

Next Steps After the Kyoto Protocol: Formulas for Quantitative Emission Targets

Jeffrey A. Frankel,
Harpel Professor of Capital Formation and Growth
Harvard University.

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It is a sign of how resigned the world has become to an absence of enlightened leadership from the United States that some were prepared to receive positively President Bush's new position on Global Climate Change at the recent G-8 meeting in Germany. The President conceded that it is a problem that is worth addressing. It will take more than this, however, to begin genuine progress on the problem.

Start from two premises: (1) the Kyoto Protocol constitutes the only multilateral framework we have to address climate change; and (2) the Protocol is severely incomplete, particularly with regard to coverage across countries (no participation of US or developing countries) and across time (nothing yet agreed after 2012). Unlike most American economists, I believe that – given the combination of political, economic and scientific realities as they are – Kyoto was a good foundation, a good first stepping stone on the most practical path if we are to address climate change seriously. Although the negotiations demonstrated that quantitative targets are more acceptable politically than the economist's favorite choice, a global carbon tax, they built desirable market mechanisms such as international trading into the agreement.

A constructive approach asks what are the requirements for the design of a second and subsequent steps in the process, a successor to the Kyoto regime of 2008-2012, one that would build on what is good about it and fix what is most lacking. The six desired criteria for such an approach are (1) *more comprehensive participation*, (2) *efficiency*, via those market mechanisms, (3) *dynamic consistency*, (4) *equity*, (5) *robustness* with respect to uncertainty, and (6) *compliance*.

We need a proposal that seeks realistically to bring in all countries and that looks far into the future. I would argue that the path of quantitative emission targets for the 21st century must be selected sequentially, perhaps one decade at a time, all within a common framework. An analogy for the appropriate framework would be the post-war General Agreement on Tariffs and Trade (GATT), which gave us 50 years of successful rounds negotiating trade liberalization, even though the original signers did know what specifics would emerge

Virtually all careful economic modeling attempts, by contrast, purport to trace out at once an optimal path over the period of a century or more. The problem with this approach is that governments cannot bind their successors. Nobody knows what the objective scientific, technical, economic, and political realities will look like in the future. Thus it is rational and sensible that the system is unable to commit to specific targets for the rest of the century. If the designers of a treaty specify a path for steep future reductions, their successor governments will not likely be willing to pay the high economic costs necessary to follow through when the time comes. Those making investment decisions today -- from power plant construction, to housing, to technological

research -- know that tomorrow's policies will not be consistent with today's promises, and will act accordingly. This is the definition of dynamic inconsistency, the third criterion listed above. One implication is that the desired path entails more aggressive steps earlier on than the optimal path that comes out of standard forward-looking "integrated assessment models."

My common framework of quantitative targets would allocate relative targets across countries by means of a formula that is fairly general at first but that becomes increasingly specific as the decade in question approaches. Viewed at the horizon of one decade, the formula for emission limits would be phrased as cuts from the expected Business as Usual Path (BAU). The BAU baseline entails, for example, rapid increases in emissions for such countries as China and India. Thus, even with cuts relative to the baseline, we are talking about "growth targets" for such countries, not cuts in the absolute levels of emissions as were agreed by the industrialized countries at Kyoto.

The formula for targeted reductions would include among its determinants the following variables:

- 1990 emissions
- emissions in the year of the negotiation
- population, and
- income.

A uniform formula would in a sense apply to all countries. But the straightjacket must not be too rigid if it is to be workable applied uniformly to all. The presence of lagged emissions on the list recognizes the reality that no country, neither the US nor developing countries, will agree to a costly sharp reduction relative to the status quo.

New joiners would be obligated to adopt emissions targets, but these paths need not immediately fall below their "business as usual" growth path. Allowing developing countries to sell permits in the initial budget period would then provide them with an economic incentive to join, or at least would not immediately penalize them for joining. Under a climate regime with a BAU emissions target in their first period of participation, developing countries would have the right to emit whatever amount they would have emitted anyway in the absence of an international climate change policy. They need not undertake emission abatement unless a foreign government or foreign corporation offers to pay them enough to persuade them voluntarily to do so, which it is in fact likely to do in order to save costs of meeting its own targets. Importantly, however, by constraining their emissions to business as usual, these commitments would forestall emissions leakage and improve the environmental effectiveness of emissions abatement efforts in industrialized countries. Thus the system would carry economic benefits for both rich and poor countries, while also bringing environmental benefits to all.

Countries *would* be required in subsequent budget periods of their participation to adopt steeper reductions in their emissions targets. The extent of *relative cuts* across countries would depend on such factors in the formulas as the per capita income and past emission levels of the country in question. The extent of cuts *in aggregate global emissions* would depend – as is inevitable -- on how strong is the international political consensus for aggressive action at that point in history. Such a scheme provides the necessary flexibility and incentives to appeal to both industrialized and developing countries.

The fourth criterion was equity. The developing countries point out that it was the industrialized countries, not they, who created the problem of Global Climate Change, and they should not be asked to limit their economic development to pay for it. The developing countries are said to have contributed only about 20 percent of the carbon dioxide that has accumulated in the atmosphere from industrial activity over the past 150 years. Moreover, in contrast to richer countries, they do not have the ability to pay for emissions abatement.

I have already said that developing countries would not be asked to make substantial cuts in the first period of joining. Two more things can be done to entice developing countries who fear being asked to make larger cuts in the second and subsequent periods. One would be the principle that even in future periods, quantitative targets would be allocated across countries progressively. Though few observers realized it, a precedent for this principle was already set at Kyoto in 1997. It can be shown statistically that the emission cuts that were agreed among industrialized countries at Kyoto followed a progressive pattern: richer countries agreed to make proportionately larger cuts from their BAU paths than less-rich countries. The same pattern could be built into the formula for emission targets expected of new joiners in the future.

Second, the framework of a nested sequence of formulas could include the possibility, at least at a rhetorical level, that the target for emissions in the limit, as the year under consideration approaches infinity, puts zero weight on income or on past levels of emissions, and complete weight on population. In plainer English, in the very long run, the developing countries would notionally achieve their equity-based demand for equal levels of emissions per capita.

The fifth criterion is robustness with respect to uncertainty. At the level of aggregate global emissions, a good way in any given decade to insure that costs don't go unexpectedly high is a hybrid system that caps costs through an escape clause, also called a safety valve. At the level of individual countries, a good way to narrow the range of variation of costs is to use formulas that index emission targets, within the decade, to national output.

The sixth and final criterion is a realistic mechanism for compliance, which is lacking from the Kyoto Protocol. Whatever other carrots or sticks someone might dream up – trade sanctions, moral suasion, or penalties in the form of steeper cuts in the future – minimizing *ex ante* the chances of substantial economic loss is the sine qua non of assuring *ex post* compliance. This leads us back to progressivity and robustness under uncertainty. Countries will not in the end comply with an agreement unless they are insulated against the risk that the target commitments will impose huge economic costs on them.

This column summarizes "Formulas for Quantitative Emission Targets," Chapter 2 in *Architectures for Agreement: Addressing Global Climate Change in the Post Kyoto World*, edited by Joe Aldy and Robert Stavins, Cambridge University Press, 2007.