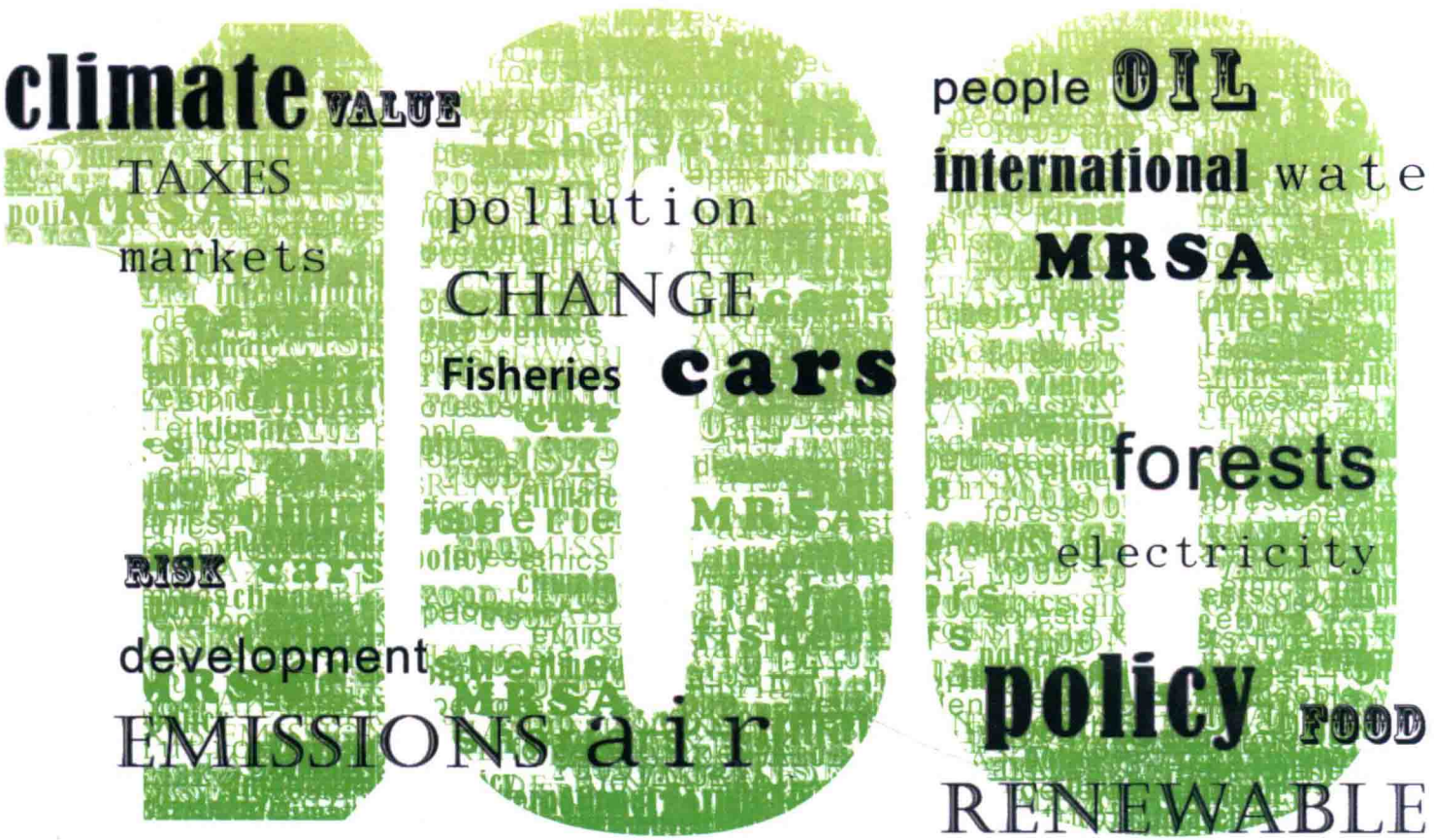
ISSUES OF THE DAY

100 Commentaries on Climate, Energy, the Environment, Transportation, and Public Health Policy



IAN W.H. PARRY AND FELICIA DAY, EDITORS

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RESOURCES FOR THE FUTURE

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EDITORS' INTRODUCTION

Every week, we post short commentaries on the RFF website, www.rff.org/weeklycommentary, that provide our readers with an easy means of learning about how policies work to control, to better and worse extents, some of the most challenging climate, energy, environmental, transportation, and public health problems of our time. Written mostly by economists, the commentaries serve to disseminate important research findings and expert judgment. They are nontechnical and enable the reader to quickly grasp the key points and background about a particular policy topic and learn from the insights of a leading expert.

We decided to collect the commentaries in book form not just for the old-fashioned pleasure of seeing them in print, but also for the most 21st-century reason: to deal with the information overload we all face and the lack of an easy place to turn to for answers. We may be well versed or even experts in our given fields, but there are many gaps in our knowledge about related fields and useful insights can often be gleaned from policy experience in other contexts.

Professors looking to update their course syllabi, students and reporters looking for background information, and business and policy professionals just trying to stay ahead of the curve should find these commentaries valuable. We also hope our readers share our intellectual curiosity; time and again, we came away edified about a problem or an idea we'd never considered before.

We cast a global net, looking at how congestion pricing works in London, malaria control is achieved in Africa, and emissions allowance auctions are designed in the United States. Some of the commentaries deal with international or transboundary policy problems, such as stratospheric ozone, and others dwell on national policy issues that are common to many countries, such as overharvesting of fish stocks.

Some commentaries are specifically focused on the United States, though they still provide useful insights for other countries. These offer an overview of various federal regulatory programs and how they might be reformed, including the Endangered Species Act, control of hazardous wastes and power plant emissions of sulfur dioxide, management of flood insurance and forest fires, and food safety regulation.

Rather than evaluating specific programs, some commentaries provide background on the seriousness of policy problems, broad trends in the form of policy interventions over time, or technologies that might be developed to help address them.

KEY THEMES

A key theme of the commentaries is the potentially critical role of careful economic analysis in helping to understand complex policy questions and hence aid in policy reform.

Some essays confirm a case for a particular policy or policy change on cost–benefit grounds. For example, the economic case for higher fuel taxes is well established. However, an alternative approach—specifically, policies to encourage automobile insurance companies to offer premiums that vary in direct proportion to vehicle mileage (in place of the current system of lump-sum insurance premiums)—would also generate substantial economic benefits, but without a large transfer of revenue to the government.

In other cases, economic analysis is valuable in informing about the extent of unintended policy consequences. For example, restrictions in the number of days vehicles can be driven in city centers appear to be an ineffective way to improve urban air quality, at least in Mexico City, because any gains in pollution are offset by increased use of

secondary vehicles, as people attempt to circumvent driving restrictions. And advisories warning about mercury levels in fish have public health benefits from reduced consumption of contaminated fish, but these benefits appear to be offset because alerts lead to reduced consumption of all fish (rather than just high-mercury fish alone), thereby forgoing some of the health benefits from moderate fish consumption.

Understanding about the wide-ranging issues covered in this book is not just interesting for its own sake. Increasingly, issues in different fields are becoming related in one way or another. For example, it is useful for the climate economist to understand policy issues affecting the transport sector, like congestion pricing, fuel taxes, and fuel economy standards, as these policies have implications for the effects and costs of national-level greenhouse gas control programs. In the same light, biologists grappling with natural resource management issues can gain insights from innovative land management programs, voluntary pollution control efforts, and the use of satellite data.

ACKNOWLEDGMENTS

We owe a huge debt of gratitude to a number of our RFF colleagues for assistance with the web series and production of the book. In particular, we thank Adrienne Foerster for helping to manage the series on a week-by-week basis and for carefully editing many of the commentaries. Sally Atwater and John Anderson helped prepare many of them, and their contributions are very much appreciated. We also thank Peter Nelson and Don Reisman for their guidance during the book development process. Ellen Davey designed and produced the book. Tiffany Clements and Scott Salyer, of our web team, and David McLaughlin and Michael Eber also provided valuable support. Finally, we thank all of the 134 authors for their willingness to contribute to our series. We hope this book, and the commentary website, will help to provide them with access to a broader audience for their valuable work.

Ian W.H. Parry is an RFF senior fellow and holds the Allen Kneese chair. He dedicates this book to his late grandfather, William H. Skelton, in appreciation of support for his education.

Felicia Day is RFF's managing editor. She dedicates it to her "office" grandfathers, John Anderson and Joel Darmstadter, for their wise counsel and friendship over the years.

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PART 1

Global Environmental Challenges

It is difficult to imagine a more challenging policy problem than global climate change. The appropriate goals of climate policy, and which countries should be held the most responsible for reducing greenhouse gases, are highly contentious. On top of this, there are many complicated issues in the design of domestic climate policy for a country like the United States.

The commentaries in this first section touch on a variety of climate policy issues. At the international level, these include the implications of delayed participation by developing countries in international emissions control agreements, the design of globally efficient policy architectures that take into account political constraints, incentives to comply with international agreements, the monitoring of climate-related trends, lessons from emissions trading to date in Europe, and the successful phasing out of ozone-depleting chemicals.

At the domestic level, issues covered include design provisions in prospective U.S. climate legislation, the choice among emissions control instruments, to what extent supplementary policies to promote clean fuels and clean technology innovation are warranted, how allowance auctions in a cap-and-trade system might be designed, and measures to deal with the risk that energy-intensive capital will migrate to countries with no emissions controls.

Additional issues include the case for, and practicality of, incorporating the forestry sector into climate programs, and the possibility of allowing firms to offset their carbon dioxide emissions by funding projects to reduce greenhouse gases in other sectors of the economy or in other countries. Two commentaries discuss one of the most important issues in assessing the economically efficient stringency of climate policy, namely the rates at which future damages from climate change should be discounted. Also included is a discussion of the expected risks posed by sea-level rises and how to adapt to them.

1. STABILIZING ATMOSPHERIC CO_2 WITH INCOMPLETE INTERNATIONAL COOPERATION

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The urgency of bringing large emitters in the developing world into an international agreement to control greenhouse gases critically depends on the ultimate goals of climate policy. Under modest, rather than aggressive, climate stabilization targets, early participation is less critical as there is much greater scope to offset delayed participation through greater abatement in wealthy countries and more global abatement later in the century.

Most policymakers concerned about global warming have in mind some ultimate objective for limiting the amount of projected climate change, or atmospheric carbon dioxide (CO_2) accumulations. Much of the debate has focused on climate stabilization targets consistent with limiting CO_2 concentrations to either 450 parts per million by volume (ppmv) or 550 ppmv (currently, CO_2 concentrations are 385 ppmv, compared with preindustrial levels of about 280 ppmv). According to the Intergovernmental Panel on Climate Change, these stabilization targets are consistent with keeping eventual mean projected global warming to about 1.5°C and 2.5°C above current levels, respectively (this would be on top of temperature rises of about 0.75°C over the last century).

Economists and climate scientists have developed a number of models to estimate global emissions prices that are consistent with ultimately stabilizing atmospheric CO_2 concentrations at these target levels and minimizing the global burden of mitigation costs over time. To carry this out requires a uniform price on emissions from different regions within a given year (to equalize marginal abatement costs across different countries). The emissions price must also rise at roughly the rate of interest (about 5 percent) over time (to equate the discounted marginal abatement costs at different points in time).

However, it is unlikely that the world will address climate change in this wholly cooperative fashion—more likely, it will be years before developing countries are willing to comprehensively price their emissions, and even when they do, it may be at a lower rate than prevailing in the European Union and United States. How much of a problem is delayed participation by developing countries in terms of raising the overall burden of global mitigation costs, and what does this imply for appropriate near-term emissions pricing goals for the United States, if eventual targets for global stabilization are still to be met?

To explore these questions, we used our MiniCAM model and the following assumptions: that industrialized countries impose a common emissions price in 2012, China joins the agreement at a later date, and other countries join whenever their per capita income reaches that of China at the time of China's accession into the emissions control agreement. In one scenario, countries entering into the control regime would immediately price emissions at the same level as in industrialized nations, while in another case the emissions price for late entrants into the agreement converges gradually over time to the price in industrialized countries.

The model is designed to examine long-term, large-scale changes in global and regional energy systems in response to carbon policies. Given the many uncertainties—such as the costs of future emissions-reducing technologies (for example, nuclear power, carbon capture, and storage technologies) and emissions growth in the absence of controls (which is highly sensitive to assumed population and productivity growth)—the predictions should not be interpreted literally. But the results do

provide some flavor for the proportionate increase in global abatement costs, and in required U.S. emissions pricing, due to delayed developing country participation.

We started with the more moderate climate stabilization target for CO_2 of 550 ppmv. In the ideal case, with full and early emissions pricing by all countries, global emissions and emissions in the United States rise above current levels before peaking around 2035 to 2050, and progressively decline thereafter. Global emissions prices rise to about $6 per ton of CO_2 (in current dollars) in 2025 and to about $20 per ton by 2050. By midcentury, annual global gross domestic product (GDP) losses are 0.2 percent (most other models also suggest global GDP losses of less than 1 percent by midcentury under this stabilization target).

With delayed participation, even if China joins between 2020 and 2035, the implications for emissions pricing in developed countries can be significant but are not that dramatic under the 550 ppmv stabilization goal. Compared with the globally efficient policy (with a globally harmonized emissions price at all times), near-term emissions prices in developed countries rise from between a few percent and 100 percent under the different scenarios, and discounted global abatement costs are higher by about 10 to 70 percent.

Emissions pricing policies implied by the 450 ppmv target are far more radical. Under globally efficient emissions pricing, CO_2 prices rise to about $35 per ton by 2025 and about $130 per ton by midcentury, while global and U.S. emissions are roughly 5 percent and 40 percent below 2000 levels in 2025 and 2050, respectively. Global GDP losses approach 2 percent by midcentury.

Moreover, the 450 ppmv concentration is so close to present-day levels, and demand for fossil fuels is rising so rapidly in developing nations, that delayed participation has severe consequences for early participants in this case. Developed countries would have to achieve a reduction of more than 85 percent (relative to 2005 emissions) in 2050 to stabilize CO_2 at 450 ppmv if developing countries don't begin participating until 2020. Even more drastic reductions would be required if the delay is longer. Discounted global abatement costs are anything from about 30 to 400 percent higher than under globally efficient pricing in most cases, and near- and medium-term emissions prices can be 10 times larger with China's accession delayed until 2035.

Why does delayed participation matter so much in one stabilization scenario, but not the other? Under the less stringent concentration target, there is much greater flexibility for offsetting delayed emissions reductions in developing countries through greater abatement by all countries later in the century. In contrast, to prevent CO_2 concentrations from rising above 450 ppmv (present levels are already more than 380 ppmv), the remaining emissions that can be released by all countries in the world, without exceeding that limit, are so limited that forgone emissions reductions in nonparticipating countries must be largely made up by far more aggressive reductions in participating nations. In other words, there is little opportunity to catch up later. The problem is compounded by emissions leakage as rapidly declining fuel demand in developed countries exerts downward pressure on global fuel prices, which in turn makes fuel use and emissions an economically more attractive option in countries without mitigation policies.

Perhaps not surprisingly, the urgency of widespread participation in international emissions agreements hinges critically on the appropriate long-term climate stabilization target. Unfortunately, there are also strong incentives for countries to be "free riders," to benefit from others' emissions mitigation efforts without undertaking their own mitigation.

In the globally efficient policy, developing countries bear about 70 percent of discounted abatement costs out to 2100 (as their emissions in the absence of controls expand rapidly relative to those in developed countries). However, developed countries bear "only" about 20 to 35 percent of global abatement costs when China's accession occurs in 2035 and new entrants face lower starting prices. Side payments and other types of compensation could create incentives for earlier actions in developing regions. However, agreeing on who gets what level of compensation will, almost certainly, be highly contentious.

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Edmonds, J., L. Clarke, J. Lurz, and M. Wise. 2007. Stabilizing CO_2 Concentrations with Incomplete International Cooperation. Richland, WA: Pacific Northwest National Laboratory. www.globalchange.umd.edu/publications/493.

2. A PRAGMATIC GLOBAL CLIMATE POLICY ARCHITECTURE

Valentina Bosetti
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Jeffrey Frankel
is the James W. Harpel Professor of Capital Formation and Growth at Harvard Kennedy School. His research interests include international finance, currencies, monetary and fiscal policy, commodity prices, regional blocs, and global environmental issues.

This commentary summarizes a proposed international architecture for global climate policy that takes into account a variety of likely political constraints. These include, for example, limits on the burden borne by individual countries and the reluctance of developing nations to make commitments without aggressive action to cut emissions in the United States.

Before the 15th Conference of the Parties took place in Copenhagen, many observers questioned the likelihood that much of substance would happen, much as they have many times before.

In fact, a key weakness of the first attempt to coordinate international climate policies was its lack of credible emissions targets—most countries failed to commit to emissions targets under the 1997 Kyoto Protocol, and many of those that did ratify are expected to exceed their targets for the first commitment period, 2008–2012. These considerations underscore the critical need to develop a global climate policy architecture that takes political realities into account.

Although there are many ideas for developing a successor to the Kyoto Protocol, the existing proposals are typically based on just one or two of the following factors: science (capping global carbon dioxide [CO_2] concentrations at 450 parts per million [ppm]); equity (allocating equal emissions per capita across countries); or economics (weighing the economic costs of aggressive short-term cuts against the, albeit speculative, long-term environmental benefits). Our proposal for emissions reductions takes these considerations into account but is more practical because it is based heavily on politics. Although it accepts the framework of national targets for emissions and tradable permits, it also attempts to solve the most serious deficiencies of the Kyoto agreement: the need for long-term targets, the absence of participation by the United States and developing countries, and the incentive for countries to fail to abide by their commitments.

POLITICAL CONSTRAINTS

In our judgment, any future climate agreement must comply with six important political constraints.

- First, aggressive targets to cut U.S. emissions will not be credible if China and other major developing countries do not commit to quantitative targets at the same time, due to concerns about economic competitiveness and the movement of energy-intensive industries to countries without emissions caps ("carbon leakage").
- Second, China and other developing countries will not make sacrifices different in character from those made by richer countries that have gone before them, taking due account of differences in per capita income, per capita emissions, and baseline economic growth.
- Third, in the long run, no country can be rewarded for having ramped up its emissions high above the levels of 1990 (the baseline year for emissions targets embodied in the Kyoto Protocol).
- Fourth, no country will agree to participate if the present discounted value of its future expected costs exceeds a threshold level, which, for illustration, we assume is 1 percent of GDP.

- Fifth, no country will abide by targets that cost it more than, say, 5 percent of GDP in any five-year budget period.
- Sixth, if one major country drops out, others will become discouraged and the system may unravel.

HOW IT WOULD WORK

Under our proposal, rich nations would begin immediately to make emissions cuts along the lines that their political leaders have already committed to (consistent with emissions targets in the European emissions trading scheme or in recent U.S. legislative proposals). Developing countries would agree to emissions caps that maintain their projected business-as-usual emissions in the first decades but, over the longer term, commit to binding targets that ultimately reduce emissions below business as usual. This approach prevents carbon leakage and gives industries a more even playing field. However, it still preserves developing countries' ability to grow their economies; they can also raise revenue by selling emissions permits. In later decades, the emissions targets asked of developing countries would become stricter, following a numerical formula. However, these emissions cuts are no greater than those made by rich nations earlier in the century, accounting for differences in per capita income, per capita emissions, and baseline economic growth.

Future emissions caps are to be determined by a formula that incorporates three elements. First is a progressivity factor that requires richer countries to make more severe cuts relative to their business-as-usual emissions. Second is a latecomer catch-up factor that requires nations that did not agree to binding targets under Kyoto to make gradual emissions cuts to account for their additional emissions since 1990. This prevents latecomers from being rewarded with higher targets, or from being given incentives to ramp up their emissions before signing the agreement. Finally, the gradual equalization factor addresses the fact that rich countries are responsible for most of the carbon dioxide currently in the atmosphere. From 2050 onward, this factor moves per capita emissions in each country in each period a small step in the direction of the global average of per capita emissions.

FINDINGS

We analyzed the numerical targets using an energy/climate model that represents emissions mitigation opportunities for different regions at different future time periods. Some of the main results include the following:

- The world CO_2 price reaches \$20–\$30 per ton in 2020, \$100–\$160 per ton in 2050, and \$700–\$800 per ton in 2100.
- According to the economic simulations, most countries sustain economic losses that are under 1 percent of GDP in the first half of the century, but then rise toward the end of the century.
- Atmospheric concentrations of CO_2 stabilize at 500 ppm in the last quarter of the century, implying a projected increase in world temperatures above preindustrial levels of about 3°C.

We have not been able to achieve year-2100 concentrations of 450 ppm or lower (to limit projected warming to about 2°C) without violating the same political-economic constraints.

CONCLUSION

The proposal calls for a successor international agreement that establishes a global cap-and-trade system. The emissions caps are set using formulas that assign quantitative emissions limits to countries in every five-year period from now until 2100. Three political constraints are particularly important in specifying the formulas. First, developing countries are not asked to bear any cost in the early years. Second, even later, developing countries are not asked to make any sacrifice that is different from the earlier sacrifices of industrialized countries, accounting for differences in incomes. Third, no country is asked to accept targets that cost it more than 5 percent of GDP in any given year.

The framework here allocates emissions targets across countries in such a way that every country is given reason to feel that it is only doing its fair share. Furthermore, the framework—a decade-by-decade sequence of emissions targets determined by a few principles and formulas—is flexible enough that it can accommodate major changes in circumstances during the course of the century.

Further Reading

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3. THINKING BEYOND BORDERS

Why We Need to Focus on Global Public Goods

Scott Barrett

is a professor in the School of International and Public Affairs at Columbia University. His research focuses on interactions between natural and social systems, especially at the global level. He is best known for his work involving international environmental agreements, such as the Kyoto Protocol.

Under what conditions has the international community dealt effectively with certain global problems, like smallpox eradication? The international response to other global problems—most notably climate change—has been ineffective so far; treaties cover only a limited number of countries, and even for those countries, incentives for complying with the agreement are too weak.

In Copenhagen in December 2009, governments met to discuss a road map for controlling global greenhouse gas emissions as a successor to the Kyoto Protocol, which expires in 2012. As we continue to contemplate a post-2012 future, it's worth reflecting on some basic economic concepts in order to better understand what it will take for that map to truly show us a way forward.

Global climate negotiators try to provide what economists call a public good. To prevent atmospheric greenhouse gas concentrations from rising, a substantial number of countries must act together. It is the total sum of emissions that affects concentrations, not the amounts emitted by individual countries. So each country has an incentive to let others act—one of the reasons so little has been achieved so far.

If each country's climate were shaped only by its own emissions, and not by the total of every country's emissions, the incentive would be different.

For example, national defense is a national public good. It is public in two senses. First, "consumption" of the good by one person does not reduce the amount available to others. Second, no citizen can be excluded from enjoying the benefit of national defense. This second attribute is particularly important: if beneficiaries do not have to pay, then why should they pay? But if no one pays, the good won't be provided—and everyone will be worse off.

This, then, is why government exists—to get around the free-rider problem and to supply public goods. Other examples of domestic public goods include clean air and water and the preservation of unique natural wonders.

But what about global public goods like climate change mitigation, nuclear nonproliferation, and disease eradication? These are harder to supply for the simple reason that there is no world government but, instead, 192 nation states. To supply these public goods, a different approach must be tried.

Imagine that we learn that Earth will be hit by a massive asteroid 25 years from now. If nothing is done to avert the collision, *Homo sapiens* will almost certainly become extinct. Engineers tell us that there are a variety of ways in which the asteroid's orbit could be altered. All it would take is a single best effort. Could we be confident that the money needed to deflect the asteroid would be raised?

The answer, fortunately, is yes. The incentives to act are so strong that we can be sure that the only real constraint on our ability to supply the global public good of asteroid protection is technical feasibility. Indeed, it would be in the interests of a single country to supply this global public good all by itself. International cooperation would not even be needed.

Perhaps the greatest global public good ever provided was the eradication of smallpox. When the world began this audacious effort, over a million people died every year from smallpox. Almost all of these people lived in poor countries, but the rich countries also gained from eradication. This is because the vaccine that offers protection from smallpox is costly and dangerous. Once the disease was eradicated, the need to vaccinate evaporated. Everyone gained.

What is novel about this global public good is that its supply requires the active cooperation of every country; success depends on the weakest link. The last case of endemic smallpox occurred in Somalia in 1977. Had this person not been isolated, had the people with whom he had come into contact not been vaccinated, and so on, smallpox would still be with us today.

Back then, Somalia had a government that could help in this effort. But in 1991, that government fell in a coup, and ever since, Somalia has been a "failed state." It is interesting to speculate whether smallpox could be eradicated today. I think the chances are good that it could not happen. Indeed, one of the reasons polio eradication has yet to succeed is that wild polioviruses still reside in trouble spots like the border region shared by Afghanistan and Pakistan.

Climate change mitigation is the hardest global public good to supply. In contrast to asteroid protection, it cannot be addressed by one huge project. Unlike eradication, it is not in the interests of each country to contribute, so long as all other countries do so. For climate change, the incentives are more challenging: success depends on the aggregate efforts of all countries.

An agreement to reduce greenhouse gas emissions must do three things. First, it must attract wide participation. Even the United States and China, the two largest emitters, are each responsible for no more than a quarter of the total problem. Also, should only a few countries act, carbon-intensive industries will likely shift production to other countries, causing their emissions to rise.

Unfortunately, the Kyoto Protocol failed to attract wide participation. True, China is a party; but China is not required to reduce its emissions. The United States, of course, is not a party. Kyoto is a failure if only because it has not provided incentives for both countries to change their behavior.

Second, the treaty must also provide incentives for compliance. Canada's emissions currently exceed the Kyoto limits by over 30 percent and are expected to rise even further. When a country like Canada, a Kyoto signatory and an upstanding member of the international community, fails to comply, then you know there are problems with the agreement itself. Kyoto provides no incentives for Canada to comply, just as it provides no incentives for the United States to join.

Finally, the treaty must get all countries to reduce their emissions by a very substantial amount—eventually by half and soon after that by much more. Even if Kyoto were implemented to the letter—if the United States were to ratify and all parties were to comply perfectly—global emissions would keep on rising.

Efforts may be made to get the industrialized countries to accept much tougher targets. This would go some way toward meeting the third requirement, but it will make no difference at all if the first two requirements are not also met. This has been the problem with the climate negotiations so far: they have avoided the hard but essential challenge of enforcement. Without that, targets are meaningless.

Lacking a world government, global public goods must usually be provided by international cooperation. The world has succeeded before—in eradicating smallpox, in vanquishing the Axis powers, in preventing nuclear war, and in protecting the ozone layer. There are reasons for this. They have to do with incentives and the ability of international institutions to change them. Climate change is a harder problem, but we will not make any progress in addressing it until we understand this. That is the main lesson to be learned from the study of global public goods.

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