



# The Peculiar Economics of Global Warming

*By Robert Mendelsohn*



In recent decades negotiators have managed to hammer out mind-bogglingly complex treaties affecting trade liberalization, arms control – even the protection of endangered species. Why, then, is it proving so difficult to curb the “greenhouse” emissions that are warming the planet?

The Kyoto Protocol on Climate Change in 1997 did take a stab at the problem, setting limits on emissions by the industrialized countries and creating some incentives for developing countries to control theirs. Certainly, there’s no lack of enthusiasm for the protocol among activists who originally pushed the global warming issue to the top of the policy agenda. Indeed, to many environmentalists, global warming is *the* issue – the post-cold war equivalent of the threat of nuclear winter.

Look more closely, though, and it’s plain that big trouble lies ahead. Cost was the primary concern of the negotiators at Kyoto. And even with the relatively modest emissions targets chosen then, it dawned on many participating countries that the bill could be very large. Further, it became all too clear that the burdens would not be uniform from one

country to the next. Controlling greenhouse gases – notably carbon dioxide – would fall disproportionately on countries that rely on coal for energy, since coal releases more carbon dioxide per unit of energy than oil or natural gas. That explains, for instance, why Australia, a major producer and consumer of coal, fought for less onerous reductions.

The equity issues go beyond whose ox is gored, however. Is it reasonable, for example, to ask Chad to spend the same amount (per person? per unit of output?) as the United States? Who should decide what is fair?

Then there are the wheels within these wheels, affecting both the magnitude of the bill for stopping global warming and the distribution of the economic burden. The flexibility to “trade” emissions rights is widely understood to reduce the costs of meeting emissions targets – perhaps by as much as 90 percent. Say it costs country A about \$500 to reduce carbon emissions by a ton, but it only costs country B about \$100 to manage the same feat. Then it pays them to pool their rights and to shift emissions from country A in return for a payment of anywhere from \$100 to \$500 per ton to country B.

But who gets to trade with whom? When the protocol was debated in 1997, the European Union lobbied aggressively to be treated as a bloc so the member countries could trade freely with each other. This would make it possible for most of the actual reduction to take place in regions that still had plenty of low-lying fruit to harvest (think eastern Germany, with its ancient coal-fired

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power plants). Yet it would also make it possible for the Europeans to say with straight faces that they could comply without “exporting pollution” – an important political advantage on a continent with powerful Green parties that disapprove of emissions trading in any form.

On the other hand, the United States lobbied for everyone’s right to trade allowances

tries would not agree to control their own emissions even if the cost was fully offset by payments from others, arguing that they had a “right” to catch up with the industrialized world in the pollution department.

### WHAT ABOUT THE BENEFITS?

While cost issues dominated the agenda at Kyoto, potential benefits were hardly mentioned. Countries simply assumed that the



with everyone else. This would have minimized Washington’s costs of compliance, but would also have increased the global demand for tradable emissions allowances. That, in turn, would have both raised the price the Europeans would have been forced to pay for allowances and – more importantly – strip the European Union of its no-pollution-export fig leaf.

For their part, low-income countries balked at having to pay anything to slow global warming. Indeed, some low-income coun-

benefits from slowing global warming would be widespread, and would justify the investments made by each treaty signatory.

Hence, except for the handful of island nations that view global warming – and the subsequent rise in the sea level – as a threat to their very existence, nobody seemed particularly concerned about the differential impact of climate change. Yet the scientific evidence amassed over the last five years raises serious issues about these benefits:

- The estimated magnitude of the benefits from controlling greenhouse gases has fallen. While less warming is still thought to be preferable to more, there is now a lot more reason to doubt that the most expensive

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control programs – the ones aimed at the high-hanging fruit – are worth the expense.

- The distribution of the potential benefits from containing emissions is clearly not uniform among countries, or even among regions within large countries. Countries closest to the poles – notably Russia and Canada – and even temperate countries such as the United States and Western European nations are now expected to benefit from warming. Only the tropical countries are likely to suffer substantially.

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Why have damage estimates fallen? Early studies vetted by the blue-ribbon Intergovernmental Panel on Climate Change forecast that by the year 2060 unchecked climate change would reduce global economic output by 1 percent to 3 percent. This level of damage justified a modest investment in containing greenhouse gases today and much larger investments later on.

Yet the scientific evidence amassed over the last five years raises serious questions about the benefits of slowing emissions. First, the original impact studies were based on estimates that temperatures would rise 4 degrees to 6 degrees centigrade by 2060. The most recent IPCC climate report – one based on new data plugged into more sophisticated models of temperature transmission in the

oceans – forecasts increases of just 1.5 degrees to 4.5 degrees by 2100.

Second, the original studies predicted that climate change would heavily damage regional ecosystems. Whether the ecosystems were crops, forests or grassland, productivity would fall and some systems would actually “collapse.” But while these studies correctly assumed that temperature change would alter the ecology, they failed to note that the consequences for economic productivity would not always be negative. Indeed, on balance, global



output is likely to increase as carbon dioxide builds up, and many of the ecosystems that cannot tolerate climate change will probably be replaced by new ecosystems that better serve the economic interests of the human population.

Earlier predictions forecast ecological catastrophes that would transform parts of the earth into moonscapes. The new predictions envision an expansion of tropical and boreal forest toward the two poles. Of course, any global change of this magnitude would involve local changes that are both good and bad; it is hard to assay the overall impact of such a broad change with models that rely on the limited data now available. The critical point, though, is that the movement of biomes across space is not necessarily threaten-

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ing to mankind or even to nature.

Third, many of the earlier impact assessments focused solely on the damages from warming. Thus the energy studies concentrated on the increased electricity that would be needed for cooling. The agriculture studies concentrated on temperate-zone crops that would fare badly in warmer climates. The recreational studies concentrated on skiing that would be damaged by shorter seasons. The health studies looked at the deaths of

global warming turns positive.

Fourth, the early studies generally overlooked the potential for economic adaptation. Many of them simply assumed that climate change would happen overnight, when in fact the change would unfold gradually over the century. And over a century, farmers would be able to switch crops and to move heat-sensitive crops poleward.

This is not Pollyanna talking. Over the last 150 years, equivalent crop migrations have taken place relatively effortlessly. For exam-



elderly people caught in heat waves.

Conspicuously missing from these analyses were the offsetting benefits. The energy studies ignored the savings in oil and natural gas no longer needed for heating. The agricultural studies failed to include heat-loving plants that would do exceptionally well in a warmer world. The recreational studies overlooked the prospects for summer recreation – say, swimming off the beaches of Oregon or fishing in northern lakes. The health studies overlooked the fact that the elderly live often longer in warm places.

What's more, these estimated benefits have turned out to be surprisingly large. Indeed, if they are included, the net economic impact of

ple, farmers shifted the American grain belt hundreds of miles westward in response to changing transportation costs. Farmers can also adapt by changing planting dates, harvest times, tilling strategies and plant varieties. Biotechnology can help, too, by modifying plants for temperature and rainfall. This sort of adaptation would not only reduce crop damage in places that get too warm, but also increase net revenues in places that are currently too cool.

### FIGHT – OR ADAPT

Similarly, it is clear that adaptation strategies in every other market sector affected by climate-linked change would dramatically

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reduce damages. For example, early estimates of the costs of a rise in the sea level assumed that it would be necessary to build sea walls around all vulnerable coasts immediately. But simply erecting the sea walls gradually over the next century as they are needed would reduce the present value of the costs of this response by a factor of 10.

By the same token, the early models assumed that climate change would wreak havoc on forests by destroying the trees that could not adapt. However, a careful model of the way forests would actually change in the

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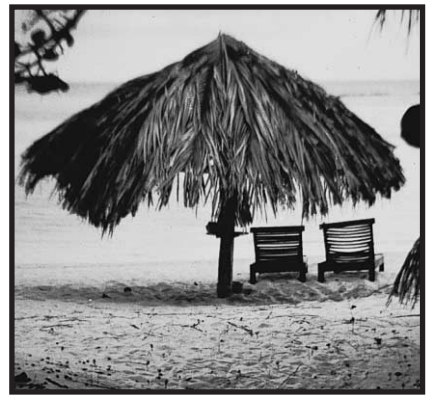
face of climatic stress suggests that many of the trees could be harvested and replaced as part of normal forestry operations. In fact, a gradual warming would allow more productive forests to replace existing stands and actually increase timber production.

Early analyses of global warming predicted there would not be enough water to supply growing metropolitan areas in semi-arid regions. But more recent studies recognize that catastrophe could be avoided merely by taking water away from lower-value uses – a process facilitated by pricing water according to its “opportunity cost.” Reductions in runoff in semi-arid places would presumably still lead to ancillary environmental damage – but hardly the spread of deserts envisioned by the

first generation of global warming studies.

Hence damage estimates look very different in light of both new climate evidence and a more sophisticated conception of adaptations. Developed countries including the United States, Canada, Japan and Western Europe are all in cool latitudes and so are likely to benefit from global warming over the next century. There will still be damage from warming in some sectors in these countries, but the benefits are likely to offset them.

First-generation studies predicted annual damages of between \$56 billion and \$63 bil-



lion in Europe; between \$60 billion and \$140 billion in the United States, and between \$56 billion and \$59 billion in the other rich temperate-zone countries. These damages amount to between 1.3 percent and 1.6 percent of projected income.

The new estimates, by contrast, show small net gains (perhaps 0.1 percent of output) for the developed world. Hence damage estimates that once were a good reason for rich countries to press for a global warming treaty have become net-benefit estimates that actually create incentives for delay.

The IPCC’s old climate-change estimates for the former Soviet bloc countries were more mixed, with numbers ranging from an \$8 billion annual benefit to damages in the

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\$18 billion range. The old estimates for China were bleaker, predicting net damages of about \$17 billion.

Note, however, that most of the transition economies are in cool latitudes and thus have a good shot at winning the global-warming lottery. Indeed, the former Soviet bloc countries are expected to gain between \$86 billion and \$228 billion annually. Even China, which straddles warm and cool latitudes, would gain an expected \$14 billion to \$42 billion from warming.

Of course, not every country would be better off if the atmosphere warmed. In par-

smaller. The net impact is likely to run between a benefit of \$138 billion and a loss of \$176 billion, depending on how easily agriculture adapts. Thus, of all the regions in the world, the countries of the tropics have the greatest direct incentive to have emissions of greenhouse gases reduced.

### **WILL THE BLACK HATS WIN?**

Note the irony: countries emitting the most carbon dioxide these days are likely to benefit from warming, while countries that have not yet emitted their “fair” share are likely to be victims. What’s more, adding the probable global damages from low-latitude countries

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ticular, countries that are currently quite warm are vulnerable, but very little climate impact research has been undertaken in tropical countries. There is consequently a great deal of uncertainty about the potential impact of warming in the countries where much of the world’s population is situated.

Agriculture will likely be harmed in low latitudes – or at least the growth of farm productivity will be slowed – while agriculture expands in the higher latitudes. Tropical countries also face the prospect of coastal flooding, increased energy demand and rainfall instability.

The IPCC predicted annual damages in the tropics of between \$54 billion and \$116 billion – large numbers in view of the relatively low output of the regions. Newer research estimates suggest the tropical impacts are less certain, but not necessarily

to the benefits in high-latitude countries yields a small number of ambiguous sign for the entire globe. Hence, our growing knowledge about the process of global warming is likely to complicate negotiations over how much to limit emissions and how to pay for the controls.

First, there is little collective economic incentive to spend heavily to slow warming. It is now only a possibility – and not even a likely one – that warming will cause significant net damage in the coming century. By the same token, the probability that damages will be very large has shrunk.

Second, it is becoming far more difficult to build a winning political coalition in favor of emissions abatement. The countries that signed the Kyoto agreement no longer have compelling national interests at stake in slowing warming. Far from it: for the next centu-

ry, warming will probably help the countries that emit most of the greenhouse gases.

Indeed, once reality sets in, the developed countries may be quite content to argue about treaty details indefinitely before implementing a binding agreement. In contrast, it is in the interest of the developing countries to create binding emissions reductions immediately. However, these countries effectively boycotted the Kyoto agreement, and influencing the process now won't be easy.

Besides, it is one thing for developing countries to acknowledge that greenhouse gases are a threat to their interests and quite another to ask their citizens to accept lower rates of economic growth today in order to spare their grandchildren the uncertain consequences of global warming. The outcome may well be one of little collective action.

Thus, it appears the world is about to undertake a massive greenhouse gas experiment. Carbon dioxide levels will likely continue to increase, testing the resilience of the planet's biosphere.

### COMFORTING FORECASTS

Readers worried that global disaster looms can take some comfort from the latest impact forecasts. Although it is impossible to guarantee that good things will come to pass over the next century, the forecasts are decidedly cheerier than they were five years ago. Climate science now forecasts much slower rates of warming. The predicted consequences of doing nothing to control greenhouse gases today compares favorably to what we used to predict would happen if the world adopted fairly ambitious controls.

The ecological models predict that greenhouse gases (in particular, carbon dioxide) will bring a greener world. Carbon dioxide is expected to fertilize plants and expand the portion of the globe where trees can grow. If

the forest products industry continues to invest in tree farms, there may even be room for increasing the amount of untouched forests in the world. This is hardly the moon-  
scape that was once expected.

Agronomists now predict that crop productivity will rise, lessening the likelihood of world hunger and probably reducing food prices. Coastal flooding and more severe storms will exact some costs, but these effects are expected to be smaller than the benefits expected in agriculture.



Global warming may, in fact, turn out to be a lot like Y2K. We were very anxious before it happened. However, with a reasonable amount of planning and action, everything turned out all right in the end.

The idea that global warming is not an immediate threat to either civilization or nature will surely upset some. For example, many activists were hoping that fighting global warming would be the wedge for a much broader campaign to control the economy and promote nature. The science, however, suggests that global warming is a slow and gradual process, and that we have plenty of time to make thoughtful and prudent responses. Expensive draconian responses are simply not required. **M**