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Designing a Regime of Emission Commitments for Developing Countries that is Cost-Effective and Equitable

Joseph E. Aldy
Department of Economics, Harvard University

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

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The Kyoto Protocol was negotiated in 1997 as a first substantial step in addressing the problem of global climate change. The agreement established greenhouse gas emissions targets for industrialized countries for the 2008-2012 period. Despite this initial effort, many obstacles continue to stand in the way of effective mitigation of global climate change. First, neither the Framework Convention on Climate Change nor the Kyoto Protocol commits developing countries to any specific emissions abatement efforts or targets. Second, the United States has refused to ratify the Protocol. Finally, the Protocol and the Framework Convention are silent about post-2012 emission commitments.

For all the criticism that the Kyoto Protocol has received, the most feasible approach in future policy efforts may be to build on this foundation.[1] If so, then developing countries, particularly large growing countries, will at some point have to agree to accept binding emissions commitments and to participate in the system of international trading of emission permits. Emissions trading and other related flexibility mechanisms are among the most important principles of the Kyoto Protocol, and are some of the prime reasons why Kyoto provides a foundation worth building on.

The subject of developing country commitments is very controversial. On the one hand, developing countries make two reasonable points on equity grounds why they should not proceed now with emissions abatement. First, they believe it would be unfair for them to sacrifice their economic development for a problem created by the industrialized countries. The developing countries have contributed only about 20 percent of the carbon dioxide that has accumulated in the atmosphere from industrial activity over the past 150 years. Second, they have more pressing development concerns, and, in contrast to richer industrialized countries, they do not have the ability to pay for emissions abatement. Developing country governments consider the raising of their

[1] Frankel, "You're Getting Warmer: The Most Feasible Path for Addressing Global Climate Change Does Run Through Kyoto," in Trade and Environment: Theory and Policy in the Context of EU Enlargement and Transition Economies, edited J. Maxwell and R. Reuveny, (Edward Elgar Publ., Ltd., UK), 2004.

people's economic standard of living the number one priority. Achieving this objective requires raising market-measured income as well as improving the local environment, particularly reducing air and water pollution. They believe they should address these fundamental development challenges before contributing to efforts to mitigate the global climate change problem primarily created by industrialized countries.

On the other hand, industrialized countries point out that any plausible effort to mitigate climate change risks must involve the full participation of developing countries for several reasons. First, a global problem requires a global solution. Unilateral actions by countries would likely yield little progress because of the "free rider" problem that characterizes global climate change. A solution requires that all (or at least all "major") countries agree to participate together. Second, China, India, and other developing countries will represent up to two-thirds of global carbon dioxide emissions over the course of this century, vastly exceeding the OECD's expected contribution of roughly one-quarter of global emissions.[2] Without the participation of major developing countries, emissions abatement by industrialized countries will not do much to mitigate global climate change. Third, if developing countries do not participate in the international regime, their emissions might rise by *more* than is currently forecast under their business-as-usual paths, as a result of cutbacks in the participating countries. This *leakage* of emissions could come about by relocation of carbon-intensive industries from countries with emissions commitments under the Kyoto Protocol to non-participating countries, or by increased consumption of fossil fuels by non-participating countries in response to declines in world oil and coal prices. Leakage could be on the order of a quarter ton increase in developing countries for every ton abated in an industrialized country. Finally, developing country participation is crucial because it would permit relatively low-cost emissions abatement in the South in place of high-cost reductions in the North. This would increase the probability that industrialized countries both participate in and comply with a system of international emissions commitments. Even the Clinton-Gore Administration would not have submitted the treaty to US Senate ratification without it.

If quantitative emissions commitments are set for developing countries in a very careful way, they can address both developed and developing countries' concerns. Three important principles should guide the formulation of such targets:

- gains from trade
- progressivity, and
- protection against inadvertent stringency.

We explain in the remainder of this note how an agreement on targets under such principles can bring economic and environmental benefits for developing countries as well as for rich countries. Thus everyone should be able to agree that these targets represent an improvement, relative to the alternative of not having developing countries in the system. This is true regardless of how much weight one wants to put on the

[2] The tables in the appendix present the composition of global carbon dioxide emissions currently, in the near future (2025), and in the distant future (through 2100).

economic interests of poor countries versus rich, and regardless how much weight one wants to put on environmental goals versus economic goals.

The Gains from Trade

If developing countries were to join a Kyoto-like system of targets-with-trading, it would not only have environmental and economic advantages for the rest of the world; it would also have important environmental and economic advantages for the developing countries themselves. For the sake of concreteness, consider a plan under which developing countries do no more than commit to their "business as usual" (BAU) emission paths and join the trading system.

A BAU emissions target would not hurt developing countries. These 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. 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.

Developed countries' governments and private firms would likely offer to pay developing countries enough to persuade them voluntarily to reduce emissions below their BAU paths. How do we know this? It would be expensive for the United States, Europe, and Japan to reduce emissions below 1990 levels if the reductions are made only at home. The cost of emissions abatement would be far lower in many developing countries, and so rich countries could offer terms that make emission reductions economically attractive to them. The economic theory behind the gains from trading emission rights is analogous to the economic theory behind the gains from trading commodities. By doing what they do most efficiently, both sides win.

Why is it so much cheaper to make reductions in China or India than in the United States? One major reason is that, in industrialized countries, one would have to prematurely scrap coal-fired power plants in order to replace them with natural gas facilities or other cleaner technologies. This would be expensive to do, because it would mean wasting a lot of existing capital stock. In rapidly growing countries, by contrast, it is more a matter of choosing to build cleaner or more efficient power-generating plants to begin with. When contemplating large increases in future demand for energy, it is good to be able to plan ahead. The benefits include learning from the mistakes of others that have gone before, and taking advantage of their technological advances.

An extreme example of how measures to reduce carbon emissions can have low costs in developing countries is the case of subsidies to fossil fuels. Eliminating such subsidies would create substantial immediate benefits – fiscal, economic, and environmental – even before counting any benefits under a Kyoto agreement. Subsidy cuts within a target-and-trade system would pay developing countries twice over – once

in the form of the money that is saved by eliminating wasteful expenditure, and then again in the form of the money that is paid by a developed country for the claim to the resulting emission abatement.

Progressive Emissions Commitments

Developing countries fear that they will be asked to accept emissions targets that are more stringent than BAU, and perhaps lower than current or past emissions (such as what the industrialized countries accepted in the Kyoto negotiations). It would not be reasonable for the rich countries, however, to insist that the poor accept targets that fail to allow for their future economic growth. It is useful to begin by expressing all possible emissions targets as relative to BAU. Any proposed emissions abatement is relative to BAU, not relative to the past.

A reasonable lower bound for developing country emission targets would be the "break even" level. This is the level that leaves them neither better off nor worse off economically than if there had been no treaty at all. In other words, it is a level where they have to make some low-cost reductions from the start, but where sales of emission permits at an intermediate price are sufficient to compensate them for their marginal reduction. The aim should be to fall somewhere in the range that is bounded above by BAU and bounded below by the break-even level. As long as the target is above the break-even lower bound, the developing countries benefit economically from the arrangement. Developed countries still enjoy the opportunity to invest in low-cost emissions abatement in developing countries and the lower global emissions of such an arrangement. Everybody gains from having taken the first step to fight global climate change.

There is probably a moderately large range between business as usual and the break-even point. What would constitute a "fair" emissions commitment within this range? A fair target for developing countries might be one that fits the pattern tends to hold among the existing targets agreed at Kyoto. Even though the emission targets agreed at Kyoto reflected the outcome of political negotiations, rather than economists' calculations of some definition of optimality, it is possible statistically to discern systematic patterns in the targets. This approach turns out to allow some *progressivity*, with richer countries committing to larger emissions abatement efforts than poor ones. Yet it does not go nearly so far as the massive redistribution of wealth that some poor-country representatives unrealistically ask for, even though it might seem to follow from a tabula rasa notion of equity.

Out of 30 industrialized countries' targets agreed at Kyoto (those with adequate data, including some that have not subsequently ratified the agreement), the average reduction from BAU was 16 percent. For the less-rich half of the countries, the average reduction was 5 percent below BAU, which shows the progressivity in a very simple way. The progressivity of the Kyoto system was also revealed within the EU's "bubble" allocation: wealthier countries such as Germany and the United Kingdom accepted emissions targets much more stringent than the EU-wide commitment (1990 minus 8%),

to allow less wealthy countries such as Portugal and Ireland to have less stringent targets. Further statistical analysis can help illustrate the progressivity of the targets. Controlling for countries' projected BAU emissions growth, their coal intensities, and whether they are beginning the transition from central planning, we estimated that a one percent increase in per capita income implied a target of 0.11 to 0.17 percent greater emissions abatement from BAU.

As an illustrative example, when this pattern is extrapolated to China, the projected target is about 5 percent below BAU. This emissions level happens to lie inside the desirable range: below BAU but above the breakeven point (based on a number of global energy-economic models). In other words, if China accepted such a target, economic benefits would accrue both to it and to the rich countries that would pay China to reduce emissions further. As a rough guideline, 5 percent is not an unreasonable benchmark for other developing countries as well. To repeat, it still allows for growth.

Resolving Concerns about Unintended Target Stringency

One important objection concerns uncertainty regarding how stringent given numerical targets would turn out to be. Calculations regarding the BAU path or the cost of deviations from it are subject to great imprecision and unpredictability. Poor countries worry that uncertainty surrounding their forecasted economic performance is so great that they cannot in 2004 risk adopting an emissions target that would be binding five or ten years in the future. Even if a particular numerical target appears beneficial *ex ante*, it might turn out to be something different *ex post*. If the country turns out to achieve unexpectedly rapid growth, the last thing it wants is to have to put a stop to it because the accompanying emissions threaten to overrun its target. A response to this concern would be to structure international agreements regarding these countries' targets so as to reduce the risk of being inadvertently stringent.

Symmetrically, environmentalists have also expressed a concern on the other side that a target may turn out *ex post* to be too lax. They fear that such a target might fail to result in environmental benefits in terms of actual emissions reductions relative to what would have happened in the absence of a treaty. If, for example, Korea or Thailand had accepted targets at Kyoto in 1997, the sharp slowdowns that began in East Asia in the same year would have turned out to imply that they might have been paid for emission abatement that would have happened anyway. This is the so-called "hot air" problem. Thus, it is desirable to mitigate the risk of inadvertent laxity while also mitigating the risk of inadvertent stringency – to narrow the variability of the effective stringency of the target without relaxing or tightening the intended target itself.[3]

One solution is indexation of the emissions target. The general notion is to agree today on a contract under which the numerical target depends in a specified way on

[3] See also Lutter, R. 2000. Developing Countries' Greenhouse Emissions: Uncertainty and Implications for Participation in the Kyoto Protocol. *Energy Journal* 21(4): 93-120.

future variables whose values are as yet undetermined.[4] Future economic growth rates are probably the biggest source of uncertainty, especially in developing countries. A simple approach would index a country's aggregate emissions to future income alone. Other possible proposals could allow the targets to vary with other variables such as population or temperature.

More specifically, for every percentage point in GDP growth that is higher or lower than forecast, the emissions target is raised or lowered by a corresponding amount. If the relationship were fully proportionate, this rule would be equivalent to what is called an emissions efficiency standard (e.g., the Bush Administration's greenhouse gas intensity goal). A better formula, however, would make the adjustment a little less than proportionate. For example, every 1 percent of extra growth might call for an automatic 0.7 percent increase in the target. Or the coefficient could be ½, which would make the formula into a simpler "square root" rule.[5] The proposal would require countries that are doing a bit better to contribute more than those that are not, maintaining principles of progressivity and insurance, without penalizing them unduly for their success.

Indexation is only one possible approach to removing some of the economic uncertainty that holds back commitment to a quantitative emission target. For example, a Safety Valve, which eases the quantitative limit when the price of an emissions permit threatens to rise above a pre-agreed threshold, could also serve this end. Approaches that explicitly account for at least some of the uncertainty that characterizes emissions abatement would make it more likely that the target will turn out to fall within the range intended, where it brings benefits – both environmental and economic – to developing countries and industrialized countries alike.

[4] An analogy is a cost-of-living adjustment clause in a labor contract. It specifies a given increase in the wage for every dollar increase in the Consumer Price Index – thus reducing uncertainty over *real* wages.

[5] The Argentine government proposed an emissions target indexed to the square root of its economic growth at the 1999 Conference of Parties in Bonn, Germany.

Appendix: Current, Near Future, and Distant Future World Greenhouse Gas Emissions

Table A1. 2000 Carbon Dioxide and All Greenhouse Gas Emissions

	Fossil Fuel CO_2 Emissions		All Greenhouse Gas Emissions	
	Emissions (MMTC)	Share of World Total	Emissions (MMTC)	Share of World Total
Annex I	3,784	58.0%	4,664	50.8%
USA	1,573	24.1%	1,892	20.6%
EU-15	884	13.6%	1,086	11.8%
Russia	420	6.4%	520	5.7%
Non-Annex I	2,738	42.0%	4,512	49.2%
China	948	14.5%	1,356	14.8%
India	275	4.2%	506	5.5%

Source: World Resources Institute Climate Analysis Indicators Tool.
Notes: Emissions are expressed in terms of millions of tons of carbon equivalent (MMTC). Non-Annex I also includes emissions of countries that are not a party to the Framework Convention on Climate Change. The measure of all 6 greenhouse gas emissions does not include sequestration of carbon dioxide through land use change.

Table A2. 2000 and Forecast 2025 Carbon Dioxide Emissions
(U.S. Energy Information Administration)

	2000		2025		
	Emissions (MMTC)	Share of World Total	Emissions (MMTC)	Share of World Total	2000-2025 Growth Rate
Annex I	3,935	61.3%	5,255	51.9%	1.2%
USA	1,578	24.6%	2,221	21.9%	1.5%
W. Europe	939	14.6%	1,097	10.8%	0.6%
Russia	428	6.7%	596	5.9%	1.3%
Non-Annex I	2,484	38.7%	4,869	48.1%	2.7%
China	780	12.2%	1,818	18.0%	3.3%
India	249	3.9%	500	4.9%	2.9%

Source: Energy Information Administration 2004 International Energy Outlook.
Note: Represents all carbon dioxide emissions associated with fossil fuel combustion.

Table A3. Share of Cumulative Global CO_2 Emissions Forecast Over 2000-2100 Period (IPCC A2 Scenario)

Region	Models Used in IPCC Special Report on Emissions Scenarios					Average
	AIM	ASF	IMAGE	MESSAGE	MiniCAM	Share
OECD-90	25.6%	27.0%	28.1%	31.7%	25.4%	27.6%
Transition Economies	10.8%	8.9%	3.5%	9.6%	14.2%	9.4%
Asia	35.2%	36.0%	37.2%	34.3%	35.9%	35.7%
Africa & Latin America	28.4%	28.1%	31.2%	24.4%	24.4%	27.3%

Source: IPCC 2000 Special Report on Emissions Scenarios, pp. 466-490.

Notes: The A2 scenario is considered a "marker" scenario by the IPCC. It is one of the six scenarios prominently presented in the Special Report on Emissions Scenarios as representative of the larger set of 40 scenarios. The A2 scenario is characterized by a positive growth rate in world CO_2 emissions throughout the 2000-2100 period.