PART IV

THE POLITICAL ECONOMY OF CLIMATE POLICY

1. THE PRECAUTIONARY PRINCIPLE AND CLIMATE CHANGE

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The two great buzzwords in environmental discourse these days are "sustainable development" and "the precautionary principle."

I have set out elsewhere why I believe that the concept of sustainable development is logically incoherent and, insofar as any meaning can be attached to any of the common definitions of it is either morally repugnant or is a badly distorted version of the well-established economist's objective of maximising welfare.[1] Furthermore, contrary to the assumptions of its protagonists, it does not guarantee intergenerational equity. If anything, as I shall argue below, it conflicts with most peoples' simple humanitarian value judgement that, if anybody is to be helped, it should be the people most in need of it. These happen to be people alive today, and the main way we can help them — and future generations at the same time — is to promote basic liberties. This means helping countries to adopt more democratic institutions and freer markets.

It certainly does not mean imposing further burdens on the present generation in the name of the other widespread principle, the so-called "precautionary principle" on the grounds that unless some sacrifices are made today we are running the risk of terrible catastrophe striking the human race in the longer run, notably on account of the danger of climate change. I am delighted that some of the scientific uncertainties surrounding global warming have been brought out in other papers, and I don't think I should try to add to this part of the discussion. But I shall give my views on the some of the economic implications of these predictions, and the extent to which the uncertainties justify drastic action to prevent climate change in the name of the precautionary principle. My comments will be organized around the following four headings.

These are: (a) the seductive appeal of the long-range computerised predictions that have done so much to frighten people about the dangers of climate change; (b) the concept of the "precautionary principle"; (c) the alternative way of balancing risks against the costs of avoiding them faced with pure uncertainty; and (d) the implications of the above for present policy towards climate change.

How to Sell Predictions

In his wonderful book *A Connecticut Yankee in King Arthur's Court*, the great American humorist Mark Twain, describes an incident in which a charlatan "magician" is impressing a large crowd of people in the days of King Arthur by spectacular demonstrations of his magical powers. His method was to tell the multitude exactly what various distant Kings and Emperors were doing at that precise moment, although they were hundreds or thousands of miles away. Since the crowd

did not know any better they were very impressed. It may be difficult for us today to believe it but the fact is that in the Middle Ages people were almost as gullible and credulous as are many people now when confronted, for example, with predictions of catastrophe in a hundred years' time. Anyway, the Yankee decided to perform a simple test of the magician's powers that could be immediately checked by the audience. Facing the magician and with his back to the crowd he put his hands behind his back and challenged the magician to say what he was doing with his right hand. Of course, the magician had no idea and his limitations were immediately exposed.

This illustrates the state of affairs in long-range predictions of the economic effects of global warming, or of any particular economic measures to check it, such as carbon taxes. The chief thing is to make the predictions for a period such as fifty or a hundred years into the future. Nobody then will ever bother to check whether they were correct, or even know about them. And even if some eccentric research student in fifty or a hundred years' time was digging up old predictions and exposes their errors the authors would long be dead. Or if they are not dead — for who knows what advances there may be in medical science, Heaven forbid, that keeps them alive? — they will probably have passed retirement age and no longer be fighting for promotion or for fat research grants.

The first principle of forecasting then is not to make forecasts for next year or the year after that. For, as we have all seen in the last decade or so, all short-run economic predictions have been ludicrously wrong. During the last few years economists have failed to predict the Japanese recession, the solidity of the American recovery, the scale of the unemployment in the German economy, and the turmoil in the European exchange rate mechanism. As a result, short-range economic prediction is now rightly regarded by the public with great suspicion, if not open derision. So if you want to impress customers stick to predicting something really simple, like the precise global composition of output in a hundred years' time, the way each country's production is distributed among different sectors, the technical progress in energy use and the relative prices of different sources of energy, and, finally, the amount of energy that will be consumed in the world as well as how much of it will be in different forms of carbon intensity. Nobody in a hundred years' time will know if you got it wrong, and nobody, least of all yourself, will care.

But, of course, there is more to it than that. For any old fool could present some long range predictions. You still have to convince the authorities that hand out research grants, as well as your peers in the profession, that you are able to do a solid professional job. In the old days, magicians could get away with a bit of mumbo-jumbo, make a few flames, and dance around some totem pole. Nowadays you have to be more sophisticated.

So the second principle of getting grants for predicting the economic effects of climate change over the next hundred years is to promise to construct a large expensive computerised model. As a result, the best-known and most highly respected predictions of the economic damage that will be done by increased carbon emissions over the next century are extremely complex computerised models, embodying perhaps hundreds of equations. Otherwise, why should any grant-giving body

hand out large sums to support the research? If you ask for, say, a million dollars to produce a dynamic, optimisation, multi-sector, international model of the economy you stand a good chance of getting it. For an extra million dollars you might also offer to make the model inter-planetary, or even inter-galactic while you are at it. You never know, some charitable or government foundation might support it.

After all, the basis of the second principle is that the bureaucracies that staff most large grant-giving institutions measure their output by their input — i.e., by how much money they have been able to disburse in grants. In order to get promotion inside such organizations, it is necessary to sponsor really big projects. Otherwise how can you justify a bigger staff, a bigger office, more travel to discuss the project and monitor its progress, and so on? If somebody like me were to apply to such a body to pay me $500 for the half day's work where I would write out on a couple of sheets of paper what can be safely predicted about the economic effects of climate change, it would cause great hilarity in such an organization. One can imagine the official who received my request running excitedly around the office saying "Hey! Look at this! Here's some poor guy called Beckerman who is asking for $500 for some project!"

As a result of these two principles of getting grants for long-range modelling of climate change there are several very complicated computerised models on the market for making the requisite predictions. But, in fact, none of them is necessary. It can all be done on the back of an envelope, or even in one's head.

The Economic Impact of Global Warming: The Back-of-the-Envelope Estimate

The fact that the alarm over the predicted effects of global warming is vastly exaggerated can be demonstrated by one simple piece of evidence. This does not require gigantic systems analysis or computerized models of the world's climate or economy, and, hence, vast research grants, but it easily refutes the widespread notion that the human race is some tender plant that can only survive in a narrow band of plus or minus three degrees Celsius. This is the present dispersion of the world's population over widely different temperature zones. For example, taking the average temperatures in the coldest month in the countries concerned, 32.3 percent of the world's population live in a band of zero to three degrees C, whereas 18.8 percent live in the band 12 to 15 degrees C, and 14.6 percent live in a band 24 to 27 degrees C. The same wide dispersion exists if one takes average summer temperatures. Furthermore, across countries as a whole there is no correlation at all between average temperatures and their income levels, even excluding Middle Eastern oil states.

Of course, it will be argued that such cross-country comparisons cannot adequately take account of the speed of temperature change over time. In principle there is some truth in this. But throughout history there have been vast migrations of population through totally different climatic conditions. In the more distant past the Goths, the Vikings, the Romans, the Tartars, and others moved climate zones that differed far more than the changes envisaged under global warming

scenarios. In more recent centuries similar vast population movements have taken place — witness the Europeans who have migrated to north or south America, the millions of people from the Indian sub-continent or other semi-tropical areas to Europe, or internal migrations such as the millions of Americans who have moved from northern states to California or Florida. Global warming could mean that future generations would not have to go to all the trouble! As for Britain, a recent official major study reported that climate change would mean an increased frequency of hot dry summers and a lower frequency of extremely cold winters. That suits me fine.[2]

It is often argued that the speed of climate change is serious on account of the inability of the flora to adapt. But it is often overlooked that the people who migrated through climate zones in the past were not aided by any of the scientific knowledge and technological weapons that are available today to the human race to tame nature and convert inhospitable areas to lands on which humans can prosper. Nature is no longer alone in its efforts to provide sustenance to the human race.

What About Agriculture?

The sector of activity most likely to be affected by climate change is, of course, agriculture, though other sectors, such as construction activity and transport are also likely to be affected — favorably! And simple back-of-the envelope calculations also suffice to show that, for the United States at least, global warming could hardly have a significant impact on national income. For the sector most likely to be affected is agriculture, which constitutes only about three percent of U.S. GNP. So even if the net output of agriculture fell by 50 percent by the end of the next century, this is only a 1.5 percent cut in GNP.

In any case, the net effect of climate change on U.S. agricultural output is likely to be negligible. In the northern states, global warming would mean longer growing periods and less disruption through frosts. A higher carbon concentration is also good for plant growth, which is the same as saying that one can get the same growth with less water. Even in Australia, where most of the country experiences very hot desert-like conditions, a recent article in *Nature* reported that the increase in wheat yields over the last decade or so could be partially attributed to global warming. In other countries, too — notably Canada, China and some of the largest ex-Soviet bloc countries — the effects on agriculture will be favorable as the production regions move northwards and growing periods are extended.

Furthermore, all this leaves out of account the probable, indeed inevitable, contribution that will be made by the continued rapid improvements in agriculture and plant technology as a result of genetic engineering and other technological innovations. Even if, on balance, global warming did raise the real costs of achieving any given level of agricultural output by, say, 10 to 20 percent by the middle of the next century, this is likely to be totally swamped many times over by continued increases in control over plants, possible production of new proteins, technological progress in water conservation and irrigation, and so on. Furthermore, over the

last four decades food production has been rising faster than demand, so that some barely noticeable cut in the rate of growth of agricultural production, if any, does not spell mass starvation. Famines, as we now know, have been more the result of wars, appalling policies, civil strife, and ethnic discrimination, than the result of acute physical food shortages in any given area.

But suppose that all these arguments are much too complacent. Would this possibility justify immediate action rather than waiting until further progress has been made in understanding climate change. Would it justify running the risk of imposing heavy costs on the present generation rather than devoting more time, effort and resources, to helping the developing countries to overcome the environmental problems that they are facing today, not to mention many environmental problems in the richer countries? This is where the "precautionary principle" is wheeled out.

The Precautionary Principle

This principle is just a pompous way of saying that, as in many human activities, one should bear in the mind the case for taking out some sort of insurance against unpleasant events or make investments designed to prevent the event ever taking place. It is argued that even if we cannot be certain that serious damage will follow from global warming it is worth while incurring costs now to reduce future global warming just in case the damage turned out otherwise to be catastrophic.

Expenditures designed to reduce the risk of global warming are not, of course, the same as taking out an insurance policy. In the global warming case, heavy expenditures now to reduce global warming is designed to reduce the chances of the unfortunate event ever taking place. It is much more like an investment in smoke alarms, burglar alarms, better locks on doors and cars, and so on. The calculation, therefore, is how far such an investment seems worthwhile. For nobody in their senses is prepared to invest any amount to prevent some event, irrespective of the probabilities, on the grounds of some "precautionary principle."

It is sometimes argued that, in a situation of pure uncertainty — i.e., where one is not facing a choice between options to which quantitative estimates of the risks can be attached — one should fall back on the precautionary principle on account of the possibility, however remote, of some terrible disaster. But nobody in their senses applies this doctrine either. Life is too full of remote possibilities of terrible disasters that we cheerfully ignore. When a Chinese satellite was out of control a few years ago and was expected to fall to earth in a more or less solid state but at an unpredictable spot, which would have been a disaster for anybody on whose head it might have fallen, we did not all rush down to spend a day or so in the nearest subway station.

The fact is that in a situation of total uncertainty, we are choosing between options that are incommensurate. Subtle calculations are useless. It is like trying to decide whether Picasso was a greater artist than Tintoretto, and if so, by how much, or, worse, by how much better is some painting by Picasso, if at all, than some book by Tolstoy. Faced with the problem of choosing between incommensu-

rate options one has to fall back on tastes, sentiment, and a non-numerical evaluation of the strength of various arguments. Rational choice in such a situation does not consist of choosing which option is measurably superior to another. It consists of choosing on the basis of arguments that stand up and that, given the chooser's particular predilections, stand up better than arguments for another option. And there are several such arguments that support the view that, in the present state of knowledge, drastic action to reduce climate change is undesirable and it is better to wait until we have more information about the likely severity of climate change.

First, for reasons given above, even if one adopts warming scenarios that are at the top of the range of possibilities indicated in the IPCC reports, the economic effects are not likely to be catastrophic. Furthermore, every successive IPCC report downgrades its previous prediction of temperature increase, and if one extrapolates the trend in their predictions they will soon be predicting global cooling — back to what Stephen Schneider was predicting about 25 years ago.

Secondly, delaying action by several years makes a negligible difference. A recent article in *Nature* showed that a ten year delay and switching over from the IPCC's "Business as Usual" scenario (i.e., no action taken to reduce global warming) to a tough anti-global warming scenario would only reduce the increase in temperature by the year 2100 by between 0.1 degrees C and 0.3 degrees C according to whether one adopts the bottom or the top of the IPCC's range of global warming predictions. Since this article was published, the IPCC has reduced its projected rate of increase of global temperatures, so that there is even greater force in the authors' conclusion, "This indicates that the penalty is small for a ten year delay in initiating the transition to a regime in which greenhouse-gas emissions are reduced."[3] So if we delay action by ten years, the extra warming that would occur by the year 2,100 would probably be between 0.1 and 0.2 degrees C. We would all have plenty of time to change into a lighter shirt.

There has been an explosion of research into climate change during the last few years so that one can expect major improvements in our knowledge of this phenomenon during the course of the next few years. One can expect major advances in the scientific understanding of the phenomenon over the course of the next decade. So it is much more sensible to support this research rather than rush to conclusions that could prove to be very expensive. This is particularly so in the light of the following economic considerations.

Reductions in the supply of some material relative to the demand do not have significant effects on the world economy as long as there is time for the economy to adapt. Incentives are set up to find substitutes and to economize in its use. But if the change were to be dramatic — the world was to wake up tomorrow and find that it had suddenly run out of supplies of some basic raw material — the effect could be extremely costly, and possibly catastrophic. The same applies to drastic action to curtail energy consumption. If, in the light of further scientific progress, it is found necessary to carry out any significant cut in energy use, it is far less costly to bring it about gradually, thereby giving the world time to invest in substitutes, in technological progress to economize in energy, and to gradually switch patterns of production and consumption into less energy intensive forms. Large scale dra-

conian action is a recipe for economic disaster and tilts the balance of costs and benefits heavily on the wrong side.

Furthermore, as we have already shown, even without any special measures to curb energy consumption — indeed even with a decline in the "real" price of most energy sources over the last decade or so — there has already been considerable technological progress in the exploitation of renewable energy resources and in methods of economizing in energy in general. A continued reduction in the costs of energy-economizing investment or in the use of non-polluting renewable energy would mean that the costs of measures to cut energy use would be further reduced. It would be absurd, therefore, to press for rapid early cuts in energy consumption before taking advantage of cheaper methods of reducing this consumption that can be anticipated over the course of the next decade or so.

Since there is little point in any individual country trying to reduce global warming by itself, effective action to reduce global warming depends on international agreement. It will be immensely difficult to reach any effective international agreement to reduce carbon emissions, if only because of the vast differences between countries with respect to how far they lose or gain from some action. This does not mean, however, that it is impossible to reach an agreement. But it means that a hastily contrived agreement is hardly likely to be the most efficient one. It is more likely to take the form of some agreement that imposes quantitative limits on the carbon emissions of different countries than an agreement embodying least-cost market mechanisms. Given more time there is at least some chance that the international community could agree on some sort of market-based mechanism for allocating carbon emission reductions among countries that (a) minimised the total burden on the world economy; and (b) ensured an equitable compensation for those countries ,especially the developing countries, who will be least able to bear the costs.

This brings me to the last point — namely who bears the costs of reducing carbon emissions and who gets the benefits of reduced climate change? It would be absurdly presumptuous of me to try to improve on the analysis given recently by Tom Schelling.[4] A major point that emerges from his analysis is the inconsistency in a policy designed to raise the incomes of people who will be distant from us in time whilst being reluctant to do so for more needy people alive today. Schelling points out that the gains to future generations from measures taken now to prevent global warming will accrue mainly to poorer countries where agriculture is, and will still be, a major component of their total GNP — countries like China, or India and many other poorer countries. But even on conservative estimates of their future growth rates they will probably be five to ten times richer in 100 years time than they are now. Given the reluctance in most advanced countries to increasing aid to poorer countries today, Schelling is right in stating, "It would be strange to forgo a percent or two of GNP for 50 years [for example, in incurring costs of reducing carbon emissions] for the benefit of Indians, Chinese, Indonesians and others who will be living 50 to 100 years from now — and probably much better off than today's Indians, Chinese, and Indonesians — and not a tenth of that amount to increase the consumption of contemporary Indians, Chinese, and Indonesians."

He might have added that measures to reduce carbon emissions would also bear most heavily on the Indians and the Chinese, since they are major producers of coal, the most carbon intensive of the fossil fuels.

Even if one took no account of which particular people are like to benefit most from reduced global warming or incur most of the costs of abatement of carbon emissions, on very conservative assumptions concerning future growth rates world average incomes per head are likely to be over four times as they are today. So that if one is seriously concerned with equity, as those who parade their devotion to the cause of sustainable development claim to be, it makes no sense to impose heavy burdens on today's generation in order to raise the welfare of people alive in 100 years. And if one takes account of the different groups of people who will benefit most from reduced global warming and bear the costs of measures to reduce global warming such measures are even more difficult to justify. The absurd pretentions of the global warming lobby to occupy the moral high ground could hardly be a greater travesty of the truth.

Given these considerations, one does not need a quantified cost-benefit analysis based on a complex computerized model to arrive at the conclusion that it is not really worthwhile making expensive investments in measures to enforce rapid reductions in CO_2 emissions if the penalty for waiting is so small? What the precautionary principle slogan seems to imply, at least in this context, is, "take action now when it is very expensive and that will hit very poor people in order to benefit less poor people in the distant future rather than wait a few years when technical progress will have made it much cheaper, and we will have a much better idea of whether it is necessary anyway."

At the same time there is little doubt that there are market failures in energy use. In particular, large subsidies are paid in many countries to the production and use of coal, which is among the "dirtiest" forms of fossil fuel from the point of view of its carbon emissions. In developing countries, old-fashioned production techniques are far more energy intensive and polluting than those that are available today in advanced countries. But what is more inexcusable is the degree of economic support given to uneconomic industrial activities and the destruction of tropical forests (though this makes relatively very little difference to global warming). In all countries there are market distortions that prevent the optimal implementation of measures to economize on energy use, though environmentalist estimates of the significance of such market failures are often exaggerated.[5] Thus, action taken now to reduce the various subsidies to excessive energy use, deforestation, and carbon emissions, would be not merely costless, it would actually reduce costs.

Conclusions

Global warming has to be taken seriously, but is no cause for alarm or for drastic action. There is plenty of time to improve our understanding of the science, and to take measures to cut out uneconomic uses of fossil fuels, and to remedy market failures that lead to inadequate research into alternative sources of energy.

It does not justify diverting vast amounts of peoples' time, energies, and funds, from more urgent environmental problems, particularly those in developing countries. We are not on the edge of an abyss, and the human race is not facing destruction on account of the accumulation of greenhouse gases. Global warming is far more glamorous and telegenic, of course, than building better lavatories in the Third World, or ensuring a stock of the gene pool of endangered species, or tackling air pollution or bad housing in many cities in advanced countries. But it is to these environmental issues that people who are genuinely concerned with the welfare of their fellow creatures should pay attention, rather than with just striking fine poses.

Notes

[1] Wilfred Beckerman, *Small is Stupid (*London: Duckworth, 1995); USA edition: *Through Green-Coloured Glasses* (Washington, D.C.: Cato Institute, 1996).

[2] For references see *Through Green-Colored Glasses*, pp.111, 208.

[3] Schlesinger and Jiang, "Revised projections of future greenhouse warming", *Nature*, March 1991, p. 221.

[4] See Thomas C. Schelling "Intergenerational Discounting", in *Energy Policy*, Vol. 23, No. 4/5, 1995, pp. 395-401.

[5] See Jean-Marc Burniaux et al. *The Costs of Reducing CO_2 Emissions: Evidence from Green*, OECD Economics Department Working Papers No. 115 (Paris, 1992), Section V.

2. ECONOMISTS AND THE GLOBAL WARMING DEBATE

ROBERT CRANDALL

In recent months, a large number of economists have added their support to a new initiative to control carbon dioxide and other greenhouse gases that contribute to global warming. Their support is based on their understanding that economic growth is likely to lead to a warming of the earth in the next century or two and their conviction that economists, unencumbered by politicians, can design an approach to controlling greenhouse gases that is efficient and therefore not unduly costly.[1] Specifically, these economists recommend a global system of emissions trading.

Whatever the state of the science on global warming, to which economics can contribute very little, economists should surely be wary of contributing to a political movement on the assumption that government will respond to a health-safety threat with an efficient control strategy, much less that a multinational body will be able to devise and carry out an efficient policy that requires the transfer of billions of dollars between industrial and nonindustrial countries. Rather, economists should use their analytical insights to ask global-warming activists and supportive politicians to address the important trade-offs before starting to reduce GDP today in the pursuit of uncertain benefits tomorrow.

Using The Market: Replacing or Augmenting Regulation?

The failures of government ownership and regulation have become so well known that governments all over the world have moved towards privatization and deregulation. For example, Argentina, Chile, Peru, and even Brazil are moving rapidly away from tight government controls on transportation and communications, substituting markets for either government ownership or government regulation. More dramatically, China's recent successes have been attributed to a dramatic shift toward markets and away from strict government ownership and control of important productive facilities.

In the United States, we have deregulated large sectors of the economy in transportation, finance, energy, and communications and seem to be committed to much more entry and deregulation in many industries, such as electricity and local telecommunications. In every one of the industries deregulated or liberalized thus far, there is virtually unanimous agreement that the market has outperformed the previous regime of bureaucratic government controls. There is simply no political movement towards reregulation even in the face of an occasional stumble along the deregulatory path.

Health-safety-environmental (HSE) policy has moved in the opposite direction — towards much more regulation. Recent policy initiatives on air quality and

chemical contaminants are a case in point. Most of these policies involve the most detailed of government controls, dictating the precise technology to be used to reduce exposures to each and every presumably hazardous situation. Federal safety regulators must approve everything from bottle-caps to seatbelts to devices designed to reduce pollution. There is only a passing attempt to measure the costs or the benefits of each regulation because such measures are not required in the statutes authorizing the government intervention. Since the mid 1970s, however, federal HSE agencies have been forced to provide at least rudimentary estimates of the costs and benefits of each new "major" rule — one that would impose $100 million or more in annual costs on the economy.

From these regulatory assessments, we know that a large proportion of federal HSE rules are poorly designed, with prospective costs much greater than the likely benefits.[2] The excessive costs in some cases, such as the further tightening of new-car pollution standards or proposed rules to ban the remaining uses of asbestos, can be enormous. In many instances, the excessive costs derive simply from a poor choice of regulatory targets, but in others the manner in which individual regulations are established is to blame. The latter problem often derives from a curious practice of requiring the "best available control technology" for each and every source, regardless of the costs or the likely benefits from such a strategy.

Because of the obvious policy failures in setting HSE standards so inefficiently, there has been some political momentum towards finding an alternative approach. Fearing the repercussions from the imposition of cost-benefit analysis in each and every regulatory proceeding, environmentalists have begun to entertain alternatives to make environmental policy "more efficient" but not more lax. Not surprisingly, the search for efficiency has attracted economists and economic solutions. Among the most prominent of these potential solutions is the use of "tradable" or "marketable" permits for pollution reduction, an idea once labeled by environmental policy officials as a compromise with the devil because these permits involve a "license to pollute."

The movement towards economic incentives reflects an attempt to make regulation a little more efficient so as to derail attempts to reduce the scope of HSE regulation. It may seem commendable that environmental policy is finally moving in the direction of the market. But this is not entirely true. If the choice of regulatory targets is the principal problem, this new embrace of the market only deflects attention from the real issue — why are we reducing human exposures to a degree that is not justified at any feasible cost of compliance?

Acid Rain Policy — The Model for Global-Warming?

In the 1970s and 1980s, environmentalists focused a great deal of attention on acid rain — caused by the long-range transport of sulfur and nitrogen oxides from sources in the Midwest and East to the lakes and streams of New England and Canada. Indeed, Canada placed substantial pressure on the U.S. to reduce its emissions of sulfur oxides from coal-burning power plants while conveniently ignoring the fact that it had less rigorous controls on similar emissions from its nonferrous

smelters. One of the most ill-designed of U.S. environmental policies, the mandatory-scrubbing provision of the 1977 Clean Air Act Amendments, was passed partially in response to concern over acid rain.[3]

Despite the folly of the 1977 provisions, some environmentalists and their supporters in Congress wanted more — a 10 million ton reduction in sulfur dioxide (SO_2) emissions from their level of about 24 million tons in 1980. For the entire decade of the 1980s, a commission established by the Congress studied the costs and benefits of acid-rain controls at a cost of $500 million to the U.S. taxpayer. The result was not encouraging to the proponents of controls as this commission discovered that the damages from acid rain in the U.S. and Canada were remarkably small.[4] As a result, the commission's report was deliberately delayed so that Congress could consider controlling SO_2 and nitrogen oxides (NO_x) without the political embarrassment of a report that demonstrated that new controls were not necessary. In this difficult political environment, the advocates of tighter controls had to look for allies. Their choice was to seek an alliance with pro-market forces by agreeing to replace the earlier mandatory-scrubbing policy with a policy of marketable permits in the 1990 Clean Air Act.

In short, as part of the strategy to sell even further unnecessary controls on the precursors of acid rain, the environmentalists co-opted economists. Always outsiders and mere carpers in the environmental policy arena, a number of economists were more than eager to comply, hoping to be elevated to new players in an important policy arena. They would lend their support to more regulation if it were "efficient." But efficiency meant not that there was a demonstration that the marginal benefits would exceed the additional costs, but only that costs of each level of control would be more or less minimized. Economists' egos were being stroked while environmentalists escaped a potentially embarrassing legislative defeat. The Clean Air Act of 1990 passed with its mandated reductions in the precursors of acid rain even though there was no sound evidence that such a reduction was worth undertaking.[5]

The marketable-permit strategy for reducing sulfur-oxides emissions appears to have worked much better than anyone would have expected in 1990 and certainly much better than did the environmentalists' previous mandatory-scrubbing madness. The old mandatory-scrubbing policy cost about $500 per ton of SO_2 reduction. Today, the permits sell for less than $100 per ton! Indeed, no one is quite sure why the price of the permits is this low, given the alternative costs of using low-sulfur coal or washing slightly dirtier coal. Perhaps the answer is that we also abandoned another form of regulatory madness, forbidding new power plants to be designed to use clean natural gas. But even at costs of $100 per ton or less, abating SO_2 to prevent acid rain is still probably not justified.

The irony of the economists' participation in the development of acid-rain policy is that they may have helped to push the acid-rain abatement policy over the top in the 1990 Clean Air debate despite rather conclusive evidence that the new controls did not generate benefits in excess of costs. Had they let the environmentalists continue to press for a 10 million ton rollback through further technological mandates, we might have been spared the acid-rain provisions altogether. Whether

the old mandatory-scrubbing standards would have remained in place, however, is unclear, but I think that it is difficult to conclude that the economists served the country well by becoming the foot-soldiers in the environmentalist crusade to force tighter and tighter controls of every pollutant regardless of the societal benefits from doing so.

From Acid Rain to Global Warming

The current policy debates over global warming cannot help but remind one of the 1990 debate over acid rain. The climate modelers have been forced to react to new scientific evidence and moderate their forecasts of the likely degree of warming in the next few decades or centuries; therefore, the environmentalists' ability to scare the public into support of a draconian new set of policies to control greenhouse gases has surely been declining. The United States Senate has voted unanimously to warn the Administration against committing the U.S. to any policy of reducing greenhouse gases in an international agreement. As a result, proponents of taking the first policy step in the direction of reducing greenhouse gases need to assure the public that there are "efficient" if not completely costless mechanisms for doing so.

Once again, economists are being enlisted to advertise a policy of marketable emissions to launch a cautious first step towards mitigation. The economists signing this policy declaration simply announced their belief that the threat of global warming is sufficiently real to warrant some modest reductions in the growth of greenhouse-gas emissions, but their declaration does not provide quantitative estimates of the benefits or costs of such a policy, an enunciation of the degree of abatement that is justified, nor any basis for believing that a marketable emissions program can and will be effected through the political process that will generate something that even resembles an efficient policy.

The economic estimates of the costs and benefits of abatement that are in the literature are not particularly supportive of going ahead with any policy of abatement although some may argue that a worst-case scenario consisting of benefits that are several standard deviations greater than those that emerge from most models may justify some immediate action. One common scenario that is used in these modeling efforts is a freeze on emissions at 1990 levels. As McKibbin and Wilcoxen point out, however, the estimates of the costs of such a freeze are generally about 0.2 to 0.3 percent of GDP per year.[6] The benefits are much more difficult to quantify, but most respectable estimates for stabilizing the global climate are in the range of 0.2 percent of GDP per year — benefits that will not arise for 30 to 50 years. Moreover, the climate models generally forecast that it would require far greater reductions than a return to 1990 emissions to stabilize the climate. The conclusion is obvious: We cannot justify a return to 1990 emissions based on the average estimates in the literature, no matter how efficiently it is done.

It is clear that the marginal costs of abatement in low-income societies like China and India are substantially below those in the developed countries. As a result, the economists signing on to the global-warming proposal envision the

marketable permits program as being global in scope. The U.S., France, Japan, and Germany, for example, would buy permits from China, India, or Bangladesh. The latter would, in turn, reduce their CO_2 or other greenhouse-gas emissions by this amount over the levels that would have occurred without the permits policy in all future years. Imagine the difficulties involved in such a global program: measuring emissions from millions (billions?) of sources from motor scooters to bovine animals; forecasting emissions levels for the uncontrolled scenario; and, finally, enforcing the reductions from these forecasts. If enforcing nuclear nonproliferation treaties is difficult, enforcing a global greenhouse-gases trading program would be incomparably more complicated.

The marketable permits for SO_2 have been much easier to administer because they have involved only U.S. sources and these sources are very few in number — consisting largely of major power plants and smelters. However, even in the SO_2 program, there were heated controversies over the initial allocation of baseline pollution levels from which the trading would begin. Imagine how much more complicated this initialization process would be in China or India, given their size and the proliferation of sources of greenhouse gases!

The Political Naivete of the Emissions-Trading Proposal

The political forces driving the policy towards global-warming abatement are very closely related to those that marshaled their forces to devise an "energy conservation" program after the two OPEC oil shocks. Proponents of a strong conservation program played upon public fears that the world price of oil would soon be driven to $50 to $100 per barrel by the forces of world supply and demand. To prepare the U.S. for this threat to its national security, the protagonists successfully pushed through some of the most inefficient and grotesque policies imaginable, but that we now largely forget as we enjoy oil at prices of less than $10 per barrel (in OPEC-I dollars). Recall:

- An oil entitlements policy to benefit unintegrated domestic refiners which simply transferred billions of dollars from U.S. oil producers to members of the OPEC cartel.
- A Corporate Average Fuel Economy (CAFE) program that resulted in thousands of additional highway deaths with very modest contributions to energy conservation.
- A Public Utilities Regulatory Policies Act (PURPA) requirement that electric utilities purchase power from cogenerators or renewable power sources at prices above the marginal cost of their own generation — requirements that are now a major part of the utilities' claim for "stranded cost" recovery.
- Retail gasoline rationing by day of the week or long lines that needlessly reallocated gasoline supplies from those with a high value of time to those with less valuable time.
- Prohibitions against new gas-fired generators for the electric-utility

industry that needlessly delayed the push for electricity deregulation, increased SO_2 and particulate emissions, and raised electricity costs.

When the price of oil plummeted in the early 1980s, some of these policies were abandoned, but many remained. Their proponents, temporarily in retreat, waited for another day and another excuse to advocate similar policies once more. The global-warming issue provides them with this opportunity. They are now among the major proponents of the proposition that the global-warming problem is real and requires prompt action, and they will not settle for market solutions alone because they simply distrust markets. Government regulation may be losing favor throughout the world — with the possible exceptions of North Korea, Cuba, and France — but it is alive and well in some parts of the U.S. environmental establishment.

My experience in serving on a National Academy of Sciences panel on global warming several years ago was truly an eye-opener.[7] There were several members of our mitigation panel who were able to persuade a majority (myself excluded) that:

- A very large share of U.S. energy consumption (that consumed in commercial facilities) could be avoided altogether at *zero or negative* cost. Therefore, federal mandates on energy technologies in such institutions are desirable even there are no global climate benefits.
- Federal fuel-economy (CAFE) standards have been a success, do not cause an increase in highway fatalities, and should be tightened. (Not even if the Department of Transportation in the current Democratic Administration would agree with this diagnosis today.)
- Households fail to invest in energy-efficient appliances because they are unfairly saddled with a cost of capital that is far above the social cost of capital, and therefore the government should mandate energy-efficiency standards for home heating, appliances, and the like.

I have little doubt that the "price" for gaining passage of a "limited" marketable permit program would be some new assortment of federal regulatory mandates that would correct for these alleged market failures reflected in decisions that manufacturers, households, and owners of commercial buildings make in investing in energy-using durables. Even if marketable permits across international borders were feasible, there is no reason to expect that the advocates of global-warming policy would relent and rely simply on paying the Indians or Chinese to satisfy our moral obligations to future generations. A large number of new government mandates would surely be part of any global-warming legislation.

The More Modest Abatement Proposal

Many advocates of doing something now to reduce the future threat of global warming recognize the difficulty, indeed the folly, of trying to construct a global

marketable-permit policy. As a result, they suggest an even more modest first start — a system of tradable permits within the United States and within other OECD countries.[8] Clearly, this proposal is more practical because it does not require a world EPA establishing baselines and trying to enforce compliance from Bangladesh, China, or Khazakstan.

Unfortunately, this even more modest first step is even less defensible on *a priori* economic grounds. If the costs and benefits of a worldwide program of efficient abatement do not justify more than a modest first step today, the case for a similar policy confined to the national boundaries of each of the OECD countries is even weaker. Remember that the reason for the global trading policy is that the prospective marginal costs of abatement in developing countries are less than the marginal costs in OECD countries. The marginal benefits are the same — a gram of greenhouse gas has the same effect on the world's climate whatever its origin. Therefore, the notion that there are benefits in excess of costs for intra-OECD country programs must be very much weaker.

The Right Questions for Economists

Economists *should* be involved in the global warming debate. They should be trying to quantify the costs and the prospective future benefits of greenhouse-gas abatement. They should be explaining the power of compound growth on the scarce savings diverted from today's investments in schools, highways, hospitals, or medical research and left in place for 30, 40, or more years. But they could add immeasurably to the debate if they asked one simple question: Why now?

Regardless of the model used, all forecasts of global warming see only a gradual warming over the next few decades or centuries. The alleged problems from the delayed impact of past and future greenhouse-gas accumulations do not become serious for at least fifty or sixty years. Every dollar dedicated to greenhouse-gas abatement *today* could be invested to grow into $150 in the next 50 years at a ten percent social rate of return, even at a puny five percent annual return, each dollar would grow into $12 in 50 years. Therefore, we need to be sure that the prospective benefits, when realized, are at least 12 to 150 times the current cost of securing them. Otherwise, we should simply not act, but use our scarce resources in other ways.[9]

Many of the economists supporting a first modest step have strong views about the inadequacy of current savings and investment and lagging productivity. Further reducing our current scarce savings in the pursuit of climate stability in the next century or two must surely take into account the further neglect of current problems, including the growth of worker incomes through more investment in human capital. It is not sufficient to say that we could begin spending billions of dollars per year on global-warming abatement *and* these other current needs. If we devote these billions to reducing the potential for global warming, we surely will reduce current savings and investment and, therefore, the monies available for other current problems.[10]

It is not clear why economists should advocate a modest first step towards

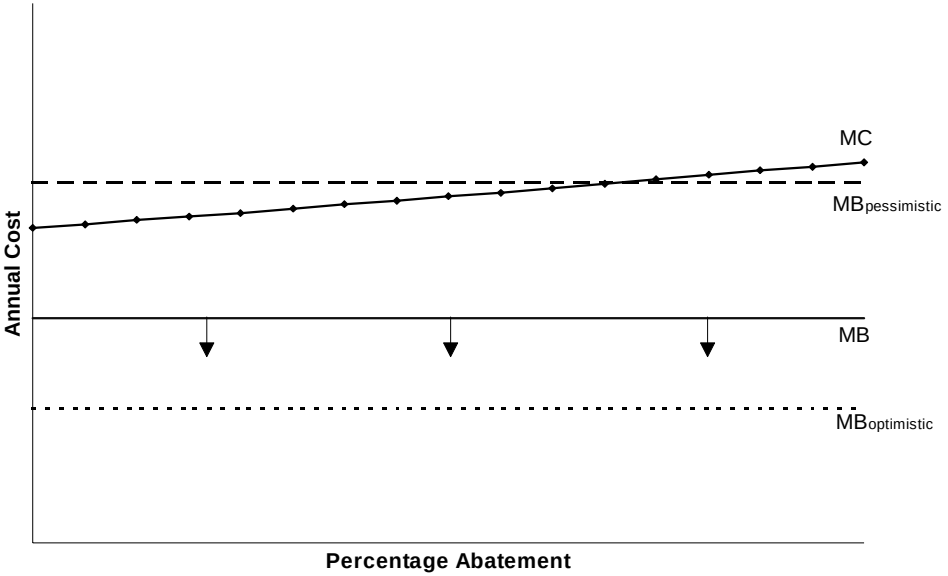
greenhouse-gas abatement today. If action is justified *today*, why is it presented to us with such modesty. Consult Exhibit 1; the present value of the marginal benefits from abating greenhouse gases is shown by MB. These additional benefits per ton abated are undoubtedly flat over a wide range — I do not believe that the climate models suggest that the first 0.1 or 0.2 percent reduction will have much greater effects than the next 0.1 or 0.2 percent reductions. In addition, the incremental costs of abating CO_2 — shown as MC — are probably gradually upward sloping over the first few percentage points of abatement, but it is unlikely that the degree of upward slope is very great. We may not be able to reduce our emissions (or China's) at zero incremental costs, despite the surprising findings disseminated by the NAS report, but surely these incremental costs do not increase very rapidly as we substitute more dismal compact fluorescent bulbs for incandescent lighting or cars with greater fuel economy for gas guzzling sports-utility vehicles. The additional costs of shifting among fuels or conserving energy through capital-energy substitution increase, but surely not very rapidly at first.

Under these assumed conditions, it is highly likely that if the two curves actually intersect, they will do so at a level of abatement that is much more than modest. Moreover, each new tweaking of the models in the alarmist direction or new discoveries of abatement technologies could lead to rather large increases in desirable abatement. Of course, the climate models have been moving in the other direction, driving MB down towards the more optimistic scenario, denoted $MB_{optimistic}$ over the past decade or so, and increasing the probability that no action is warranted — i.e., that they do not intersect at all. However, we may find that further research moves us back in the opposite direction towards $MB_{pessimistic}$ in the next few years or even the next decade or two. If the latter occurs, a substantial amount of abatement may be justified.

But even this analysis does not tell us why we should act today. If, for example, the intersection of MB and MC tell us that, say, $2 billion is worth spending each year, it does not necessarily tell us that we should start *this* year. What if we waited one year? If the discount rate is say, ten percent, in real terms, then waiting one year saves us $200 million in output and investment that we would have otherwise devoted to abating greenhouse gases. Why not wait and spend $4 billion next year, or wait two years and spend $6 billion the following year, or wait even longer and spend more later. The answer, of course, depends on the effects of waiting on the warming effect and the present value of the costs. If the effect of greenhouse-gases on warming increases only slowly over time and if the technologies of abatement are improving over time, we may want to wait until 1998, 1999, or even later.

More important, if we are unsure today about the benefits, waiting a year or two or five may reduce the uncertainty of attacking the greenhouse problem in either direction. Uncertain benefits surely require a greater discount rate than more certain benefits. Put another way, the present value of the benefits of acting today are lower, the greater is the uncertainty over the future climate. If someone wants to reduce greenhouse gases by 10 million tons per year starting today as a modest first step, we can wait five years until we know more about the future climate and have better abatement technologies. We can then begin to reduce greenhouse gases

Exhibit 1: Marginal Benefits and Costs of Abating Greenhouse Gases Today A Hypothetical Example



by, say, 20 million tons per year. Within 11 or 12 years from today, we will be on a lower path if greenhouse-gas accumulation and will have avoided the premature action that *surely* costs us substantial reductions in output and investment over the next five years while yielding extremely *uncertain* benefits.[11]

Why not wait? The proponents of any modest first step owe us an analysis that proves that immediate action is preferable to a few years of delay. This is not a battle against *E-coli* bacteria. It is a distant *future* potential problem caused, in part, by accumulations of gases over decades. We can still effect the same abatement, but wait until we know that the reduction in social product is worth it.

Conclusion

Economists should be wary of wading into a political battle in which they are little more than foot soldiers for those who have a much wider, and potentially costly agenda. Whether it is health care, public-transit, or environmental policy, economists will often ignore the larger political issues and allow themselves to be conscripted as technocrats to implement an otherwise poorly justified policy more efficiently. This was precisely what happened in 1990 as a number of economists supported a monstrously-inefficient Clean Air Act simply because it mandated an efficient control strategy for one pollutant that a $500 million government study had already found to require no further controls. There is no need to be rushed into a modest first step in the battle against global warming unless someone — perhaps the economists? — can show that the present value of waiting is negative. No one has made that showing as far as I know.

Notes

[1] See "Economists' Statement on Climate Change," sponsored by Redefining Progress (San Francisco, CA), January 1997.

[2] See, for example, Robert W. Hahn, "Regulatory Reform: What Do the Government's Numbers Tell Us?" in Robert W. Hahn, ed., *Risks, Costs, and Lives Saved: Getting Better Results from Regulation* (Washington: Oxford University Press/ The AEI Press, 1996); John F. Morrall, III, "A Review of the Record," *Regulation*, Vol. 10, November/December 1986, pp. 25-34.

[3] Bruce Ackerman and William T. Hassler, *Clean Coal/Dirty Air: or How the Clean-Air Act Became a Multibillion-Dollar Bail-Out for High-Sulfur Coal Producers and What Should Be Done About It* (New Haven: Yale University Press, 1981).

[4] National Acid Precipitation Assessment Program (NAPAP), *Final Assessment*, (Washington, D.C.: 1990). For a readable version, see J. Laurence Kulp, "Acid Rain: Causes, Effects, and Control," *Regulation*, Vol. 13, Winter 1990, pp. 41-50. (Kulp was the research director for NAPAP.)

[5] Today, some environmentalists point out that reducing SOx reduces fine particles in the air and that some studies suggest that this produces sizable health benefits. First, it should be noted that these studies are highly controversial within the scientific community. Second, my criticism of the decision to control SOx is based upon what we knew then. At the time when this debate was transpiring in 1990, the expert group, the NAPAP group, had said that the benefits were really very small.

[6] Warwick J. McKibbin and Peter J. Wilcoxen, "A Better Way to Slow Global Climate Change," *Brookings Policy Brief* No. *17*, The Brookings Institution, 1997.

[7] National Academy of Sciences, *Policy Implications of Greenhouse Warming* (Washington D.C.: National Academy Press, 1992).

[8] This is the proposal of McKibbin and Wilcoxen, *op.cit.*, for instance.

[9] There are some economists who might argue that we should not discount the health-safety-environmental benefits of future generations in today's decision calculus. Many of them, however, lament the lack of current savings and investment in productive human capital and infrastructure.

[10] One of the three propositions in the statement signed by the economists (see note 1) is that carbon taxes and auctions of emissions permits could be used to substitute for current growth-stifling taxes, but the notion that tax policy would suddenly become efficient in response to a new alarm about global warming in surely naive. Sulfur-oxide permits were not auctioned. Digital broadcast licenses

were not auctioned. Sulfur taxes never attracted a single Congressional vote. A 1993 administration proposal for carbon taxes died on the way to Capitol Hill. The 1997 tax package was hardly a reflection of concerns for economic incentives for savings and investment.

[11] The other side to this argument is that uncertainty over the effects of global warming, if not reduced by waiting, could actually create an economic case for greater control today because of uncertainty about future discount rates. See William A. Pizer, "Optimal Choice of Policy Instrument and Stringency under Uncertainty: The Case of Climate Change," Resources for the Future, March 3, 1997.

3. CONCLUSION: THE ROLE OF OPPORTUNITY COSTS IN THE GLOBAL WARMING DEBATE

FRED L. SMITH JR.

Former Environmental Protection Agency Administrator William Reilly once quipped that his agency had a "Ready! Fire! Aim!" approach to policy. The global warming debate, as the reader of this volume will recognize, provides ample evidence that this tendency is alive and well. Political activists and media spokesmen reinforce this *act first, think later* bias by emphasizing the possible risks of global warming, while giving little attention to the risks of energy curtailment policies, especially the impacts of such policies on the poor in America and the Third World. Before making any decisions at Kyoto, we should examine these neglected arguments; otherwise, we risk adopting policies which will prove costly, ineffective and unfair.

We must take the global warming issue seriously. In December 1997, the nations of the world will meet in Kyoto to seek agreement on a global treaty to withdraw carbon dioxide from the atmosphere by reducing emissions of greenhouse gases. If agreement is reached — and all indications are that Kyoto will produce *some* form of "binding" commitment — then the environmental establishment, will have achieved its first major victory. Modern Malthuisans have long sought to classify all environmental problems as resulting from a "terrible toos" problem — *too* many people consuming *too* many goods and relying *too* heavily on technology which is *too* poorly understood. From this diagnosis, the environmental establishment has long argued for curbs on economic and technological growth. Yet these are the very forces which have made possible the major environmental gains of the last century, such as sanitation and the expansion of clean water supplies. Global warming provides the ideal pretext to promote such anti-progress policies. Thus, while global warming itself may or may not pose a threat, global warming policies pose very real threats to our civilization.

Global warming is a possible catastrophe that might befall our planet. But there are others. Only two decades ago, many in the environmental establishment were concerned about global cooling. More recently, planetologists have pointed out the non-negligible risks that an errant asteroid might collide with the earth. And mankind still faces the more prosaic risks of heightened tectonic activity or a new virulent plague. All of these risks are potential; action to fend off any or all of them would be expensive. How then should our democratic society go about allocating resources among these potentially catastrophic risks?

The global warming issue is itself highly complex with major scientific, economic and political uncertainties. Information on all aspects of the topic exists and is gradually improving; still, today, much of this information remains partial and conflicting. What decision procedure should we use in reviewing the conflicting evidence and deciding an appropriate course of action?

Advocates of an international treaty find this an easy question. They invoke the "Precautionary Principle" — any change that might create any risk should be prevented. The use of energy *might* be warming the earth. That warming *might* produce catastrophic results. The speed of this change *might* require immediate action. Governments *might* be able to prevent that warming by an aggressive global carbon withdrawal policy. That is, the evidence *might* demonstrate the validity of the global warming hypothesis.

But, of course, one or more of these statements *might not* be true. Further scientific analysis *might* find that mankind's energy use patterns have little impact on the climate and that solar activity or some other factor dominates climate. On balance, we *might* find that the impacts of warming are positive, that there *might* be little need for haste, and that the proposed global conservation policies *might* fail. That is, the evidence *might* demonstrate that the global warming hypothesis is wrong.

Sequential decision theory suggests one way of addressing such complex policy questions. One begins with an hypothesis — the world is warming — and one collects data and conducts analysis over time (sequentially) to test out that hypothesis. There are two possible choices, either to accept or reject the hypothesis, and thus two possible errors: A Type I error occurs when we reject a correct hypothesis (that the global warming advocates have it right and society ignores their advice), and a Type II error occurs when we accept an incorrect hypothesis (that the global warming advocates are wrong and we impose needless costs on the world economy). Our challenge is to assess the costs of both types of errors and weigh each of them. We compare the expected costs and select accordingly. As information is derived on both the likelihood and consequences of the various errors, we are able to make a better decision.

Our decision, of course, depends in part upon the steps we have taken. What is the best way to insure ourselves against probabilistic risks? In the global warming area two broad types of insurance have been proposed: a *Prevention Strategy* and a *Resiliency Strategy*. The first is the conventional prescription of the Precautionary Principle and is championed by the environmental establishment and its political allies. It would seek to restrict fossil energy use and therefore seek to stabilize anthroprogenic greenhouse gas emissions. Change is the culprit; stop change and we reduce the risk. The second strategy argues that change is best managed by encouraging economic and technological growth. Adaption or resiliency would best improve the ability of mankind to surmount increased risks. Change is inevitable and rarely predictable; a wealthier more advanced society reduces the risks of unforeseen changes.

To address this issue via sequential decision theory, we first estimate the probability that the global warming hypothesis is or is not true. Probabilities, however, are not certainties and, therefore, we must estimate the consequences of error under both insurance responses. What are the expected costs of a Type I error under both a prevention and resiliency strategy; similarly, what are the expected costs of a Type II error under the two possible responses. Statistical decision theory combines both the likelihood and the consequences of such errors to estimate the *ex-*

pected costs of Type I and Type II error and decides accordingly. If the results are unclear — if our knowledge of either probabilities or consequences is weak — we may wish to defer action while we gain additional knowledge. That delay decision depends, of course, on the costs of acquiring additional information versus the costs of delay itself. In summary, therefore, society has three choices: Accept the global warming hypothesis, reject the global warming hypothesis, or suspend judgment pending better information. This sequential decision process has long been the basis of scientific progress.

The Precautionary Principle can be viewed as a truncated subset of this decision framework. To the Precautionists, the Earth is delicately balanced at the brink of disaster. Any disturbance, always possible given man's capricious and non-sustainable ways, risks the destruction of our planet, an infinite loss. Thus, the Precautionary Principle types urge immediate action now. Additional carbon dioxide emissions might be causing adverse climatic change. Therefore, we must reduce these emissions. Only a prevention strategy can be entertained. Whatever costs might be incurred in delaying or blocking economic and technological change can safely be ignored. With great firmness, but little theoretical or empirical basis, they argue that the risks of innovation and economic growth will always outweigh the risks of stagnation. Precautionists have a strong, if reactionary, preference for the status quo.

A more balanced view would first note that the global warming hypothesis is actually a compound hypothesis. For the global warming advocates to be correct, a series of linked hypotheses must *all* be true. First, man's increased use of fossil energy must be warming the earth significantly. Second, the impact of such warming must be catastrophic and rapid. Third, energy use reductions must be the sure and certain means of reducing such warming. Finally, for the global warming proponents to be right, the scheme to coordinate global energy use reductions across the world must prove effective. Note that the mere fact that the Earth may be warming or that mankind might be causing this warming resolves little. We would also need to consider whether this warming was imminent and, on net, whether such warming might be harmful or beneficial. Finally, we would need evidence that the global energy reduction strategies now being contemplated would actually prove effective. Clearly, the global warming proponents face a major challenge.

So far, they have not been forced to meet that challenge. Instead of the balanced risk/risk sequential decision theory approach outlined above, we have largely adopted the *act first, think later* policy mentioned at the outset. Admittedly, politics makes it hard to adopt a balanced and formal approach; still a structured approach is essential if our solutions are not to prove more costly than the problem itself. And, as this volume makes evident, that need for balance is even more obvious when both the science and the economics remain uncertain, the need for haste remains unproved. We're not sure whether carbon dioxide concentration increases or even warming would have negative consequences. Nor have we shown that the global warming threat would best be addressed by a prevention rather than a resiliency. Nonetheless, global warming advocates seem eager to rush to judgment —

to act rather than to think. Any evidence of change is a clear indication of imminent disaster which can best be addressed by steep restrictions on energy use.

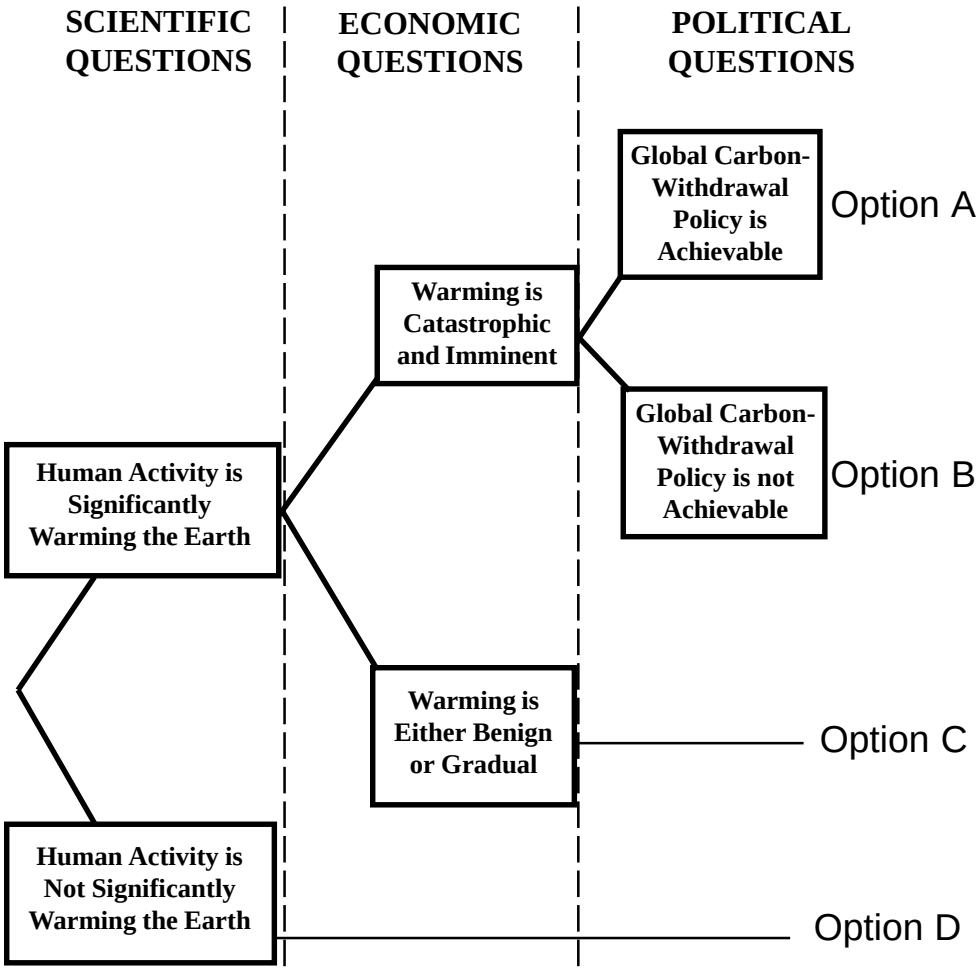
Precautionists see only one side of the issue. Vice President Gore, environmental activist groups and the renewable energy industry have effectively highlighted the likelihood and potential consequences of a Type I error (the world is facing catastrophic risk and we fail to act). Indeed, in his widely publicized book, *Earth In the Balance*, Vice President Gore argued that western society's greenhouse gas emissions constituted an "ecological Kristallnacht" — a clear signal that mankind was destabilizing our planet and that we must move rapidly to curtail fossil fuel consumption. Gore argued passionately that those critical of global warming policies, those urging that we learn more before rushing to judgment, are morally akin to those who remained passive as the Nazis seized power throughout Europe.[1] More recently, Interior Secretary Bruce Babbitt suggested that anyone dissenting from the global warming agenda was "un-American."[2] The popular culture has reinforced this bias, as illustrated by the dramatic portrayal of the potential consequences of a Type I error presented in Kevin Costner's multi-million-dollar flop "Waterworld." Many scientists have emphasized the losses that might occur if the earth were to warm quickly and, more recently, several thousand economists cited Type I risks in calling for urgent action on climate change. Type I concerns have also been cited by those business leaders who have climbed on the global warming bandwagon.

There has been far less attention given to the likelihood and consequences of Type II errors (the losses incurred if the global warming hypothesis proves false and we have foolishly slashed fossil fuel use). In many respects, the science, economics, and politics of this issue have all been neglected by the global warming advocates. Over the last decade, much knowledge has been gained about climate, the influence of human activity upon it, and the extent and speed of any induced shifts. We've also learned much about the possible consequences of global warming and, at long last, have given some attention to the question as to whether a carbon withdrawal policy would prove effective. This book reviews much of that neglected perspective, to bring some balance to the global warming debate. This review has generally been reassuring. We've become more aware that carbon dioxide increases and temperature increases have beneficial as well as negative impacts. The impacts of global warming, were it to occur, seem now to be less severe and more gradual than once feared. We've also gained greater understanding of the difficulty of implementing any carbon withdrawal policy — and the costs, burdens and inequities that such restrictive policies might entail.

Given these trends, the current rush to judgment is especially unfortunate. Our people deserve better. In a world in which information is never perfect, but opportunity costs are inescapable , environmental policy should be determined in the sequential risk-risk framework outlined above. We must consider the likelihood and consequences of Type II as well as Type I errors to decide whether prevention or adaptation offers the superior path. Exhibit I illustrates the sequence of possible outcomes that must be considered. First, there are the science questions: Are man's activities significantly warming the planet? Second, there are the socio-

economic questions: Would such warming be on net catastrophic, neutral or beneficial, and would it be abrupt or gradual? Finally, would the carbon withdrawal strategy proposed by global warming advocates prove effective or not? There are four possible outcomes: Outcome A, the global warming hypothesis is correct; Outcome B, the global warming fears are correct but the carbon withdrawal option fails; Outcome C, man is affecting the climate but the results are slow and/or benign; and Outcome D, mankind is not affecting significantly the climate at all.

Exhibit 1: Possible Global Warming Outcomes



The impact of each outcome depends upon the insurance option we have selected. Exhibit 2 summarizes the consequences under each outcome of either a prevention or a resiliency strategy. Note that the prevention strategy favored by the environmental establishment is never an obvious best strategy, even when the global warming hypothesis is right. Even a feasible carbon withdrawal policy might prove a more costly way of addressing the more adverse weather brought about by man's activities. In the other three possible outcomes, the prevention strategy is clearly inferior to the resiliency insurance strategy. This framework should be kept in mind when considering the issue and reading the rest of this chapter. A rational decision in the global warming area requires that we consider science, economics and political factors — our choice as to the appropriate response depends critically upon how these factors interrelate. *Thus, in summary, while we should be concerned about the risks of global warming, we must also be concerned about the risks of global warming policy!*

Exhibit 2: An Assessment of Global Warming Outcomes Under the Prevention and Resiliency Responses

	INSURANCE OPTION	
	Prevention Strategy	**Resiliency Strategy**
Treaty Advocates Are Right		
OPTION A: Global warming, due to human activity, is imminent, catastrophic and resolvable.	A world poorer in wealth and technology with stable weather ("A Good Purchase")	A world richer in wealth and technology with worse weather ("Run Faster")
Treaty Advocates Are Wrong		
OPTION B: Global warming cannot be prevented by carbon withdrawal policies	A world poorer in wealth and technology with worse weather ("All Pain, No Gain")	A world richer in wealth and knowledge with worse weather ("At Least We Can Buy an Umbrella")
OPTION C: Global warming will be benign and/or gradual	A world poorer in wealth and knowledge with better weather ("We Stopped a Good Thing")	A world richer in wealth and knowledge with better weather ("We Didn't Buy an Umbrella and It Didn't Rain")
OPTION D: Human activity is not Significantly warming the Earth	A world poorer in wealth and knowledge with stable weather ("Over Insurance")	A world richer in wealth and knowledge with stable weather ("It Didn't Happen")

The Science of Global Warming: Is it Happening?

The first stage of the decision process is to review the science of global warming. As noted in the earlier chapters, in climate science, some facts are agreed upon. The climate of the earth depends upon the energy received largely from the sun via radiation, the amount of that heat retained by the earth because of the greenhouse effect, and the extent to which that heat is distributed vertically and horizontally around the world by air and water currents. Were radiation the only impact on our planet, the earth would be too cold for life. Were radiation and the greenhouse effect the only influences, the planet would be too hot. Additonal impacts include convection which moves heat from the earth's surface to the troposphere where it is radiated into space (via outward longwave radiation). This latter effect reduces the "raw" greenhouse effect and makes our planet habitable.

Most also agree that the concentrations of carbon dioxide and other greenhouse gas levels in the atmosphere have increased significantly over the last century. (Water vapor which constitutes the vast bulk of all greenhouse gases at 90 plus percent is assumed to be constant, although little data exists on this topic.) Carbon dioxide has increased by 28 percent over this period, mostly in the last few decades; other greenhouse gas concentrations have increased as well. Concurrently, most scientists believe there has been a real, but slight (0.5 degrees C), increase in global temperature. However, human-induced increases in carbon dioxide levels cannot easily be linked to this temperature increase. Most of the observed warming (approximately 70 percent) occurred before 1940, while most of the greenhouse gas buildup occurred after 1940. Other trends, of course, may have obscured the warming impact, but the issue remains unsettled. Many temperature measurements are from urban areas that were once rural, biasing the temperature records upward. The less biased and more accurate source of temperature data, the satellite record, available since 1979, shows no temperature increase in recent years. Efforts to relate model predictions to empirical measurements continue but the situation remains unclear.

The computer models which suggest serious temperature changes are evolving rapidly, but still remain crude approximations of the complexities of the energy and material transfer systems that determine weather. Current computing capacity limits the "unit" of analysis to a very large volume of the atmosphere, rendering the models less useful for regional weather analysis. Moreover, the treatment of factors known to be key to climate remains weak. For example, the variability of solar radiation which some believe may well explain (without recourse to any greenhouse theory) most of the temperature variation of the last century is largely ignored. Water, which scientists increasingly recognize as the critical variable in the climate determination game, is handled unimaginatively. Dynamic interaction effects such as how warming might impact upon the amount, distribution and state (liquid, gaseous, solid) of water in the atmosphere are also addressed in rather rigid ways. Some have argued that the additional surface warming suggested by carbon dioxide increases would increase ground-level moisture levels and increase the strength of convection currents which move heat from the surface to the tropo-

sphere. The efficiency of out-radiation of heat there is influenced strongly by the dryness of the tropospheric air masses. If the overall impact of surface level warming is a less moist troposphere, then much of any initial greenhouse warming impact might be offset; if the effect is a moister upper atmosphere, then we might anticipate greater warming. Current models simulate these critical relations only imperfectly. For such reasons, Option D seems highly likely. And, if so, there is little reason to engage in any further discourse.

The Economic Impacts of Global Warming: Should We Worry?

The second phase of the decision process addresses the "so what" question. Even if the scientific evidence were to suggest that man-induced global warming were a certainty, this would decide little. It is not temperature change per se that triggers the global warming concern, but rather views as to how such changes will affect our planet. Warmer weather will certainly have benefits — lower heating bills in the winter and greater agricultural productivity — but some argue it will also increase the frequency and/or severity of hurricanes or floods. Hurricane Andrew and the Mississippi-Missouri floods were disasters of unanticipated magnitude, and we should clearly be concerned if the frequency of such disasters is likely to increase. Here, however, the evidence remains so inconclusive that even the report of the U.N. Intergovernmental Panel on Climate Change stated, "Overall, there is no evidence that extreme weather events, or climate variability, has increased, in a global sense, through the 20th century, although data and analyses are poor and not comprehensive."[3]

In fact, warmer weather may well be better weather. Evidence for this may be found in the terminology used by the English climatologist Hubert H. Lamb to label the two warmest periods of the last ten thousand years — the Climate Optimum around 5000 to 1000 B.C. and the Little Climate Optimum around 800 to 1200 A.D.[4] Recent historical research by Dr. Thomas Gale Moore provides further evidence that warmer weather correlates well with better times.[5] Such findings are compatible with current climate change theories which suggest that if warming occurs, it will largely occur at night, in the winter, and at higher latitudes. Such a warming pattern would likely lengthen growing seasons and, by reducing temperature variations over time, tend to reduce extreme weather events. Furthermore, higher levels of carbon dioxide increase plant growth and thus increase agricultural output.[6] Thus, it is not clear that global warming is something that should be prevented, even if it were easy and cost little. Spending money to avoid better weather makes little sense.

In any event, the existing computer models (the basis of most global warming claims) suggest slow response rates to any changes in carbon dioxide levels which implies that quick action now would have little impact on climate for many decades. One recent study suggested that delays on the order of a decade or so would have little impact on the temperatures that might be expected in the late 21st century. Since discontinuing any political program is extremely difficult, we should be very careful about locking ourselves into what may well be an unnecessary pro-

gram. The science of global warming provides little support that global warming is clearly upon us, that it will prove decisively harmful, or that urgent action is required. That is, the answer to the phase two question, "should we worry?" is "probably not," Option C appears more likely than either Options A or B.

The Politics of Global Warming: Would Carbon Withdrawal Policies Work?

The final decision process issue deals with political feasibility. Even if global warming were to occur and it were to be harmful to the United States, the question remains as to whether any viable political strategy exists to prevent it. Greenhouse gases are linked closely to the use of fossil fuels. For the foreseeable future, fossil fuel represents the only form of energy useful for mobile sources. Electricity, in principle, could be produced via nuclear plants, but the environmental establishment would vigorously oppose any move toward greater reliance on nuclear energy. Moreover, even if the U.S. were to somehow reduce fossil energy use, it would do little good unless most other nations do likewise. Is this likely? Is it feasible? First, note that no agreement in history approximates the complexity of the proposed Kyoto arrangement. Nations would have to control the household energy budgets of their citizens, monitor all industrial and agricultural activities and restrict mobility. America has been very reluctant to penalize energy consumption via gas taxes, why will the global warming proposals face an easier time?

Moreover, as noted earlier, the United States and the rest of the developed world are projected to comprise an ever smaller fraction of the greenhouse gas emission budget of the world. If we are to reduce greenhouse gases, the Third World also reduce its projected use of energy. For such reasons, great pressures are being placed upon Third World nations to sign a global warming treaty at Kyoto this December. A small nation which believed this treaty to harm its self-interests is likely to find itself threatened by the prospect of trade sanctions or reduced foreign aid. Kyoto negotiators, of course, are promising technological and economic aid to offset the costs of reduced energy use; however, the amounts required to improve living standards in the world of suppressed economic growth seem unattainable. Indeed, a world made poorer by restrictive energy policies seems far more likely to be less generous than the world of today. Certainly, private capital flows (the dominant source of international aid today) will decline as world economic growth contracts.

Nonetheless, given the current geopolitical realities, poorer nations may well sign some version of a global warming treaty at Kyoto. Yet while it is easy to sign a treaty, it is far harder to monitor its compliance. Developing countries have little ability or reason to comply with complex carbon reduction policies. The sophisticated regulatory and tax arrangements which make it possible for energy regulators in the U.S. and Europe to monitor and enforce current anti-energy-use laws are weak to non-existent in the Third World. Efforts there to raise the price of market energy might simply lead to increased reliance on non-market derived fuels such as wood and dung. These fuels would be even more difficult to monitor and could produce *even more* carbon dioxide than the coal, oil or natural gas displaced. Such

traditional "renewable" fuels also contribute to other environmental problems, such as indoor air pollution, a real concern in the developing world. The argument noted above that such problems could be offset by economic or transfers of "environmentally friendly" technologies from developed to developing countries is naive. The world is today far too poor to offset any slowdown in growth by wealth transfers.

Foreign aid, in any event, has largely been a failure. Too often, it becomes nothing more than a shift of funds from the poor in the developed world to the rich in the developing world. Too often, such political wealth transfers are wasted in symbolic or pork barrel projects, reducing rather than enhancing the wealth of these nations. Much of the environmental arguments for wealth transfers today are little more than a recycling of arguments raised years ago. Then it was argued the south was poor because the north was rich; the solution was to transfer wealth from the North to the South. The global warming debate now incorporates a green version of that same idea.

The dismal history of international agreements suggests that rhetorical treaties rarely ensure realistic results. Note that any global energy reduction treaty would be akin to a super-OPEC which in its own way for its own purposes has long sought to moderate energy use. From time to time, largely when war or national policy has disrupted energy markets, OPEC has approximated this energy restriction role. Mostly, however, OPEC has failed. Although the OPEC members would all have benefitted from actual curtailment of energy output, their self-interest encouraged each of them to produce more energy. The result was that while all OPEC members expressed support for the energy curtailment program, most simultaneously expanded output. The reasons for cooperative energy reduction policies are far less compelling for non-OPEC countries; non-OPEC nations have no common interest in energy use reduction; thus, one would expect even less success with a Kyoto style agreement.

This may be a good thing; people may be far better if a Kyoto agreement fails than if it succeeds. After all, any Third World nation able to exercise effective control over the household energy budgets of its citizenry would have massive power indeed. Many nations in the world are just emerging from decades of government abuse — especially abuse to those sub-populations not represented in the ruling class. Have the risks of granting politicians a renewed license to exercise massive moral power over their citzenry been considered? Would one really wish to grant one ruling minority in a balkanized nation life-and-death power over energy use by their historic rivals?

These thoughts aside, it remains the case that an agreement that omits the Third World will do little to stem the growth in greenhouse gases and thus to address the perceived threat of global warming. Most of the greenhouse gases produced to date have come from developed nations. But energy use in the developed world has plateaued. All projections indicate that in the 21st century, the major increases in these gases will come from the developing world. And, while we in the developed world might, at high cost, adapt to a virtual reality world of minimal increased energy use, we start from a very real level of comfort. The peoples of the

developing world do not. If they are to improve their standard of living, they must consume far more energy than they do today; that increase for the foreseeable future will rely heavily on fossil fuels. For such reasons, the developing world has been excluded from the first round of Kyoto. This exclusion is understandable and justifiable; yet it makes meaningless the sacrifices urged upon the United States and the other developed nations.

Under current conditions, any Kyoto agreement would most resemble an *All Pain, No Gain* energy diet. Even if all the fears of the global warming advocates are conceded, it remains doubtful that a carbon withdrawal policy would make sense. Option B remains far more likely than Option A.

The Insurance Options

Regardless of whether global warming is real or not, whether its impact would be positive or negative, and whether proposed control policies would prove effective, it remains understandable why many would fear climate change and, thus, endorse some form of global warming insurance. Insurance measures — steps to reduce the impacts of risky events — are a logical response to uncertainty and one that we should certainly explore. The question is whether the better insurance option is prevention or adaptation. Most global warming advocates see prevention as obviously better. Action is needed now. The longer we delay, the more costly action will eventually become. The precautionists endorse the old saying, "An ounce of prevention is worth a pound of cure." But there are also costs of locking society into a political energy allocation program. Few government programs are easily dismantled, even when their original purpose has disappeared. That the Corporate Average Fuel Economy Program (which forces Americans into smaller, less-safe cars) have yet to be seriously challenged should make us very cautious about imposing any new energy restrictions. Why should a Kyoto decision be any less reversible, any less permanent?

The case for a carbon withdrawal policy is further weakened when one seriously considers the likely costs of proposed anti-energy use policies. The Administration pledged to review the economic consequences of a Kyoto treaty but have yet to do so. The economic consequences are potentially massive, as would be expected by the predictions of some computer models that to reduce the global warming threat, the fossil fuel reductions would also have to be massive. The restrictions are on the order of those experienced by nations blockaded during wartime. The United States, for example, would have to reduce carbon dioxide emissions by 60 to 80 percent to stabilize atmospheric CO_2 concentrations, necessitating severe rationing and/or high energy taxes. Recent efforts to raise gasoline taxes and to impose BTU taxes have fared badly. This suggests that any U.S. action in this area would be indirect and regulatory in nature — more restrictive Corporate Average Fuel Economy standards program, for example, or a further slowdown in new power plant permitting. Such approaches are less effective and more costly than the measures made infeasible by political reality.

The economic consequences of Kyoto, as suggested by the work of Frederick

Reuter, Wilbur Steger, David Montgomery, and Brian Fisher, should give pause. These papers portray a frightening severe economic future for the world if current proposals become reality. Even more are the geo-political implications of policies that would greatly shift comparative economic advantages around the world. Protectionist pressures are already significant; massive shifts of basic industries around the world would almost certainly inflame these sentiments. Were Kyoto to lead to a collapse of international trade, the consequences of global warming policies would be far worse.

Of course, one must move beyond these macro-impact analyses to review how Kyoto might affect consumers, workers, and the peoples of the developing world. Frances Smith, Eugene Trisko, and Deepak Lal emphasize these themes. Anti-energy policies, of course, are not simply economic; they also threaten public health in America and the world. CAFE already costs thousands of lives on the nation's highways; the far more restrictive policies envisioned in the Kyoto proposals would greatly increase these fatality levels. The costs of energy suppression policies in the developing world are severe. Americans, Europeans, and Japanese enjoy a high standard of mobility and household comfort in large part, due to high levels of energy use. The energy-poor of the world still lack the basic elements of modern life — hot and cold running water, electricity, cars, telephones, home and office climate control, labor-saving technology. All of these now will require that we use more, not less, energy in the Third World, and that use will take the form of expanded fossil fuel use. To deny the Third World the opportunity of increasing energy use would be to lock these people forever in poverty.

Wilfred Beckerman points out that the Precautionary Principle seems based on a presumption that the current generation must sacrifice today to reduce the sufferings of the generations yet to come. Global warming advocates act as if such a redistribution plan would enhance inter-generational equity. Yet, as Beckerman notes, the last several centuries have seen the reverse — our grandchildren will be wealthier, not poorer, than we. Beckerman argues that the best thing we can do for tomorrow is to create wealth today. A wealth expansion program would liberalize, not restrict, the use of fossil fuels.

How the Insurance Industry Relates to Climate Change

Consider how one industry, the property and casualty insurance sector, has addressed the risks of global warming. In effect, what insurance strategy should the insurance industry adopt? Insurance is the business of selling private risk management contracts — agreements to compensate the individual for damages resulting from specified risk in return for compensation (premiums). Global warming may well affect the insurance industry, if, as some fear, it would increase the frequency of such catastrophic climatic events as Hurricane Andrew. The insurance industry is the group, after all, that pays the bills for such natural disasters. Hurricane Andrew was a costly event which resulted in heavy losses to the insurance industry. Can all this be blamed on global warming?

Not really. America has changed dramatically over the last fifty years. Once

poor people lived in shacks in the more vulnerable areas of this nation — the hills and the flood plains. Now the rich have moved to such riskier but more scenic areas; moreover, unlike the poor, the rich reside in far more substantial and expensive structures. They also purchase much more insurance. The result is that the insurance industry has much greater financial exposure to severe climatic events than in years past. Of course, insurance premium revenue for this storm-related line of business has also increased. Had these demographic changes, such as the move to locate more expensive structures in higher risk areas and to insure them more heavily, been accompanied by appropriate changes in rates and policy terms, there would have been no insurance crisis. The insurance industry sells risk contracts; a riskier world, per se, constitutes an opportunity, not a threat for such companies.

The problem is less the weather than the fact that the insurance industry is highly regulated and, thereby, lacks the freedom to adjust rapidly to changing demographic risk conditions. Major storms are unusual occurences; years may pass between disasters. In the interim, firms sometimes lower their underwriting standards, attracting business that may prove unprofitable over time. The option of building a disaster reserve over a longer time period is hindered by the fact that current tax laws treats such reserves as profits, making it more costly to set aside premium revenue to offset such long-term liabilities. In today's highly regulated world, severe climatic events such as Hurricane Andrew can indeed create major problems for insurance companies but the problem is more government expropriation and interference than Mother Nature.

Higher disaster insurance rates, of course, would help to offset such losses and some insurance leaders no doubt felt that their regulatory overseers would be more likely to approve such rate increases if they could blame the problem on global warming. By joining forces with the powerful environmental establishment, these business leaders may well have believed they would gain favor. Some even hoped to persuade the government to nationalize the catastrophic risk insurance business. Not surprisingly, those insurance spokesmen who took this stance have been applauded by the environmental establishment, eager to broaden their coalition. Since the costs of carbon withdrawal policies will largely fall on groups outside the insurance sector, the insurance industry has little reason to oppose global warming policies in any event.

Nonetheless, this approach still creates some problems for the insurance industry. First, note that the real problems of the insurance industry remain political, not climatic. Those in the industry seeking a more robust environment in which to operate gain little by short-term improvements in rates. True change requires deregulation and tax reform. Moreover, by endorsing a political approach to risk management, the insurance industry runs the risk of encouraging government to push them out of the risk management field. Government flood insurance has long been a national disgrace; do we really wish to expand its ambit to the storm damage area? If catastrophic global warming is a reality, then we want insurance costs to go up in storm-prone areas. How likely is that outcome if politics determines rates? Can we imagine a political entity rushing to impose higher premiums

on shore front properties than on inland properties? Certainly, the experience with federal disaster relief and federal flood insurance suggests that government exacerbates rather than reduces the risks of imprudent social investments.

Even worse, politicians sometimes fail even to enforce those building standards intended to reduce storm damage — government, after all, doesn't bear the losses. In the aftermath of Hurricane Andrew, it was found that, despite stringent building standards, many Florida houses lacked the roof tie-downs required by code. But, of course, it was the insurers and not the county officials that bore the resulting losses. Finally, state guarantor funds raise a moral hazard problem by forcing better capitalized and managed firms to co-insure their less capable competitors. (A similar policy, federal deposit "insurance," exacerbated the S&L disaster of the 1980s.) And, of course, regulation also restricts the ability of private insurers to tailor terms, such as minimum deductibles, co-payments, caps, and exclusions, to better match the varying risks within an area. Regulation restricts competition to a narrow range and leads to greater chance of miscalculation. The catastrophic losses suffered by insurance firms in recent years reflect more an abusive government, than an abused Mother Nature.

For these reasons, we would be better advised to view the global warming issue as an opportunity to seek a rethinking of the wisdom of insurance regulation, not as a means of encouraging even greater political interference with energy or insurance markets. We should pursue policies that would enhance society's ability to meet the growing demand for creative risk management services, rather than seeking further government involvement. Freeing up the insurance sector to play a more expansive risk management role in society is critical. Insurance is one of the most important activities conducted in the marketplace, allowing families with average incomes to enjoy the peace-of-mind once available only to the rich. Indeed, whether global warming constitutes a real or illusory threat, an expanding private insurance sector is essential. The same can be said to some degree for virtually every industry sector. Government restrictions are not amenable to dynamic risk management.

The Superiority of Resiliency

Insurance is an important sector, but the discussion above applies to the broader question raised earlier: How can we decide the facts of the global warming debate? What is an appropriate response? Should we adopt the Prevention Strategy or the Resiliency Strategy? The result of such choices was suggested in Exhibit 2. Those favoring expanded political control of the world economy seek to short circuit this process, arguing that only a political approach and then only one focused on stopping change, not adapting to it, offers any true "solution." Disingenuously, this group often argues that minimally we adopt a "no regrets" policy — do those things that should be done in any event. To this group, of course, this implies reducing America's "wasteful" use of energy and materials, moving toward "sustainable development." But, as the insurance example illustrates, a more useful view of the "no regrets" policy would focus on reforming the political process,

freeing up industry to play a more effective role in improving our ability to address whatever risks the future may bring.

A thoughtful policy would rely on improving society's generalized abilities to address disaster, not to seek to prevent the one disaster focused upon by the environmental establishment. Consider again the way in which storms affect various nations. Violent tropical storms occur in both America and Asia. When a hurricane occurs in Florida, people are alerted early and move out of the path of the storm. Our nation's sophisticated communication and technological infrastructure make possible such targeted and timely warnings. The widespread availability of private automobiles gives people the mobility to do so. The wealth of our society makes it possible for our people to incur the expenses of such temporary relocation, and funds rapid clean-up, restoration, and recovery.

The storms in Bangladesh are not dissimilar. Yet Bangladesh lacks the wealth, the communication technology infrastructure, and the mobility needed to respond to such risks. The risks are the same, but the resiliency of our two countries is very different. The results reflect this. In the United States, very few people die from climatic disturbances. In Bangladesh and the poorer areas of the world, the fatality lists are tragically long. Is it better to divert wealth to reduce an already low likelihood that current fossil fuel might increase the severity and/or frequency of storms, or would we achieve more by assisting these poorer nations to gain the greater wealth and technological skills which make such climatic disturbances less risky to our own societies? This is the question on which the global warming debate should focus.

A true "no regrets" policy would focus on improving our resiliency and capacity for adaptation. This would involve a series of policy initiatives like deregulation, elimination of government subsidy programs, and privatization of government enterprises which inhibit our ability to offset any natural disaster. We should eliminate the political preferences and subsidies that encourage certain fuels (coal, ethanol, solar) to be used rather than others that are more efficient. We should deregulate electricity generation and transmission and thereby allow the most efficient (and typically least-polluting) firms to expand output. We should remove all regulatory barriers that now limit our ability to innovate and therefore create new ways of achieving old results (for example, government restrictions on biotechnology pose major threats to our ability to produce more weather-robust crops and to fend off future insect infestations). We should encourage that such free market reforms occur throughout the world (by eliminating World Bank and other foreign aid programs that shore up socialist regimes). Finally, we should encourage free trade to strengthen the liberalization forces created by global competition. This would accelerate a shift away from wasteful material and energy policies and lighten man's footprint on the planet. The policies that are best for the ecology of the earth are those that are best for the economy of the earth. No policy that harms people can help our planet. That fact should be the basis of all environmental programs.

Evidence for the superiority of the Resiliency strategy is suggested by the fact that while in 1992 all the developed countries agreed to voluntary reductions of

greenhouse gas emissions, only Germany and Great Britain were successful. It's ironic that these two countries, who most avidly support stringent international political controls over the world's energy consumption, achieved their reductions by liberalizing and depoliticizing their energy markets. Germany ended support for the inefficient East German energy sector, and Great Britain stopped subsidizing her coal industry.

Whether the future will be warmer or colder, wetter or drier, stormier or more tranquil, some risks will increase and others will decline. Hampering the ability of private markets to respond to changing conditions serves no one's interests. Indeed, it can be destructive. Stanford University's Stephen Schneider suggests that those who oppose precipitous action to avert global climate change are willing to run an uncontrolled experiment on the only planet we've got. Yet Schneider and those who join him in calling for dramatic emission reductions are all too willing to run an uncontrolled experiment on the only civilization we've got.

The proper question to ask is: Should we seek to eliminate change or should we improve our abilities to adapt to an ever-changing world? America and the world will certainly face severe risks in the future, whether these will be climatic, tectonic, biological, or political is unclear. Since we cannot be sure which risks will prove dominant, I would argue that the case for improving our generalized strengths — for becoming smarter and wealthier — is decisive.

There are risks of global warming, and these risks should be balanced against the risks of the global warming policies being advanced for Kyoto. As this volume argues, the greatest risk of current carbon withdrawal policies is that they will fail to achieve any positive results while imposing major costs on the world's economy. These risks are likely to fall most heavily on the poor in the developed and developing nations. The risk of starving the world of energy is all too likely to be a world of starving people. The "Costs of Kyoto" are all too real. Once this is realized, it is likely that few policymakers will rush to join the global warming bandwagon.

Notes

[1] Al Gore, *Earth in the Balance: Ecology and the Human Spirit* (New York: Houghton Mifflin Company, 1992), pp. 177.

[2] *Dianne Rehm Show*, July 21, 1997.

[3] N. Nichols, G.V. Gruza, J. Jouzel, T.R. Karl, L.A. Ogallo, D.E. Parker, "Observed Climate Variability and Change," *Climate Change 1995, The Science of Climate Change: Contribution of Working Group I to the Second Assessment Report of the Intergovernmental Panel on Climate Change*, J.T. Houghton, L.G. Meira Filho, B.A. Callander, N. Harris, A. Kattenberg and K. Maskell, eds. (Cambridge: Cambridge University Press, 1996), p. 173.

[4] Hubert H. Lamb, *The Changing Climate* (London: Methuen,1968).

[5] Thomas Gale Moore, "Why Global Warming would be Good for You," *Public Interest*, Winter 1995.

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