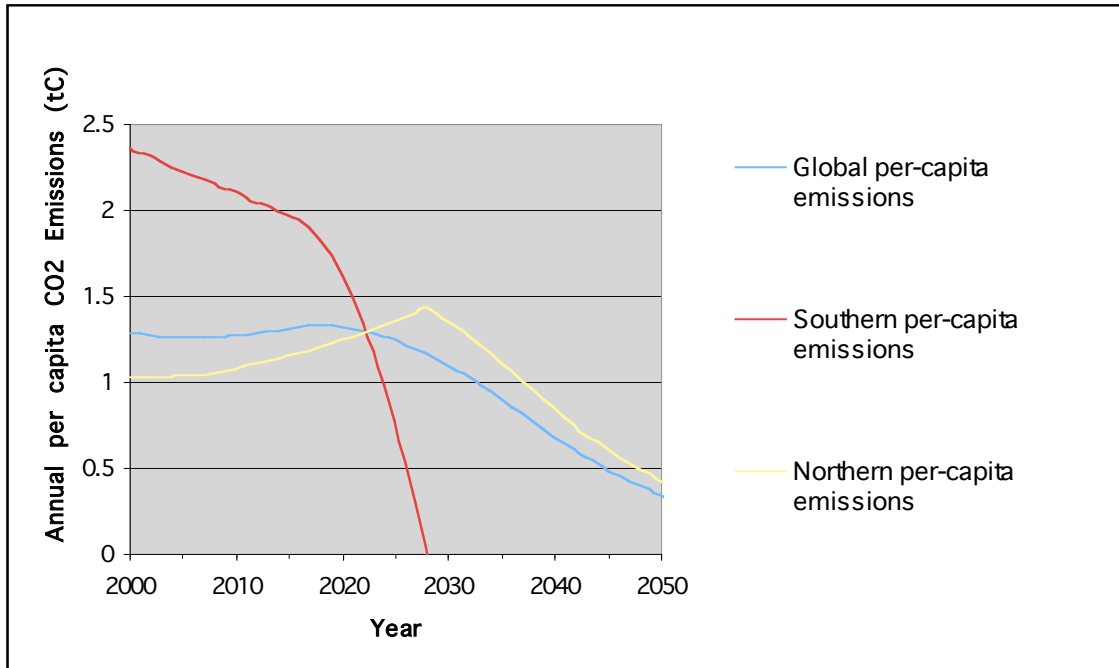


Figure 3: Global per-capita emissions allocations under the 400 GtC scenario shown in Figure 2. Global emissions peak in 2020, Southern emissions rise at 2% annually until 2028, population stabilizes at eight billion in 2050.

The South seems to recognize, far more clearly than most Northern environmentalists, the problem indicated by this admittedly stylized scenario. There is a real risk that the South could be lured by fairly generous near term targets to participate in an international climate regime, only to find itself, within a startlingly short period of time, and long before its basic development needs are met, being pressured to pay for aggressive mitigation. Thus Southern decision makers, seeking above all else to preserve and improve their prospects for economic growth and development, fear that a global mitigation regime that requires them to adopt Kyoto-style emissions targets, even one that initially protects them from costs, will subsequently cripple those prospects. And, given the scientific trend, they are entirely right to do so. Thus a key conclusion of this paper: Any truly *realistic* regime must be explicitly designed to preserve the right to development, or, more particularly the right to sustainable development. If it does not do so, the developing world will not seriously engage with any global mitigation regime, not in time.

Certainly, these problems would not be so pronounced under a less constraining global emissions trajectory. However, to be blunt, less constraining global emissions trajectories should at this point be taken as merely academic exercises, To the extent that they dominate the “realist” discourse they are distracting and, frankly dangerous. Any conclusions based on them are of little relevance to the problem of preventing catastrophic global climate change.

1.3 Climate Equity

Fortunately, the climate challenge does not require that we solve the global problem of equity in its grandest sense. Our goal here is to focus on equity only insofar as it is an

essential factor in the design of a viable climate regime, one that can actually put us on the low carbon trajectory needed to protect the climate. Nevertheless, we are extremely sympathetic to those who prioritize equity. We believe, in particular, that a central issue at stake in the climate crisis is ensuring that the South has a fair opportunity to develop, despite the now critically scarce nature of the global carbon commons.¹⁹

1.3.1 General equity principles

Clearly, we must discuss the general principles that define equitable access to a scarce global commons. But let us first admit that, by so doing, we are entering an extremely contentious realm. It is, after all, commonplace to note that countries generally advocate principles of equity that coincide with their short-term national interests. From this unfortunate reality, most analysts conclude that there will never be agreement about what is and is not fair. Our position is that it is possible – even necessary – to separate legitimate from illegitimate arguments about what is equitable.

The obvious, and instructive, example is the "sovereignty principle" – the claim that historic use constitutes a right – that is frequently enlisted by high-emitting countries as an equity principle that justifies the grandfathering of emission rights. This so-called equity principle cannot be defended as fair on the basis of any ethically coherent argument, and is, in fact, only a legal principle that defends a patently unfair historic allocation of a key common resource. As such, it is really only a factor in the calculus of realism.²⁰

There is a substantial consensus about the real equity principles that are relevant to the allocation of emissions rights.²¹ These are:

Equality: the principle that all humans have an equal right to the benefits of the global commons;

Responsibility: the principle that those who have created a problem have the responsibility to solve it and make amends (the basis of the polluter pays principle);

Capacity: the principle that common burdens should be shouldered more heavily by those with the greatest resources; and

¹⁹ We are, however, no longer convinced that a literal focus on equal emissions allocations is the best way to operationalize equitable access to the global atmospheric commons, despite its conceptual clarity. We will explain why below, with reference to what can be called "The Problem with Per Capita."

²⁰ Another factor in the calculus of realism is what the WBGU (Grassl et al. 2003) called the "principle of constancy," according to which abrupt measures leading to drastic impacts should be avoided, as these may have severe consequences affecting the economies of all nations. This claim is a reasonable defense against climate regimes that would impose abrupt and economically crippling obligations. It is in fact a claim against an unjust climate transition, and should be honored in operationalizing a climate regime. We should recognize, however, that it is too readily used as an excuse for the unwillingness of the North to pay significantly to address the climate problem.

²¹ The UNFCCC itself not only references the abstract principles of "equity" and "common but differentiated responsibilities," but offers an implicit interpretation of these principles. Recent general discussions of equity principles in the policy literature include Ringius et al. (2002), Ashton (2003), and Den Elzen et al. (2003). Classic treatments include Agarwal and Narain (1991), Shue (1993) and Grubb (1995).

Need: if there is a resource to be shared, priority goes to those who are most in need.

Each of these principles supports the conclusion that the wealthy and high-emitting countries should, in the conveniently ambiguous words of the UNFCCC, take the lead in reducing greenhouse-gas emissions. Or, more explicitly, that because the Annex I countries²² are more responsible for greenhouse-gas emissions, and because their wealth is intimately linked to those emissions, they have both greater responsibility and greater capacity to pay for mitigation. The developing countries, for their part, have used less than an equitable share of the global carbon commons and have clear economic needs – development and poverty reduction – that take legitimate priority over paying for climate mitigation.

Such general principles do not by themselves provide determinate, quantified answers to the very specific question that really matters: *Who should pay, and how much?* Yet the history of the climate negotiations is, frankly, a history of efforts to finesse these questions. Even the core division between Annex I and non-Annex I was made, not on the basis of any objective, principle-derived index but rather on an available historical basis – the UN division of developed and developing countries – which was thought fair enough to serve as a first cut.

This finesse, which sufficed while the mitigation burden to be shared was still modest, will no longer work. As the figures in the previous section make uncomfortably clear, the rapidly shrinking greenhouse-gas budget demands that strenuous mitigation efforts start very soon, in both the North and the South. In the post-Kyoto world, the question “who pays, and how much?” no longer lurks in the wings, it is now center stage. Nor, if we are looking for an equitable answer, can we look to the per-capita approach to answer it, because it fails to do so.

1.3.2 The Problem with Per-capita

Equity, within the climate negotiations, is almost intuitively equated with the notion of per-capita emission rights. More so than even the Brazilian Proposal,²³ per-capita approaches²⁴ have become the default interpretation of equity in the climate context, most notably in their “Contraction and Convergence” incarnation.²⁵ The problem with per-capita, though, is that it falls far short of satisfying the key equity principles listed above.

²² We adopt here the Annex I / non-Annex I language of the UNFCCC, notwithstanding the real diversity of countries in those coarse categories.

²³ The “Brazilian proposal” would have allocated the *share of a global reduction target* on the basis of historical contribution to global temperature increase. It was designed to allocate reduction targets to Annex I countries; it never answered the question “when do countries graduate” and cannot be taken as a serious post-Kyoto proposal without such an addition.

²⁴ Per capita approaches have a long history, going back at least to Krause et al. (1989) and Grubb (1989), but reached prominence with the publication of Agarwal and Narain's famous “Global Warming in an Unequal World” in 1991.

²⁵ While Aubrey Meyer and the Global Commons Institute did not invent the per capita idea, with “Contraction and Convergence” they have been the most persistent in injecting it into the policy debate. Indeed, C&C has done a great deal to keep the idea of rights in play in a negotiation generally hostile to rights-based approaches. For this they deserve a great deal of credit.

The promise of per-capita is that, as the greenhouse-gas budget shrinks, there will be equality of access to the little space that remains. And, certainly, this seems an attractive promise indeed, since atmospheric space will be valued at a higher and higher premium as years go by. But is this promise enough? And is it real?

Under a very low emission trajectory, such as any trajectory consistent with the 400 GtC budget needed to prevent a climate catastrophe, developing countries could in fact enjoy emission rights in excess of their needs... in the early years. But the honeymoon comes to a quick end. As Figure 2 showed, even if Northern emissions were to plummet precipitously from their current levels, Southern emissions would still need to be sharply curbed, starting a rapid decline before 2030. And the Figure 2 trajectory is *more generous* than a strict per-capita allocation would be. If, as Contraction and Convergence proposes, per-capita allocations were phased in gradually, the situation for the South would be worse yet. The fundamental equity problem, once again, is that in *any* regime that adequately protects the climate, the South is quickly cast into a world where it is forced to radically curtail its emissions, long before it has reached a level of wealth even vaguely comparable to that which the Northern countries enjoyed when they first started to curb their emissions in earnest (which has not yet happened). And, to stress the point, it is the Northern bankrupting of the greenhouse-gas budget that has put the South – and the world – in this position.

All of this presents a strong challenge to the hope that rights-based approaches can offer an equitable regime: a strong challenge, but not a decisive one. For the apparent failure of per-capita to produce a developmentally fair result may not betoken a problem with rights-based approaches *per se*, but rather with the attempt to conceive of environmental rights in terms of equal *emissions rights*. It may be that what is really needed is recognition of a quite different sort of equality -- that is, equality in the opportunity to use the atmospheric commons as a factor in development.

The actual right that a climate regime should preserve, then, may be the right to development. Or, much more precisely, the right to a climate transition that does not compromise sustainable development. Emissions, *per se*, are only a means, not an end.

1.3.3 Equity as realism

What would empower the South to actually demand equity in the climate realm, and to win a climate transition that does not compromise sustainable development? The answer, paradoxically, lies in realism.

To prevent climate catastrophe, the North *needs* the South. And, conversely, the South *needs* development. For far too many residents of the South, development is a matter of life and death. Development, simply put, is the South's first priority, and this is likely to remain the case even at the risk of a collapse in the climate negotiations and the virtual inevitability of a climate catastrophe in the indefinite future.

The reality is harsh, and should be put harshly. The South is almost certain to reject any climate proposal that does not acknowledge, and ensure, its right to development, that is, any climate proposal that would impose burdens that would hinder the South's ability to attain its pressing development goals. Of course, if we accept this right we immediately face questions about how to put it into practice, and whether it should be further restricted to a right to *sustainable* development. But if we reject it, perhaps on the

grounds of some supposed realism, it is necessary to face the fact that the South's counter-proposal – and this is no exaggeration – will likely be a suicide pact.

After all, what does it have to lose?

2 Making it to the future

One goal of this paper is to describe the constraints that we believe any viable regime will have to meet, in terms concrete enough to be useful to both policymakers and activists. In pursuing this goal, we have come to formulate the root question of the post-2012 debate as being, "What, given the climate adequacy challenge, do climate equity and political realism really mean?"

It may be helpful to briefly restate our conclusions up to this point:

Climate Adequacy: Climate science seems to be telling us that a precautionary approach demands that greenhouse-gas concentrations stabilize around 400 ppm CO₂-equivalent in 2100, and hence that that global emissions must stay below 400 GtC over this century, peaking by 2020. We are going to be hard-pressed to make it, but this is no excuse to concede defeat and ease up on the effort to create a viable and adequate climate regime.²⁶ Adequacy is non-negotiable.

Political Realism: Rarely appreciated as the two-headed beast it actually is, today's realism appears as both the developed world's unwillingness to pay and, even more perversely, the developing world's unwillingness to engage on commitments. Given the intensity with which both blocs are pursuing their perceived self-interest, the all-too-likely result is that realism will vanquish climate adequacy. Given the stakes, this cannot be allowed to happen.

Climate Equity: Most greenhouse policy proposals implicitly assume that equity is dispensable, trumped by climate adequacy and especially by realism. We, for our part, see no promise down this road. We think, in fact, that the future lies in exposing the false dichotomy between equity and realism, as they have been conceived. The South needs development. And, if there is to be any hope of avoiding climate catastrophe, the North needs the South to engage, fully and unambiguously, in the greenhouse transition. Insofar as the North/South deadlock cannot be broken unless the post-2012 regime is substantively fair, equity thus becomes a means to an end. In the view of the South, development is non-negotiable.

2.1 Cutting the Knot

Given all this, it's reasonable to wonder if there's really any plausible way forward. Or if, as many among us secretly fear, the set of all adequate, realistic, and equitable proposals is, in fact, an empty one.

²⁶ Even those that argue against acknowledging such stark limits can only justify their position by arguing that, politically, such silence increases the chances of actually meeting them.

We do not believe it is, for the simple reason that the climate crisis is not necessary. We have the technology, or enough of it, to cut a path forward, and we can afford to develop and deploy it on the needed scale.²⁷ The climate crisis, in other words, is not preordained. It is only that solving it is one of the most difficult political challenges of all time.

To clarify what we mean by this, and to justify our conclusions about how we think the knot can be cut, we want to very quickly examine the various post-2012 regime architectures now under discussion in terms of the three intertwined constraints of climate adequacy, realism, and equity. There is, of course, no way to quickly examine several architectures unless they are tidily classified, and we propose that they be laid out on a spectrum (see Figure 4, below) between two poles that we characterize in the following way:

1) Ad hoc, hyper-realist regimes

At this end of the regime architecture spectrum, countries solely pursue self-interested strategies, rather than seeking to mobilize global cooperation to produce a meaningful global accord. The goal is to forge various bilateral and multilateral agreements that are narrowly win-win for the parties concerned.

2) Global, principle-based regimes

At this end of the spectrum, narrowly-defined national self-interest gives way to enlightened self-interest. Parties recognize justice as a precondition of climate adequacy, and devise a strongly principle-based regime that, by reinforcing equity, provides incentives for cooperation, ranging from immediate economic and development benefits to averted climate catastrophe. To those Parties late to appreciate the value of cooperation, the threat of sanctions on free riders is invoked as necessary.

Figure 4, below shows the spectrum, and our rather subjective alignment of some already prominent proposals along it.

²⁷ In a recent policy editorial in *Science*, Pacala and Socolow (2004) identify fifteen available technologies that could each displace 1 GtC of carbon emissions by 2050. Their base case suggests choosing seven such "wedges" to reduce emissions from their BAU projection of 14 GtC annually to 7 GtC, consistent with stabilization at 500 ppm CO₂. However, rather than shooting for this level, which (given non-CO₂ gases, which they do not address) could easily lead to a global temperature increase exceeding 4°C or more, there is no reason that three or four additional "wedges" couldn't be implemented to reduce emissions to a level consistent with a precautionary target.

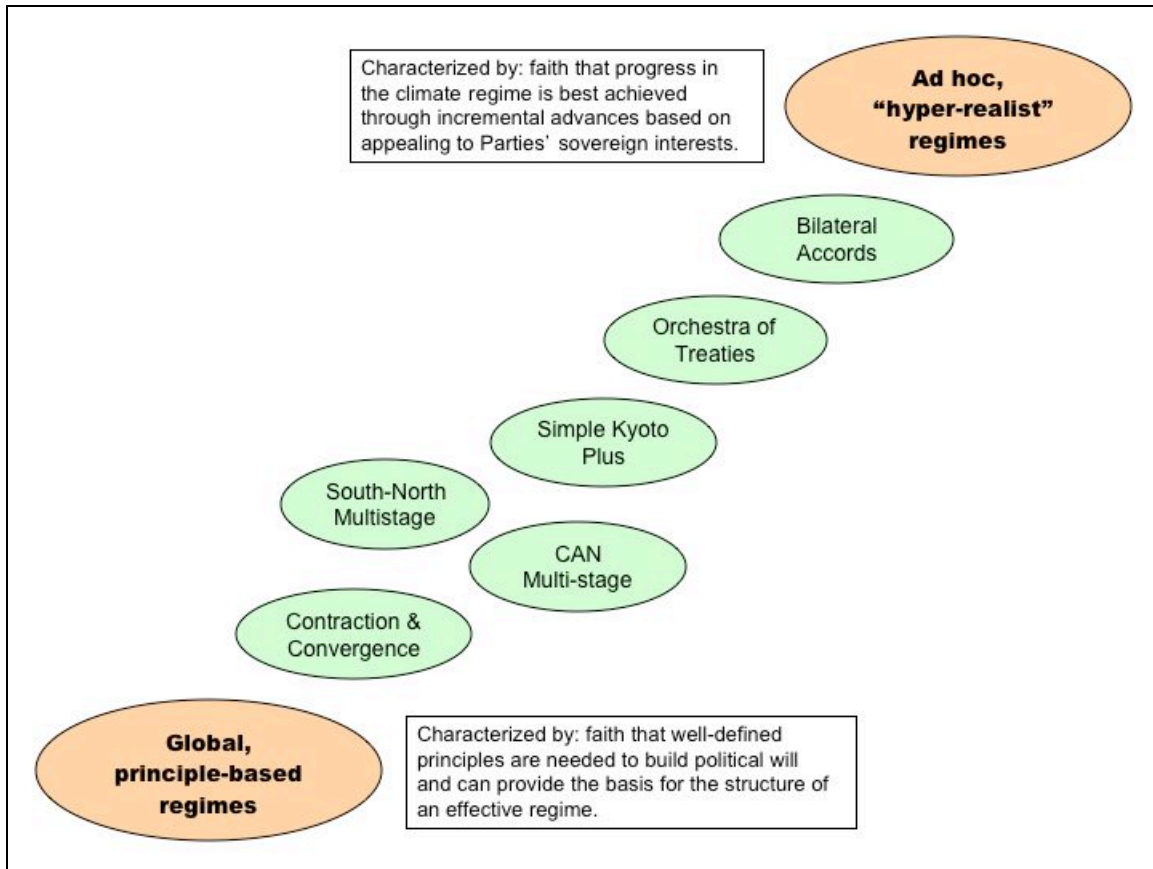


Figure 4: A spectrum of regime architectures.

On the right

Toward the right end of the spectrum, we place the "Bilateral Accords" approach popular with the Bush Administration, and also the "Orchestra of Treaties" approach in which separate, overlapping, multilateral agreements including different countries and different subjects come together – or so it is hoped – into a reasonably coherent whole. These two approaches are comparable, for both posit international action only as it can be negotiated between like-minded countries. Nations are presumed to behave, always and invariably, as sovereign states acting strictly in accordance with their national self-interest, first of all by seeking to maximize their discounted national income. This perspective stands for realism, or rather an ultra-realism that rejects any near-term possibility of strong mandatory global regimes and any broader definition of self-interest.

If, at this end of the spectrum, realism is the paramount concern, then what of climate adequacy and equity?

The hyper-realist perspective essentially takes national self-interest, and thus willingness to pay, as givens. It accepts that some countries have greater willingness to pay than others, while leaving the reasons for these differences entirely unquestioned. Any consideration of sanctions on free riders is ruled out. As for equity, its only real consequence is the claim that developing countries have no obligation to mitigate emissions, and will do so only if it is in their perceived self-interest to do so, for example for the sake of co-benefits, or because they are paid to do so by mysteriously altruistic

Northern countries. The South's right to development – in the short run – is preserved, but global sustainability does not enter into the equation, and the price of development is, thus, the destabilization of the climate. The self-interest of the industrialized countries is similarly treated as fixed and unchangeable, and it is assumed that they will continue to use as much of the remaining atmospheric commons as they feel their welfare justifies. Thus, demands for climate adequacy matter only insofar as mitigation can pass a nationally-focused cost-benefit test, and equity consists of the right to act on this cost-benefit test.

Much can be said about this perspective, but it is difficult to see how it can lead to a regime compatible with anything resembling real climate adequacy. To the contrary, it almost seems to justify a grave tragedy of the commons, one inevitable in a world where independent states, each mitigating greenhouse gases based on a national cost-benefit calculus, egregiously under-react and inexorably, almost passively, fall victim to catastrophic climate change.

Still, we do live in a world of sovereign states, each disposed, in its own way, to attend first of all to its interests. This is a realism that will not be denied. Fortunately, interests are not given; like history they are made.

In the center

Near the center of the spectrum is "Simple Kyoto Plus": regimes that add new countries to Annex I on an ad hoc yet defensible basis. The ad hoc aspect of Kyoto itself is well known; indeed, it has sometimes been overplayed. Kyoto belongs in the center because, as a first-order division between developing and developed countries, it also strongly embodies the principle of common but differentiated responsibilities. Simple Kyoto Plus approaches, whatever their details, must necessarily maintain this division, and extend it, a fact that considerably narrows their range of plausible structures. They can help, but, we think, not in a decisive way.

How will Simple Kyoto Plus approaches respond to the climate challenge?

First, they attempt to balance equity and realism by taking development as a relatively qualitative category that does not require formalization. Thus, individual countries can be invited to join Annex 1 without being measured against any objective index; rather, a country's targets can be negotiated on an ad hoc basis. No concrete Simple Kyoto Plus proposals have yet been advanced, so the status of climate adequacy in such arrangements remains an open question. Skepticism is easy, particularly given the challenges of low stabilization targets, but there is no absolute a priori reason why a Simple Kyoto Plus proposal couldn't calibrate its targets by reference to a particular, even highly-restrictive, global emissions path.

In practice, however, Simple Kyoto Plus proposals would face a particular challenge, because for reasons of both climate adequacy and political realism (acceptability to Northern countries), large developing countries (i.e., China and India) would have to accept absolute targets early on, even though, by most standards, these countries have neither high capacity nor high responsibility, and thus cannot be asked to pay significantly for mitigation. Unsurprisingly, then, in the mainstream of the post-2012 policy debate, defined as it is by a Simple Kyoto Plus vision, the ideas getting the most attention are for soft commitments – non-binding targets, intensity targets, etc. – that are

largely aimed at this specific problem. The fundamental difficulty, once again, is that the remaining greenhouse-gas budget is extremely small, and protecting the climate requires a rapidly declining emission trajectory. There is little room for emissions growth, and everyone knows it. Thus, developing countries have repeatedly insisted that their imperative to development justifies the rejection of any kind of binding commitments.

Simple Kyoto Plus would have a better chance if this obstacle could be finessed, but we see no real prospect that it will be, not by this sort of approach. On the contrary, the absence of any foundational equity principle precisely reinforces the resistance of developing countries to engage the mitigation regime on an ad hoc basis.

Towards the left

Moving toward the Global Principle-based end of the spectrum we find, first, a range of multi-stage proposals. The proposals of the Climate Action Network²⁸ and the South/North dialogue²⁹ are well known recent versions, though similar models have been developed by RIVM³⁰ and others. The key in all these cases is differentiation among developing countries, typically on the basis of per-capita emissions and income, so that, in general, the type and degree of obligations can gradually scale from no obligations for the LDCs to full Annex I-style caps for relatively wealthy developing countries such as South Korea.

Contraction and Convergence lies further towards the principle-based end of the spectrum. This is a somewhat problematic placement, however, because while a clear ethical principle – equal emission rights – is the foundation for Contraction and Convergence, the duration of the gradual convergence period is not principle-based; it is, rather, a free parameter that is to be negotiated on some political basis. One can attempt to formulate a principle capable of fixing this period – as for example the WBGU's principle of constancy, which was conjured to justify a relatively slow convergence³¹ – but in the absence of a more coherent justification, the convergence period becomes, in practice, an ad hoc feature designed to attempt to meet the acceptability concerns of the North - that is to say, to shift more of the costs to the South. And further efforts to refine Contraction and Convergence into an operationalizable system – for example, recently, with regional bubbles – only serve to increase its ad hoc nature and weaken its link to its underlying per capita foundation.

How does the three-thread knot fare on this, the principle-based side of the spectrum?

First, note that multi-stage proposals like CAN and South-North attempt to address realist concerns about non-participating developing countries by finding a scheme in which all developing countries, categorized by their development status, have some level of obligations commensurate with their responsibility and capacity. Both rely on

²⁸ A Viable Global Framework for Preventing Dangerous Climate Change. Available at www.climatenetwork.org/docs/CAN-DP_Framework.pdf.

²⁹ South-North Dialogue on Equity in the Greenhouse: A proposal for an adequate and equitable global climate agreement. See www.wupperinst.org/download/1085_proposal.pdf.

³⁰ See for example Berk and Den Elzen 2001.

³¹ See Grassl et al. (2003), Section 2.3, and the discussion in footnote 20 above.

Northern finance to pay for mitigation in the near term in all but the wealthiest developing countries. And both allude to an precautionary stabilization target, specifically to meet a 2°C maximum temperature increase. This is a promising start. So far, though, neither proposal has been elaborated to the point of spelling out an emissions trajectory or concentration target,³² and neither can yet be analyzed to determine what the costs would likely be, or how costs would be allocated among Northern countries.

The multi-stage approach, in other words, could work, and could preserve the right of Southern countries to develop. And given this, it is definitely interesting. We will know how interesting when we see a concrete proposal that takes explicit account of the need for a low-emissions trajectory and proposes a financing system.

Contraction and Convergence, for its part, attempted to cut the knot in one fell swoop. With Contraction and Convergence, the whole world would be under a global cap, so there would be no climate adequacy concerns and no leakage problems. And the system would, so it is said, be fair because, after convergence, each human would have equal emissions entitlements. Unfortunately, for the reasons that we elaborated above, we believe that Contraction and Convergence's claims to be fair and adequate do not stand up to real analysis. The bottom line, in any case, is that we believe that Contraction and Convergence will never be put into effect because the large developing countries will never accept it, and they will never accept it because, frankly, it would not grant them the right to (sustainable) development that they both need and deserve. In fact, under the low-emissions trajectory that climate protection demands, their emissions budgets would be strongly and rapidly squeezed well before their legitimate developmental goals are even close to being met.

All of which leads us to the following conclusion:

The science is clear – to prevent dangerous climate change, we must stay within a very small greenhouse-gas budget. To do so, we must somehow get to the principle-based end of the spectrum. Why? Because if we are to prevent dangerous climate change, Southern emissions must be dramatically curtailed well before the South reaches anything like developmental parity with the North. This is the fundamental equity problem, and solving it is the key to genuine realism.

3 Greenhouse Development Rights

The Berlin Mandate was a necessary first step. And Kyoto was, actually, a pretty nimble second – it managed, against heavy odds, to define a path that met the demands of the Berlin Mandate, at least to a first approximation. Some nations would have to pay to mitigate, the rest would not, and the ball would start rolling. And now, against odds even heavier than those that Kyoto faced in 1997, its ratification has been won. We love it dearly, but we should not be delusional. We're going to have to be nimble again, damn nimble.

³² It is worth noting that the International Climate Change Taskforce in its report "Meeting the Climate Challenge" (2005) endorsed a South/North dialogue-style multi-stage proposal and a long term stabilization target of 400 ppm CO₂. But they did not connect the two with quantitative analysis of emissions pathways and stage-by-stage commitments.

How then to move forward? One thing at least is clear – a strategy based upon realism-as-usual is not viable. The problem, irreducibly, is finding a route to climate adequacy, and what this appears to mean is finding an approach that breaks the deadlock between the North's unwillingness to pay for mitigation and the South's unwillingness to engage on commitments, and, by so doing, opens the road to a new realism. And to a global regime that can actually prevent a climate catastrophe.

The key, we have argued, lies in a regime that recognizes the South's desire for development, and its right to sustainable development. We have therefore decided to proceed by taking this right seriously, first by focusing on the equity principles that undergird it, and then by exploring the climate regime that they imply. It comes, finally, to this: 1) Climate adequacy is the bottom line; 2) The North developed without concerning itself with greenhouse-gas constraints, and consumed much more than its share of the atmospheric commons in the process; and 3) The South deserves the right to attend first to the fundamental priority of raising its poor residents out of poverty. In this context, a climate regime can only be considered equitable if it allows the South to focus on poverty and sustainable development, before investing in mitigation.

These claims can be framed in terms of the equity principles discussed in Section 1.3:

Equality: Countries deserve equal rights to sustainable development. As technology now stands, access to the global atmospheric commons is critical to exercising this right. Over time this dependence will decline as human society develops zero-carbon technologies and invests in infrastructure that is less fossil-fuel dependent. But in the meantime a nation's greenhouse-gas emissions correlate closely with its ability to meet basic developmental needs.

Need: The North, having already reached a high level of development, must radically curtail its emissions. It should now make available to the South a large enough greenhouse-gas budget to allow it too to prioritize development, and to pursue it without being hobbled by emissions limitations. This reflects the fact that the South has a far greater need than the North for the limited remaining atmospheric space.

Responsibility and Capacity: Alas, it is now evident that there is not enough space remaining for the South to develop without effective (though not necessarily "Kyoto style") greenhouse-gas constraints. Thus vigorous mitigation activity is necessary in the South as well as the North. The North should pay for this, and by so doing allow the South to focus on its basic development goals. The amount that any given Northern country must invest in mitigation (in both North and South) should depend on its responsibility and capacity. Once Southern countries reach a certain level of development, they themselves will have the responsibility and capacity to begin to shoulder the burden of keeping human society within the remaining greenhouse-gas budget. Until that time, their proper priority is development.

If the costs implied by this formulation seem beyond the North's current willingness to pay, this hardly makes it inequitable. A formulation that satisfied the above principles, if concrete, compelling, and plausibly operationalizable, could have tremendous value as a kind of "equity reference framework" – a benchmark against which to compare, and judge, actual regime proposals, particularly those forged by sovereign states responding to the perceived demands of their national interests. A good equity reference framework,

in other words, would offer a counterpoint to the more “realistic” proposals now flooding the climate literature, and a metric by which to measure them.

How might such an approach be more concretely translated into the language of the climate regime, to provide an explicit equity reference framework? The following three elements are necessary, each of which would need open debate in the climate negotiations:

A global emissions trajectory consistent with adequate climate protection: First, we have to establish a global emissions trajectory that is consistent with a precautionary approach to the climate. This trajectory would be established in a manner that allows for revision and flexibility in the face of evolving climate science. This will need to be debated, in light of the evolving climate science, the emerging evidence of climate change impacts, and an unflinching recognition of those communities that will suffer the consequences of the degree of climate change deemed “acceptable”.

A measurable development threshold: Second, we need a definition of the level of development to which all countries are equally entitled. That definition would provide a “development threshold”, separating those countries that will prioritize development (we call this group of countries “Annex South”) from those that are obliged to begin addressing the climate challenge (“Annex North”). Countries in Annex North would be required to provide the technological and financial resources to bring about the necessary amount of global mitigation activity, by investing those resources both within their own borders and within countries in Annex South. Annex South countries would collaborate by making mitigation opportunities available for Annex North countries, which would pay the full incremental costs. Once an Annex South country reaches the development threshold, it would – by definition – have the capacity, and the responsibility to begin to help shoulder the burden of keeping human society within the remaining greenhouse-gas budget. Until that time, development is its proper priority.

How would the development threshold be marked? Perhaps by aggregate national indicators like PPP-adjusted per-capita income. Or perhaps not. Aggregate national indicators, after all, are flawed measures of sustainable development, for they disguise intranational disparities, sometimes grievously. It might be reasonable, if there is a fear that a country’s elite minority would hide behind the underdeveloped majority, to instead consider the income of the richest quintile of the population. Here too, the issues will demand extensive debate, which we, for the moment, will pass over.

A transparent indicator of obligation: Finally, we need a measurable, transparent indicator able to determine each Annex North country’s precise level of *obligation to contribute to global mitigation*. In accordance with the equity principles outlined above, this “obligation index” should reflect responsibility and capacity. As an indicator of responsibility, it should reflect some measure of a country’s contribution to the climate problem, thus embodying the polluter pays principle. As an indicator of capacity, it should reflect some measure of a country’s resources to cope with the climate challenge and invest in mitigation. Beyond these stipulations, debate on the exact nature of the obligation index would be needed in order to come to a broad agreement.

These three elements – an explicitly defined, adequately precautionary trajectory, a development threshold, and an indicator of each Annex North country’s obligation to pay for mitigation – add nicely together into the *Greenhouse Development Rights* (GDR) framework. Obviously, much more can be said about the framework, but the key point is that it directly addresses the all-important question: “Who pays, and how much?” It does so, moreover, in a transparent manner that defines a useful equity reference framework. That is, it postulates a regime that is adequately precautionary by design, and yet, at the same time, fully conformant with the right to sustainable development. As such, it gives us a benchmark that compromises neither climate adequacy nor equity in deference to some prior notion of realism. Such a benchmark, and this is one of our central claims, will become increasingly valuable as the air thickens with proposals for the post-2012 period, for it gives us a coherent way to measure the compromises that each proposal asks us to consider, and to weigh each against the others.

Further, the GDR framework offers a fulcrum by which we can hope to redefine realism. It does so by demonstrating that climate equity must follow from the demands of climate adequacy, and that realism, so often taken as the ruling variable in the climate equation, is in fact the subsidiary term. Or, to put this another way, it demonstrates an approach designed to meet the demands of climate adequacy by increasing the South’s willingness to engage on commitments, and by actually quantifying, on a nation-by-nation basis, the corresponding obligation to mitigate.

3.1 One Possible Way to Operationalize the Greenhouse Development Rights Framework

By elaborating a few additional elements, we can adapt the GDR reference framework into proposal for a climate regime that could plausibly be operationalized. The details are outside the scope of this paper, but we would like, here, to lay out the basic ideas.³³ These consist, essentially, of proposals, all of which are merely indicative and much in need of debate, for the three ingredients listed above.

First, for a global emission trajectory, climate science currently suggests that an appropriately precautionary emission trajectory would be one that preserves a high probability of keeping warming below 2°C, with a carbon budget of 400 GtC, and a trajectory that peaks no later than 2020 and declines thereafter. As mentioned above, this could be revised at future dates as climate science evolves.

Second, to define a development threshold, we can start by reflecting on the Berlin Mandate and the Kyoto targets. Comparing each Annex I country’s Kyoto target, with its per-capita income, we see that they implicitly specify a sort of development threshold. Figure 5, below, plots these targets versus per-capita income, and suggests the development threshold implicit in Kyoto is approximately US\$17,000 per-capita, which corresponds roughly to Spain’s per-capita income. Below that level, virtually all of the countries took on targets that did not significantly constrain their emissions (“hot air” targets), whereas above it most countries have real reduction commitments, (i.e., targets that actually require real mitigation activity relative to business-as-usual). While the countries falling above this threshold contain only about 15% of the world’s population, they control approximately 55 percent of the world’s economy. This means, among other

³³ A detailed explication of this system, and its properties, is forthcoming in 2006. To receive more information on GDRs, when it becomes available, contact the authors.

things, that were this line to be taken as the development threshold, it would define a near-term “Annex North “ that had a majority of the world’s assets to draw upon in its efforts to meet its mitigation obligation. Beyond the near term, countries would be periodically assessed regarding their “graduation” into Annex North.

Third, as a straightforward indicator of obligation, we propose a country’s cumulative “post graduation” greenhouse-gas emissions – that is, the sum of its emissions since it crossed the development threshold. Such an index measures responsibility more or less directly, and embodies capacity as well. Its value is reasonably clear for today’s developed countries, while countries who have not yet crossed the development threshold would simply be rated as having zero obligation until they do. Their obligation would then rise over time as their cumulative emissions rise, and as they grow wealthier.

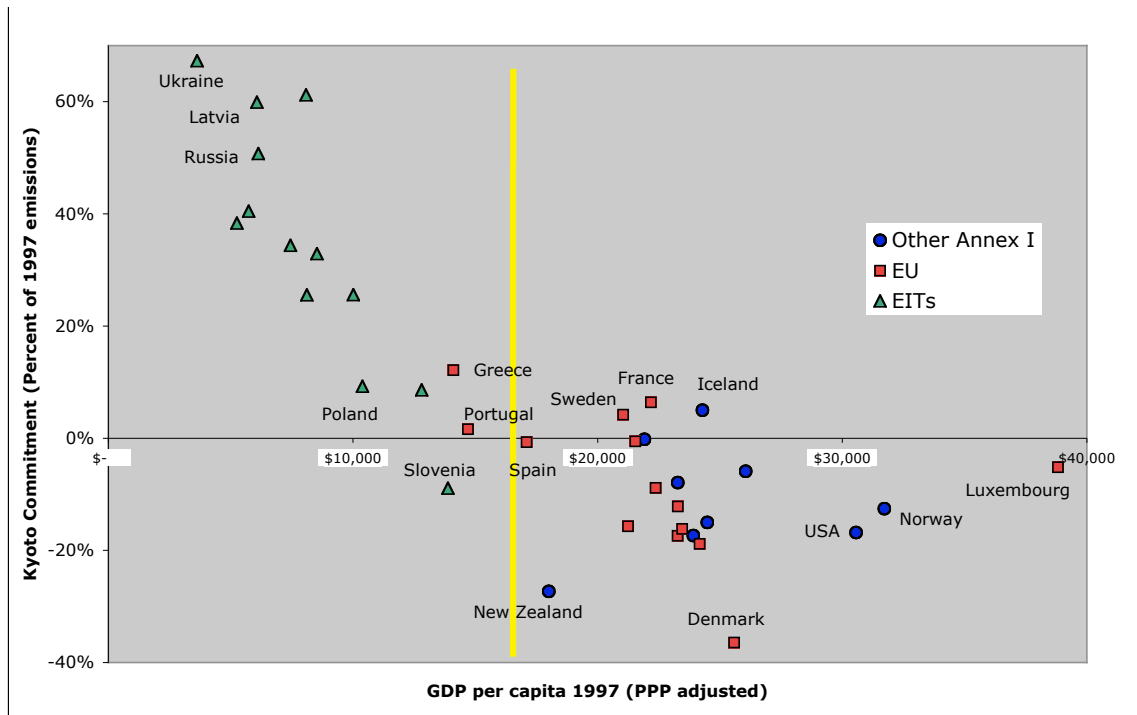


Figure 5: Kyoto Protocol emission targets for Annex I countries vs. their per-capita income. Income is 1997 PPP-adjusted, in current (2003) international dollars. Emission targets are expressed as a percentage of 1997 emissions, including differentiated targets under the EU’s burden-sharing arrangement.

Having chosen indicative approaches to these three elements, it becomes possible to consider the GDR approach as a global cap-and-trade system. To do so, however, it is necessary to define national business-as-usual trajectories extending over multiple budget periods (of, say, ten years each). Such national BAU trajectories reflect a country’s emissions assuming there were no climate regime and no GHG-reducing policies put into place. In any climate regime that assigns targets – such as Kyoto – each Party privately makes projections about their expected BAU emissions trajectory to help them judge the required level of effort entailed in meeting a given target. In an operationalized GDR system, these BAU trajectories are made explicit, publicly debated, periodically reviewed, and subjected to a common, transparent analysis. National allowances are allocated according to the national BAU trajectories.

Given such BAU trajectories, it becomes possible to define the total global mitigation requirement in any given budget period as the difference between the global BAU trajectory and the agreed adequacy trajectory. This mitigation requirement (in, say, millions of tonnes of CO₂-equivalent) is then allocated among Annex North countries proportional to each country's obligation index. The greater a country's cumulative emissions since graduation, in other words, the greater the fraction of the global mitigation burden that country must shoulder. For example, if the global mitigation requirement in a given ten-year budget period is, say, 3,000 MtC, and Japan's obligation index is 10% of the total Annex North obligation index, then Japan will be obligated to undertake (either in its own country or in other countries) 300 MtC of mitigation activity over the course of the budget period. Having done so, it can acquire 300 MtC of allowances that are no longer needed, which it can "retire" thereby discharging its obligation.

Full operationalization, of course, would be a more complex affair, but this brief thought experiment may, we hope, suffice to make our point: the GDR framework would define an incentive structure that would be extremely attractive from the standpoint of creating a workable climate regime. Notably, and in contrast to the current Kyoto framework, Annex South countries would have an incentive to develop along a low-carbon trajectory *prior* to the point at which they themselves would take on mitigation commitments. This is because, once a country reaches the development threshold, its obligation index starts immediately to rise, at a rate that is largely determined by its emissions rate and the speed at which its emissions are rising. Given this, it is not in any given country's best interest to reach the development threshold with an inefficient, greenhouse-gas-intensive economy. Further, Annex South countries would develop in a context in which Annex North countries are eagerly seeking out mitigation opportunities globally. This would drive a large flow of decarbonization investments into Southern economies, providing resources and technologies for low-GHG development.

Finally, and crucially, the GDR framework would actually give Annex North countries an incentive to see Annex South countries develop, that they might quickly graduate into Annex North and thus join the ranks of those with obligations to pay for mitigation. This means that the GDR framework would not only acknowledge the South's right to development, but, properly operationalized, would shape that right along the contours of equity and sustainability, and actually drive the development process along. This is in sharp contrast to proposals, such as Contraction and Convergence, where greater wealth does not necessarily translate into a greater obligation to contribute to mitigation.

3.2 Are we crazy?

There are, of course, more details, but the obvious question can already be asked – are we crazy? Progress on climate protection is all but blocked, in large part because of the North's low willingness to pay for mitigation. How, then, could it possibly make sense to advocate a regime in which the North would have to pay for all decarbonization, everywhere in the world?

But step back. Recall what the science is telling us – that serious mitigation activity must start globally, and soon. Recall also that while the global cost of decarbonization is expected to be significant, it is not expected to be debilitating. Then consider again our proposition that the cost of decarbonization – the entire cost, globally – should rightfully

be borne by the Annex North countries that have surpassed some modest standard of development.

Is this claim, itself, crazy?

We don't think so. We think, in fact, that today's Annex North countries developed by using the atmospheric sink in a manner that today's developing countries simply cannot emulate, and that this matters a very great deal indeed. We think that the GDR framework really does capture what the North had and what the South legitimately wants: basic development unhampered by climate constraints. And, finally, we believe that it won't take too many more years of deadlock before Northern environmentalists, planners, and diplomats recognize the impossibility of stabilizing the climate without directly addressing this most glaring disparity.

Consider *Greenhouse Development Rights*, then, as a device designed to help us peer into the future, a proposal designed to cut the knot, or at least to support a reference framework specific enough to help us understand what it would actually mean to do so, and to focus debate on ways and means.

Do not pass too quickly over this: the situation is dire, and it calls for decisive action. What else, after all, could realism possibly mean?

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