CHAPTER 28 -- EPILOGUE

[*from* **POST-KYOTO INTERNATIONAL CLIMATE POLICY: IMPLEMENTING ARCHITECTURES FOR AGREEMENT,**
*Joseph E. Aldy and Robert N. Stavins, eds.***]**

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History's evaluation of this generation will surely depend to an important extent on its handling of the climate problem—not just on what gases we leave in the atmosphere but also on what durable climate policy architecture we leave to our heirs. This valuable collection sheds new light on what I believe to be the most difficult and important dimension of the climate policy problem. All who have had a hand in the creation of this volume deserve thanks and applause. In this brief essay I offer some thoughts on what makes the international dimension of the climate problem so difficult and important, on the history of climate policy debates, and on some key elements of policy architecture that those debates have so far produced.

The International Dimension

Climate change would be a very difficult issue even without its international dimension, of course. Because much of the benefit of limiting greenhouse gas emissions would accrue to future generations, it would be both economically and politically hard to compare the costs and benefits of mitigation policies even if both were known.[2] But the future benefits of reducing emissions are highly uncertain, both because we cannot confidently predict important regional-scale climate changes and because the adaptation technologies available to future generations are unknown. Similarly uncertain are the pace of technological innovation and the quality of future climate policy design and implementation, both critical factors in determining future costs of emissions reduction.

But these difficulties seem little more than academic puzzles when set against the international dimension of this problem. To over-simplify, there are many more poor people than rich people on this planet. Those poor people want desperately to become rich—i.e., to live as well as Americans or Europeans. Recent experience in China and elsewhere strongly

[1] I am indebted to Henry Jacoby and Robert Stavins for useful comments; all errors and opinions are mine alone.

[2] To simplify exposition I generally ignore sinks and deal only with emissions sources. Essentially the same arguments apply to enhancing sinks as to reducing sources.

suggests to them that this is possible. If the world's poor become prosperous in anything like the same way today's rich did, however, greenhouse gas emissions will increase substantially, and the consequences for the entire human race are likely to be extremely unpleasant. The world's poor will not long tolerate measures they view as slowing their emergence from poverty, but we do not yet know any way for them to become rich without substantially increasing their per capita emissions. We need both to show them a much more climate-friendly path to prosperity and to induce them to follow it. Creating such a path obviously requires developing new, climate-friendly technologies, but unless they involve both lower emissions *and* lower costs than current technologies, they will not be automatically adopted in developing nations.

A few basic numbers illustrate the magnitude of this problem. According to US Bureau of the Census and Energy Information Administration (EIA) data, the United States accounted for just over 4.5 percent of world population in 2005 and about 21 percent of global CO_2 emissions associated with fossil fuels. US per capita emissions were about 5.6 times those in the rest of the world, even though the rest of the world includes all the other rich nations.

To see what these numbers imply, suppose there is no population growth anywhere that US emissions remain constant in the future. Suppose, however, that economic development continues in the rest of the world so that per capita emissions in the rest of the world rise to become one-third of those in the United States. With today's technology, this change would correspond to a dramatic reduction in global poverty, but it would hardly be enough to give most of the human race anything like the US lifestyle they see on television. *Nonetheless, this change would also correspond to an increase of just over two-thirds in global emissions*. If the climate problem is to be addressed effectively, today's poor nations simply must go down a very different path to prosperity than that followed by today's rich nations.

Some (Discouraging) History

The climate policy problem has been on the world's agenda since at least the creation of the Intergovernmental Panel on Climate Change (IPCC) in 1988. That same year, Presidential candidate George Bush promised to use "the White House Effect" to deal with the greenhouse effect. In November of the following year, in connection with the Ministerial Conference in Noordwijk, President George Bush declared that "stabilization of carbon dioxide (CO_2)

emissions should be achieved as soon as possible" and that "it is timely to investigate quantitative targets to limit or reduce carbon dioxide emissions."

In this early period, the stage seemed to be set for constructive, global action, plausibly with US leadership. In February, 1990, the United States hosted—and President Bush addressed—a plenary meeting of the IPCC, and a year later it hosted the first meeting of the Intergovernmental Negotiating Committee (INC) that was drafting the Framework Convention on Climate Change (FCCC). In April, 1991, President Bush announced that "actions—recently established in law or proposed by my Administration—will hold US net emissions of greenhouse gases at or below the 1987 level through the foreseeable future." And just over two years later, in October, 1993, the Clinton Administration announced a Climate Action Plan that it contended would reduce US emissions to 1990 levels by 2000.

I first became engaged in climate policy as a Member of the Council of Economic Advisers in this lively early period. In the fall of 1989 I found myself heading an interagency task force charged with producing a report on the economics of climate change. That report was completed in March, 1990, and a slightly revised version was published that September (US Department of Energy 1990). It noted "substantial gaps in current knowledge" and, of course, called for "a coordinated economic research program."

Some of the report's more detailed findings and conclusions have been overturned by subsequent research, but many have endured. The report noted, for instance, that "climate change is not a one-gas or one-nation problem" and that "Command-and-control efficiency standards have several significant disadvantages in comparison to incentive-based systems—such as charges, user fees, and tradable emissions rights…"

On the international front, the interagency report concluded that "Even dramatic unilateral cuts by member states of the OECD would not be sufficient to achieve widely discussed global CO_2 emissions goals unless most other nations participate fully in emissions reductions efforts." (Among those "widely discussed" goals were cuts of 20 percent below 1985 levels by 2005 and 50 percent below 1985 levels by 2025!) And, in what has proven to be rather an understatement, the report observed that "while global action is essential to limit greenhouse emissions significantly, differences among nations may make it difficult to find universally acceptable emissions targets or ways of sharing the costs involved."

In this early period, some participants in the climate debate called for substantial near-term emissions reductions, but most analysts argued that it would be more efficient to focus for at least a decade on studying the climate system and developing new technologies that could reduce the costs of emissions reductions and of adaptation to climate change.[3] This preparatory investment would permit subsequent policies both to better reflect actual risks and benefits and to impose lower net social costs.

Subsequently, of course, no substantial emissions reductions were made. US emissions rose despite the promises of the Bush and Clinton administrations. Emissions of CO_2 associated with fossil fuels (not the same as net emissions of greenhouse gases, but an important component thereof) increased by 25 percent between 1987 and 2005 and by 12 percent between 1990 and 2000 even though as noted above the Bush and Clinton Administrations, respectively, had promised no increases. A good deal of research was subsequently done on the climate system, but much less effort was devoted to the development of mitigation and adaptation technologies than rhetoric and analysis in the early period would have led one to expect. US Department of Energy spending on research, development, and demonstration actually declined in real terms after fiscal year 1990 and remained below that year's level through fiscal year 2007 (Gallagher *et al.* 2007). It is only a bit too strong to assert that we wasted nearly two critical decades on the technology front.

Since this early period there has been considerable movement toward developing an international climate policy architecture, as I discuss below. But the fundamental, critical problem of inducing poor nations to follow climate-friendly paths to development has not yet been effectively addressed. And the early-period arguments that we could wait a decade or more before making significant cuts in global emissions cuts have passed their sell-by dates: We have in fact waited nearly two decades, and most knowledgeable observers now contend that the time for serious action is upon us—ready or not.

Thoughts on Architecture

European churches were often built on top of earlier churches or temples; two or more places of worship can sometimes even be visited on the same site. A church that may have

[3] See, e.g., IPCC 1996.

seemed ideal for decades after its construction was apparently considered inadequate somewhat later. Architectural styles and details of course differ between successive structures, often dramatically. Nonetheless, all the churches built on the same site clearly served as appropriate venues for very similar, if not identical, ceremonies over many centuries. The basic basilica scheme, in particular, has served Western Christianity well for almost two millennia.

Absent unimaginable, transformative technological breakthroughs, climate policy will be a global concern for centuries. It is not likely that our generation will create an international climate policy architecture that will remain workable in all its details for even a single century, let alone as long as the great gothic cathedrals have served as places of worship. Not only are the domestic and international political, economic, and institutional environments within which climate policy is embedded almost certain to change over the relevant horizon, probably radically, but our understanding of the climate system will advance, and the set of available technologies for mitigation and adaptation will expand considerably.

It is of course essential to focus on policy designs that can be useful today, even if they fall short of what future, more stringent mitigation efforts may require. However, one must also bear in mind that the core elements of policy architectures, once put in place, are not easily changed. It is thus important to ensure that today's policy designs embody architectural elements that can serve as foundations for better designs in the future, rather than elements that must be excised if progress is to be possible. If we cannot now build an elegant gothic cathedral, let us try for a workable, adaptable basilica design scheme.

One valuable element of the emerging architecture deserves particular mention. Early European proposals in the run-up to the first meeting of the INC in Washington in February, 1991 focused on what is called in this volume "harmonized domestic policies," except that the policies proposed were essentially all of the command-and-control variety. The basic idea was that there would be protocols on autos, on steel-making, and so on. To those of us in the Bush Administration who had been involved in the passage of the 1990 Clean Air Act Amendments, which put in place the tradable allowance regime for control of sulfur dioxide emissions, this approach seemed fundamentally wrong-headed. At that first INC meeting, I participated in the start of a serious effort by the United States to move the focus of discussion from performance standards and to emissions limits. In part as a result of that effort, the Framework Convention

focuses on emissions, and, in large part because the Clinton Administration continued to push emissions trading as superior to command-and-control regulation, the Kyoto Protocol permits this approach to be used within and even between nations. It is, of course, more than a little ironic that as of this writing the EU ETS has for some time been the only large-scale working example of emissions trading as a greenhouse gas mitigation strategy.

The Framework Convention's call for "stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system" contains two architectural elements. The focus on stabilization is a valuable reminder of the long-run nature of the climate problem. On the other hand, the assertion of a threshold that cannot be exceeded is problematic. In practice, though, this assertion may be a purely ornamental element of the policy architecture: Since the Convention's critical level is unknown and possibly non-existent, it cannot be used to attack or defend any plausible policy proposal.

Architectural elements that will be of enduring value in the Convention include the coverage, in principle at least, of all anthropogenic greenhouse gases (except those being phased out under the Montreal Protocol) and of all sources and sinks thereof. In addition, the Convention and the Protocol properly stress the importance of measurement of sources and sinks and call for the creation of what seems on paper, at least, an appropriate institutional structure.

But some necessary elements are missing from these documents, and some elements that are present will need to be excised or worked around in the future. Though technology transfer is mentioned in the Convention and the Protocol, for instance, and its importance is emphasized in the Bali Action Plan, there is essentially no reflection in any of these documents of the critical need to develop *new* technologies for measurement of sources and sinks, for reducing net emissions, and for enhancing the ability to adapt. Without new measurement technologies, it will be difficult to extend international "targets-and-timetables" agreements much beyond CO_2 associated with fossil fuels, which will make stabilization of radiative forcing more difficult. Without more climate-friendly technologies to power their economies, it will be impossible for today's poor countries to become prosperous without doing serious damage to the global climate. And without serious attention to adaptation and development of new technologies to facilitate it,

those same poor countries are likely to bear substantial, avoidable costs, regardless of what feasible mitigation path is followed.

The Clean Development Mechanism (CDM) plainly needs to be transformed or at least fundamentally reformed, as several contributions to this volume argue. It suffers from a deep problem that afflicts all systems based on emissions reductions rather than emissions. Emissions can be measured or at least estimated directly, while emissions reductions can only be inferred by subtracting emissions from a no-action baseline that is always unobservable and arguably generally unknowable. If one requires that proposed baselines withstand rigorous review, few projects will pass; if one relaxes the requirements, CDM-like mechanisms are likely to produce little enduring mitigation. Perhaps the CDM can be transformed into a useful mechanism for technology transfer or for some other purpose beyond limiting emissions. If not, it should be scrapped.

The most serious problem with the architectural elements currently in place, however, is the "deep, then broad" approach they dictate.[4] The Convention divides the world into Annex I nations with emissions reduction obligations and those without, and the Kyoto Protocol defines those obligations as legally binding limits on CO_2 emissions. This division is at best an imperfect reflection of relative incomes at the time the Convention was drafted; fifty non-Annex I countries now have higher per capita incomes than the poorest Annex I countries. Moreover, poor nations, naturally more concerned with alleviating today's poverty (or, sometimes, fattening today's rulers' bank accounts) than improving climate a generation or more hence, are understandably reluctant to opt-in to Annex I and thereby take on obligations that may be violated if their economic growth exceeds expectations—particularly in the absence of serious mitigation efforts by the United States.

As of this writing, it seems likely that the United States will act to reduce its CO_2 emissions from fossil fuels, probably via a cap-and-trade system. The task of developing and enacting the necessary legislation is likely to be sufficiently intellectually and politically complex that it will necessarily be "unilateral"—i.e., only loosely coupled to the international

[4] For a longer version of this basic argument, written during the negotiations leading up to the Kyoto Protocol, see Schmalensee 1998.

negotiation process. Serious US action seems a necessary condition for substantially broadening international participation in emissions mitigation efforts, but it will not likely be sufficient.

Since the climate problem cannot be solved without the participation of poor nations, particularly India, China, and other large and growing countries, it is thus critical to explore ways to modify the current architecture in ways that encourage their participation. The sort of long-term, income-contingent scheme discussed by Jeffrey Frankel in this volume may be a useful design element. But to the extent that accepting such a scheme involves binding emissions limits at the start, it may be unattractive even if those limits seem initially loose. Similarly, while the sort of "accession deals" discussed by David Victor in this volume could usefully be used to encourage participation in mitigation efforts, it does not seem politically realistic to expect rich countries to make large transfers for this purpose, particularly in the critical early years when they are likely to be especially worried about setting expensive precedents. Thus if poor nations are highly allergic to binding emissions limits, rich nations may be unwilling to finance the accession deals necessary to entice them to accept such limits.

I believe it would be accordingly useful to consider gentler accession on-ramps that do not involve targets and timetables. Suppose the next Protocol to the Convention were to create an Annex III category of nations: those willing to commit to some non-trivial mitigation efforts but not to binding emissions limits.[5] A nation could commit to non-binding emission targets, against which actual emissions would later be compared—a return to what used to be called "pledge and review." Or it could commit to particular climate-friendly domestic policies—what is still called "policies and measures." Commitments of either sort could involve land use or gases other than CO_2 and thus tend to broaden global mitigation efforts. It would be critical, of course, to monitor compliance with mitigation commitments of any sort.

It is hard to imagine non-Annex I developed nations and middle-income nations refusing to use this general sort of on-ramp, since there can be no claim that doing so amounts to limiting economic growth. If, in addition, the Convention could be modified so that only nations in either Annex I or Annex III had voting rights, participation would be further encouraged. It might be feasible to modify WTO rules so as to impose (mild) trade sanctions (perhaps above some per

[5] Annex II is already taken; Annex II nations are a subset of Annex I nations with additional obligations. It does not seem possible to opt-in to Annex II.

capita income threshold) on those nations unwilling to do *any* mitigation. There might—or might not—be an upper limit on per capita income for nations in Annex III or a limit on how long a nation could remain on the Annex III on-ramp. The result of adding an on-ramp of this general sort would be a less tidy and elegant policy architecture but, I believe, one much more likely to be effective in the long run.

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The most important and difficult climate change task before the world's policymakers today is not to negotiate Annex I emissions limits for the immediate post-Kyoto period, nor even to design the policy regime for that period. The most important and difficult task is to move toward a policy architecture that can induce the world's poor nations to travel a much more climate-friendly path to prosperity than the one today's rich nations have traveled. In this volume, Joseph Aldy and Robert Stavins have assembled a set of thoughtful essays that deserve to be read by anyone engaged in this task or, indeed, anyone who takes this task seriously.

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