

FROM TONS TO TRENDS: TRANSFORMATION OF THE CLIMATE REGIME

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Introduction¹

Given the fact that climate change is one of the greatest challenges humanity has ever faced, the Kyoto Protocol can only be recognized as preparation for the much deeper and broader engagement that will clearly be necessary after 2012. The Kyoto Protocol was never meant as a solution to the climate change problem. Limited in its targets, timeframe, and participation, the Protocol's most important success will not be in reaching its objectives - if they are reached - but rather in laying the institutional, legal, and technical groundwork for the future regime. Whether we are effective in dealing with climate change will not depend on the number of greenhouse gas (GHG) reductions achieved by the end of the first commitment period, but rather on whether we can affect the emission trajectories of both industrialized and developing countries post 2012. While the Protocol focuses on tons of GHG to be reduced between 2008 and 2012, in the future we will have to focus on changing emission trends in both industrialized and developing nations.

This chapter first identifies six design elements that must be transformed as we move from the current Protocol to the post 2012 regime, shifting the focus from tons to trends. The elements are not independent of each other, but rather interrelated and to a certain extent mutually dependent. The paper then discusses the implications of this shift for the governance of the future regime.

1. Target: From National Best Efforts to a Global Goal

The targets of the Kyoto agreement were negotiated as a bottom-up exercise in which each of the industrialized countries estimated the level of effort they might be able to muster within their respective economic and political constraints. The average of a 5.2% reduction of greenhouse gas (GHG) emissions below the 1990 levels by 2012 was not defined as a preconceived goal, but rather emerged as the result of the various reduction commitments pledged by countries or region, in the case of the European Union. Given the novelty of legally binding reduction commitments in 1997, and the level of scientific uncertainty concerning climate change at the time, the bottom-up approach to emission limitation was the most reasonable strategy.

However, nearly ten years of experience with GHG reductions, combined with the overwhelming scientific evidence of climate change already occurring around the world, may have dramatically changed the context of the next round of negotiations. Short-term incremental reduction goals are no longer environmentally acceptable nor economically recommendable to counter climate change in the long run.² Given the long-term costs of inadequate action, the post 2012 climate regime should not be built on country-based estimations of their short-term ability to reduce, but must rather be based upon a global agreement of a long-term target that achieves the ultimate objective of the United Nations Framework Convention on Climate Change (UNFCCC): “*stabilize the concentration of greenhouse gases at a level that would prevent dangerous human interference with the climate system.*”

There is no concurrence on what concentration of GHGs would actually avert dangerous climate change. To some stakeholders, such as small island states witnessing the rise of sea levels, our current concentration of 370 ppm is already palpably harmful. Others, such as India and China, argue that emissions must continue to rise as their

Figure 1. Pathways to Stabilization

CO ₂ stabilization profiles	Year in which global emissions peak	Year in which global emissions fall below 1990 level
450	2005-2015	<2000-2040
550	2020-2030	2030-2100
650	2030-2045	2055-2145
750	2040-2060	2080-2180
1000	2065-2090	2135-2270

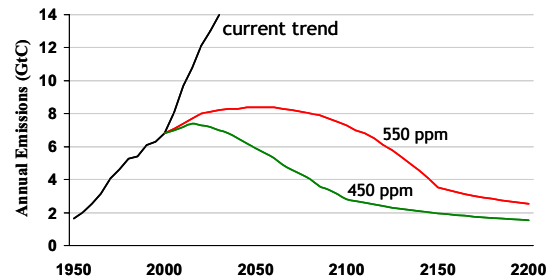
Source: IPCC.

economies continue to grow. However, there is a timidly looming consensus that stabilization should occur somewhere in the range

between 450 ppm and 550 ppm CO₂ equivalent, either of which will require a dramatic effort. Stabilizing at 450 ppm would require emission reductions of 60 to 80 percent below current levels by the end of the 21st century. Even limiting concentrations to a *doubling* of pre-industrial levels (i.e., 550 ppm, which would likely entail significant adverse climatic impacts) would require global emission reductions to peak within the next few decades and fall below 1990 levels by the end of this century. The relationship between various emission concentrations and timing of global emission reductions are shown in Figures 1 and 2 based on data provided by the Intergovernmental Panel on Climate Change (IPCC).

The effort required to meet either the 450 or 550 ppm goal cannot be underestimated. Over the next hundred years, the global population is expected to increase by 40 to 100 percent, and economic growth (with concomitant emission effects) is projected to climb 10- to 20-fold (IPCC 2000). In the absence of concerted global action, atmospheric concentrations could exceed 1000 ppm -

Figure 2. Stabilization Scenarios



Source: Based on IPCC.

nearly four times pre-industrial levels - by the end of the century, with unpredictable effects on the planet. The stabilization challenge is formidable and unprecedented; meeting it will require moving beyond national short-term efforts to a commitment from all countries to an ultimate and global concentration level in the next few years. The long-term goal may not be firm but rather indicative and may be subject to change as knowledge of the impacts increases, but at least it would provide a compass and a yardstick for the progress of efforts.

Advanced developing countries have been vocal about their concern that such a long-term goal would favor the already developed countries and leave little opportunity for growth in the South. This justifiable concern can be met by including a safety valve mechanism that would guarantee developing countries the right to develop.

A global long-term goal is admittedly daunting when viewed from the perspective of today's mainstream technologies, much as the achievements of the industrial revolution would have been impossible to predict prior to the development of the internal combustion engine.

However, a desirable stabilization level would have the very significant advantage of orienting capital stock turnover and motivating technological transformations that will help decrease the costs of progressively increasing GHG reductions and put us on a cleaner trajectory.

As was the case when the oil era first emerged, new technologies are already being developed today which could launch us into a whole new era of energy production and open up heretofore unknown possibilities. As Lovins points out,³ merely putting hybrid power or improved components in an existing vehicle will produce only small improvements in energy consumption and GHG emissions. Much more can be achieved by redesigning the whole vehicle and its supporting infrastructure with a purposely environmental intent. An energy revolution is already in the making, with advanced new technologies such as hydrogen fuel cells which will revolutionize transportation; thin-film solar cells which will be easily applied to building facades and windows; and super efficient wind turbines with long-term energy storage capacity. We cannot stop there. We will have to increase investments in technological developments, continue to “think out of the box” and push through the confines of the known to go from incremental technological changes to more far reaching breakthroughs.

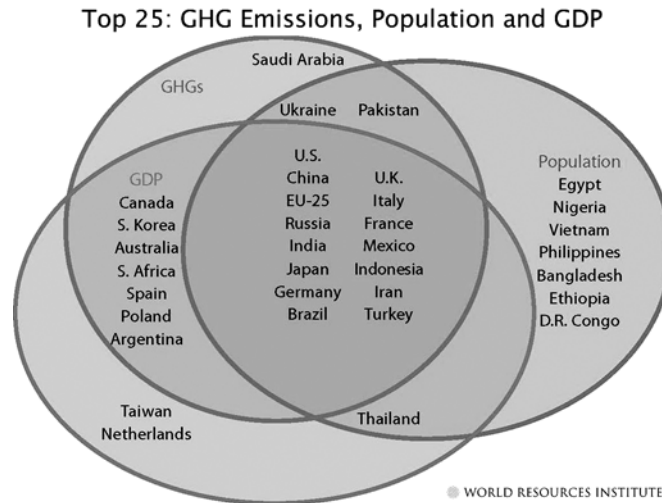
Technological transformation depends to a large extent on the right economic signals such as tax code and subsidy shifts, which must have an effect on at least two dimensions. At the front end, companies – and governments – have to believe that the signal is strong and persistent enough to make the research investments on next generation development. As to the second dimension, the financial community must recognize the permanence of the signal and provide the financing for the capital stock turnover that is necessary.

The capacity of technology to transform, when coupled with adequate investments, policies and regulations, gives us hope that we will be able to supply exponentially increasing energy needs without further contaminating our atmosphere.

2. Structure: From Binary to Multifaceted

Although it is a multilateral agreement, the structure of the Kyoto Protocol is a very simplistic binary construct: industrialized countries are listed in Annex B of the Protocol⁴ and are committed to legally binding reductions, while all other countries do not have specific reduction commitments.⁵ The post 2012 climate regime is likely to break away from this two-pronged approach. It is certainly true that industrialized countries

have an obvious historical responsibility in the build-up of GHG concentrations and must lead the way, but it is equally true that the larger developing countries are quickly catching up in both emission and GDP levels. As can be seen in Figure 3, there is a substantial overlap among



countries with the highest GHG emissions (responsibility), population, and GDP (capacity to act). Twenty five countries already account for 83% of GHG emissions, 71% of the global population and 86% of the global income.⁶ It only stands to reason that most of these countries, if not all, need to be engaged in the global effort to curb emissions at some point in time and in some form.

The case of the United States is clear. The fact that the US administration chose to withdraw from the Kyoto Protocol in 2001 is economically shortsighted and morally indefensible. The United States is the largest contributor to the concentration of greenhouse gases in the atmosphere (about 28% of the CO₂ emissions from fossil fuels over the past century) and, as the wealthiest country in the world, it has significant capacity and above all the moral imperative, to reduce its emissions in a timely manner. What has been missing over the past five years is mere political will. In the absence of meaningful federal efforts, however, 29 states⁷ and more than 300 cities⁸ have initiated emission reduction programs. There is an increasing ground swell of support for responsible climate action in the US. California, the fifth largest economy in the world, has recently passed legislation committing the state to emission targets of 2000 levels by 2010, 1990 levels by 2020, and 80 percent below

1990 levels by 2050 - a more substantial emission cut than the USA would have assumed under the Kyoto Protocol. The Supreme Court has ruled that the Environmental Protection Agency (EPA) should federally regulate GHG emissions. Evangelical Christians are calling for the protection of God's creation⁹, and Al Gore is spearheading a grassroots movement to educate and mobilize the American people on climate responsibility. In response to public pressure and a possible change in political leadership, the US will likely have a price on carbon by 2012.

And yet, even if the US becomes a committed GHG reducer, the list of new regime participants in the post 2012 era cannot be limited to one addition. Industrialized countries have indisputable historic responsibility, but an effective future regime can only be built with the eventual participation of key developing countries for three main reasons:

- These countries are expected to account for more than half of global emissions by the year 2020, and maybe sooner (IPCC 2000).
- They currently provide the greatest opportunities for low cost emission reductions (IPCC 2001).
- They have the highest growth rates in energy demand. If they do not participate, escalating energy needs will be met with carbon-intensive energy sources. This would accelerate GHG emission trends, which will be increasingly costly to curb and that will progressively complicate the entry of these countries into a carbon-efficient economy.

Unfortunately, however, environmental effectiveness and economic efficiency are not the only elements to be considered. From the perspective of developing countries, distributional equity is the most critical aspect in the emissions reduction debate¹⁰. At the heart of the debate is the question: 'who pays the costs for the carbon efficiency upgrade?' There is no simple answer, but a fair approach could combine differentiated commitments for developing countries (discussed in section 3) and a broader international emission market (as discussed in section 4).

3. Types of Commitment: From Pledged Emission Caps to a Principled Basket of Commitments

There are two different approaches to assuming commitments: pledge-based and principle-based.¹¹ The Kyoto Protocol is pledge-based:

industrialized countries pledged various reduction targets relative to their 1990 emission levels. This approach to commitment setting is based more on economic power and the political circumstances of the moment than on objective criteria. The alternative is a principle-based approach. Using this approach, countries first negotiate overarching principles and rules which are then used to guide the adoption of respective emission reduction targets and timetables among countries. Should the future climate regime move from individually estimated levels of effort to an *a priori* agreement based on an aspirational global goal as discussed in Section 1, the regime would probably also move away from a pledge-based toward a principle-based framework for the participation of countries.

Such a framework would of course have to be consistent with the basic tenets of the UNFCCC. In its Preamble and Article 3, the Convention spells out a set of principles, including:

- All states have legal responsibility to prevent damage to the climate system;
- States have sovereign rights over their natural resources but must not cause damage to the environment of other states;
- All nations have a responsibility but not all nations should contribute equally to solving the problem;
- Scientific uncertainty is not a reason for inaction;
- Every country has a right to sustainable development.

These principles will continue to be the cornerstone of any future legal instrument of the UNFCCC.

Given the necessary political will to arrive at a global long-term goal, countries could negotiate an agreement for the timing and threshold of limitation commitments for all countries, even those not currently participating in the Kyoto Protocol. In order to be fair, the threshold could be triggered by a combination of responsibility,¹² capability,¹³ potential to mitigate,¹⁴ and population.¹⁵ This type of trigger would have the advantage of setting fair rules for all countries on the basis of objective and predictable timetables for the adoption of limitation commitments. While Kyoto-bound countries would continue to take the lead, other industrialized countries would have to catch up, and developing countries - or at least the larger ones - would enter once they reach the pre-established threshold. In order to ensure meaningful participation, a minimum level of participation could be established for

developing countries that reach the threshold. While the timing would be predictable, the nature of commitments could vary.

Under the Kyoto Protocol, each country listed in Annex B assumed absolute reduction targets that represented the maximum level of emissions the country will be allowed to emit during the 2008-2012 period. This type of fixed targets can ensure a particular environmental outcome (via a “cap” on emissions), but they are difficult to negotiate due to both the uncertainties over future emission levels and the costs of achieving any future emission targets. Although in December 1997, Annex B countries agreed in Kyoto to specific absolute targets, it is unlikely that all industrialized countries will again assume fixed targets under the post 2012 regime. It is even more improbable that any developing country would assume a fixed emission target in 2012. Fortunately, fixed targets are not the only type of commitment a country could assume in the future.

There are a wide variety of potential mitigation commitments. From a legal perspective they can be binding or non-binding. They can vary according to type of limitation: fixed emission targets (as in the Protocol), dynamic emission targets (varying according to GDP for example), emission targets with cost caps (to guarantee maximum cost of mitigation), intensity targets (tons emitted per unit of production), or sectoral targets (e.g. vehicles, cement production). They can also vary with regard to coverage: either gas-determined coverage (only CO₂ or all GHGs), or geographic coverage such as sector, region, etc.¹⁶ Furthermore, mitigation commitments can be substantive (e.g. a requirement to achieve a certain target in a specified time frame or a requirement to adopt particular policies and measures); or they can be procedural (aiming to advance preparatory efforts e.g. through preparation of inventories).¹⁷

Future mitigation commitments are likely to abandon the simplicity of exclusively setting fixed targets and move in the direction of a basket of commitment types, where each country could assume the type and level most appropriate to its circumstances. The Report of the Pocantico Dialogue¹⁸ states that emission targets “should remain a core element of the multilateral effort” but that “future targets could vary in time, form, and stringency.” In addition to binding absolute targets, other types could include intensity, ‘no-lose’ or conditional targets.”¹⁹ The report also proposes that developing countries could assume policy-driven emission reductions. The BASIC Project²⁰ suggests that Annex B countries could assume a combination of absolute emission limits, emission intensity limits, and financial payments, while developing countries could quantify

the emission reductions achieved by their sustainable development actions, or adopt a sectoral or national non-binding reduction commitment, which could be either absolute or intensity based.²¹ In order to ensure that the trajectory being set is adequate to reach the long term target, the regime would have to schedule regular reviews of the collective action.

4. Markets: From Short-term Project-based to Long-term System-wide

The Kyoto Protocol's market mechanisms are widely recognized as making important contributions to the global emission reduction effort. The Protocol created three market mechanisms, one allowance based (emissions trading among Annex B countries) and two project-based: Joint Implementation (JI) for Annex B countries and the Clean Development Mechanism (CDM) for developing countries. The market mechanisms for Annex B countries have the single aim of ameliorating the cost of emission reduction. While the CDM also helps bring down the costs of reduction, it has two additional purposes: to help developing countries achieve sustainable development and to contribute to the global stabilization of GHG concentrations in the atmosphere. These two goals can only be reached by decarbonizing the economic growth of developing countries. It is indisputable that growth will continue, but it is equally certain that such growth can be sustainable only if the efficiency of energy consumption increases and the carbon intensity of production decreases, mainly as the result of deliberate long term policies and measures. Sadly, the CDM has largely been ineffective in meeting these goals.

The CDM has seen phenomenal growth - more than \$5 billion worth of transactions in the first nine months of 2006. The CDM has motivated much institutional and technical capacity-building, but CDM projects are not significantly altering the energy pathways of the economies in which they operate for two main reasons:

- The short time frame of the commitments did not allow the market to do much more than harvest the very low hanging fruit. Since the compressed timeframe to 2012 provided a short period to earn a return on capital, the only projects that were interesting in a market fraught with regulatory and performance risk were the non-CO₂ projects: HFCs, nitrous oxide and methane, due to their much higher global warming potential, and hence much higher per ton value as compared to a ton of CO₂. It is therefore not

surprising that these industrial emission reduction projects account for 65% of the current emission reduction market.²² Over the long run this market structure needs to change since growth in emissions is projected to come mainly from the energy and transportation sectors, and we will not see a serious process of decarbonizing energy and transportation until GHG reduction goals are backed by 20-30 year policy certainty. Markets are predominantly rational and policy shapes markets. While we face a long term policy issue, we have only produced short term policy instruments. We need to align the policy instruments with the policy goals.

- The single-plant or single-site approach to CDM projects has precluded systemic transformation. For the most part CDM projects represent isolated opportunities to capture the additional income stream of the sale of emissions reductions, but they have yet to catalyze a transformation of the respective sector. The recent decision to include programs of activities²³ in the CDM is an important first effort toward real decarbonization. If appropriately regulated, CDM programs could provide an incentive for developing countries to not just vacuously adopt but actually implement climate friendly policies and measures. In order to transition toward low carbon growth, the future market mechanism for developing countries must spur activities that are policy or technology-based and sector wide. The most obvious example would be the systematic phase out of inefficient and obsolete appliances and technology in developing countries, since end-use energy efficiency improvements account for two thirds of the energy-related abatement potentials.²⁴ Another example would be the conversion of the inefficient and contaminating public transportation systems in developing country mega cities to cleaner more efficient systems that entice city dwellers away from their personal vehicles.

From the perspective of developing countries, the CDM was never intended as the only instrument responsible for sustainable development, but it was seen as a promising global financial vehicle that would catalyze a transformational transition toward sustainability. At the time it was thought that the CDM would substantially increase the flow of “green” private investment into the energy, transportation and industrial sectors in developing countries, helping them leapfrog over carbon-intensive technologies.²⁵ The CDM must recapture that transformational spirit.

A long-term systems approach to the future market mechanism could enable the transformation of what will otherwise be carbon-intensive growth in the South. It would also result in a substantially increased volume in the supply of emission reductions on the part of developing countries, allowing industrialized countries to take deeper reduction commitments in the future, as their demand for international reductions could be met at predictable prices. While the willingness of industrialized countries to pay for Certified Emissions Reductions (CERs) is not unlimited, the increased supply and demand could be the basis of a significant north-south transfer of funds that would complement the self-financed efforts of developing countries as described in section 3.

5. Participation: From Single Level to Multiple Levels

The Kyoto Protocol is a single level agreement, as it is exclusively an agreement among sovereign states. In turn, each country can opt to engage other levels of society (individual companies, industrial sectors, etc.) in the achievement of its commitments. The Protocol itself does not provide for the possibility of participation of any actors other than the national governments of its ratifying countries. Given the scope of actions which will be necessary in the post-Kyoto era, it may be advisable for the next legal instrument of the UNFCCC to offer some type of participation status to entities other than national governments.

Several options for extending the scope of the legal instrument beyond national boundaries are being discussed. At the supranational level the BASIC Project²⁶ introduces the idea of incorporating international aviation or shipping emission reductions through Memoranda of Understanding (MOUs) that could be signed with international entities such as the International Maritime Organization (IMO) in the case of ships, or the International Air Transportation Association (IATA) and the International Civil Aviation Organization (ICAO) in regard to reductions from aviation emissions. At the sectoral level, industry wide targets could be included in similar MOUs or other channels. Recently, the idea of individual compensation for reducing personal emissions has been proposed.²⁷ Individuals – particularly in industrialized countries where per capita emissions can be as high as 19 tons CO₂ per year - would reduce their personal emission level and/or purchase emission reductions to compensate for their emissions. Under the current structure there are no institutionalized channels to report or account for either supranational efforts or grassroots initiatives.

It is obvious that these efforts - were they to be put into effect - do not have the legal basis provided by the UNFCCC and its Protocol. It is also clear, however, that an important part of the global reduction effort could be beyond the control of national governments. It may therefore be advisable to open an official channel for the recognition and accounting of such efforts, as discussed below.

6. Components: from Mitigation to Adaptation

To date, the Climate Convention has focused primarily on mitigating the causes of climate change, i.e. reducing emissions. Unfortunately, evidence shows that mitigation alone is not enough. Climate change has already had effects on most countries, particularly the vulnerable low lying countries, dependent mostly on agriculture, and those with the poorest economies.²⁸ Developing countries are not only the most vulnerable to climate change, they are also the least able to adapt, since they have less favorable economic circumstances, weaker institutions, limited access to capital, and restricted information exchange.

The challenge of integrating adaptation in a meaningful way into the Convention is particularly acute since unlike mitigation, adaptation is seen to provide mostly local or national benefits. Since industrialized countries are not as vulnerable, they have little in-built incentive to contribute to adaptation. Furthermore, we have as yet little awareness of the potential global impact of significant land losses, mass migrations, and shifts in agricultural land regions. It is clear that adaptation must be systematically incorporated into planning and investment policies, rather than being pursued on the level of single projects. Some progress is already being made in some sectors. In agriculture, for instance, much work is being done on strategies to cope with climate variability in order to enhance resilience. Although these efforts are a good start, they are not sufficient and must be strengthened.

A future focus on adaptation, however, should not obliterate mitigation efforts, since the two are interdependent. If we stabilized emissions at today's concentration, we would only need to adapt to the change already built into the climate system, but with little or no mitigation, the GHG concentrations will continue to rise. Consequently the climate would continue to change leading to ever larger and more serious impacts and ever more costly adaptation measures. Thus the future climate regime needs to cover and integrate the full gamut of issues, from mitigation to adaptation.

Implications for Governance

A more complex regime, such as the one described above, suggests the need for increased technical capacity in some areas. Should a global aspirational goal be agreed to, the regime would have to be able to regularly review the progress being made to achieve it, possibly based on the sequential achievement of interim goals. It is probable that the IPCC would be able to perform this review as part of its five year assessments, since it has already projected various emission trends and their effect on GHG concentrations over time. However, the IPCC can only work with information provided by the countries. Currently each country reports its inventory of emissions in its national communications. All national communications are easily comparable because there is only one metric: GHG emissions resulting from human activities on national soil. If the future regime were to allow for a basket of commitments with various metrics and diverse coverage, there would have to be an accounting system that could convert the various metrics into one equivalent measurement for both comparability and accountability purposes. The IPCC could develop the guidelines for the conversion, and each country could perform their own conversion, reporting both the diversity of metrics and the resulting equivalent single measurement, in order for the IPCC to be able to monitor progress. The need here is for increased technical capacity within the established institutions.

However, there are at least four aspects of the more complex regime that could require improved or expanded governance:

- **Threshold for developing countries:** If a threshold is established beyond which a developing country would assume limitation commitments, developing countries would have to report on the various factors influencing the agreed threshold (e.g. population, GDP, emissions). A third party would have to track each country's approach to the threshold to determine when the graduation trigger has been reached. This role could not be performed by the IPCC since the IPCC is a scientific body with no regulatory attributes, and there is currently no regulatory body in the regime with that mandate. Countries would have to agree to either give such a mandate to the Secretariat of the Convention or create a regulatory body specifically for this purpose.
- **Various levels of participation:** If the future regime allows for the participation of not only national governments, but also

regional organizations, supranational efforts or even grassroots initiatives, countries that are parties to the UNFCCC will have to decide how these extra-national efforts will be tracked, and whether or how they will count toward compliance of commitments. If they are to contribute toward compliance, they would have to be measured and monitored using transparent accounting principles in order to have a clear idea of the real level of mitigation contributed by others outside of central governments. Again, countries would have to agree to either give this role to an enlarged Secretariat of the Convention or to create a new entity.

- **Expanded market:** Should the emissions market for developing countries expand as suggested above, the sheer volume of transactions would make it impossible for it to be handled in the way the CDM is now being regulated. Currently all CDM methodologies and projects go to the CDM Executive Board for approval in a labor intensive bottom-up approach to rule definition that relies on the competence and good will of volunteer Board members. The level of work even now is straining the capacity of this body. There is no doubt that an expanded market will have to be regulated by a combination of a full time technical staff and a political/strategic oversight body.
- **Adaptation:** Under the current UNFCCC institutional arrangements, adaptation is dealt with in an ad-hoc manner without adequate administrative support. Adaptation is a long-term and growing challenge that requires the creation of a specialized group or committee to provide a permanent institutionalized form of direction and oversight. Adaptation will also require a financial mechanism (akin to the current CDM in the realm of mitigation) to help cover the costs in the most vulnerable countries.

The governance issues of an expanded regime may be surmountable. The Kyoto Protocol has laid a sound basis of legal, institutional and technical groundwork that can be built upon. The immediate challenge lies not in the new governance arrangements that would have to be made, but rather in garnering enough mutual trust and political will to mobilize the necessary collective action over an extended period of time. Facing up to climate change is not for one country or one administrative term of government. The global commons nature of the problem requires both a broader multinational approach as well as a sustained commitment. It is

only with this understanding that we will be able to make a transition from reducing emissions to affecting emission trajectories, shifting our focus from tons to trends.

Notes

- ¹ The author is a member of the Executive Board of the Clean Development Mechanism (CDM). The views expressed in this paper are her own and do not represent the views or positions of the Executive Board.
- ² Sir Nicholas Stern, *The Economics of Climate Change*, (London, HM Treasury 2006).
- ³ Lovins in Amory Lovins, Kyle Datta, Odd-Even Bustnes, and Jonathan G. Koomey, *Winning the Oil Endgame*, (Snowmass, Colorado, Rocky Mountain Institute, 2004).
- ⁴ The UN Convention on Climate Change lists industrialized countries in its Annex I, and developing countries are referred to as “non-Annex I.” The Kyoto Protocol lists the reduction commitments of industrialized countries in its Annex B.
- ⁵ Non Annex B countries can voluntarily participate in the international emission market if they so choose.
- ⁶ Pew Center on Global Climate Change, *International Climate Efforts Beyond 2012*, Report of the Climate Dialogue at Pocantico, (Washington, DC. 2005).
- ⁷ <http://www.epa.gov/climatechange/wycd/stateandlocalgov/state.html>.
- ⁸ <http://www.usmayors.org/climateprotection/>.
- ⁹ Edward O. Wilson, *The Creation, A Meeting of Science and Religion*, (New York, W.W. Norton, 2006).
- ¹⁰ Sheila Olmstead and Robert Stavins, “An International Policy Architecture for the Post-Kyoto Era,” (American Economic Review Papers and Proceedings 96, no. 2, (May 2006): 35-38; Timmons Roberts and Bradley C. Parks, *A Climate of Injustice: Global Inequality, North-South Politics, and Climate Policy*, (Cambridge, Massachusetts, The MIT Press, 2006).
- ¹¹ Kevin Baumert, ed. *Building on the Kyoto Protocol: Options for Protecting the Climate*, (Washington DC: World Resources Institute, 2002).
- ¹² Measured as cumulative CO2 emissions since 1990.
- ¹³ Measured as GDP per capita.
- ¹⁴ Measured as GHG emissions per capita.
- ¹⁵ Farhana Yamin and Eric Haites, “The Sao Paulo Proposal for an Agreement on Future International Climate Policy,” Discussion Paper for COP-12 & COP/MOP 2 (Nairobi, The BASIC Project, 2006).
- ¹⁶ Baumert 2002.
- ¹⁷ Farhana Yamin and Joanna Depledge, *The International Climate Change Regime: A Guide to Rules, Institutions and Procedures*, (Cambridge, Cambridge University Press, 2004).
- ¹⁸ In 2004-5 The Pew Center on Global Climate Change convened a group of 25 senior policymakers and stakeholders from 15 countries to discuss options and recommendations for advancing the international climate change effort post-2012. The conclusions are captured in the Pocantico Dialogue Report.
- ¹⁹ Pew Center on Global Climate Change 2005.
- ²⁰ The BASIC project is a two year EU supported project that aims at linking national and international climate policy for Brazil, China, India and South Africa. The project was commissioned to a multi-national project team in late 2004 and terminated in December 2006.

²¹ Yamin 2006.

²² www.CD4CDm.org, CDM Pipeline as of February 1, 2007.

²³ Paragraph 20, Decision 7, COP/MOP 1.

²⁴ International Energy Agency, *World Energy Outlook* (Paris, 2006).

²⁵ Esty, Daniel C. and Brad Gentry, "Foreign Investment, Globalization and Environment," in *Globalization and Environment: Preliminary Perspective*, OECD (Paris, 1997).

²⁶ Yamin 2006.

²⁷ Muller 2006.

²⁸ Vulnerability is the extent to which climate change may damage or harm a system. It depends not only on a system's sensitivity or extent of change, but also on its ability to adapt to new conditions.