

Global Warming

Introduction

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Industrial activity is affecting climate by causing an increase in average global temperatures: this idea is now widely accepted and reported as fact. While debates about the existence and extent of human-induced global warming continue among scientists, most politicians, bureaucrats, environmentalists, and members of the media choose to believe something drastic must be done to address what is touted as the biggest global environmental threat facing mankind.

The perceived magnitude of the problem has mobilized the international bureaucracy. In 1990, the Intergovernmental Panel on Climate Change (IPCC) concluded that global temperatures could increase by 0.5°F per decade unless steps were taken to control emissions of greenhouse gases. Two years later, at the Earth Summit in Rio de Janeiro, Brazil, 154 countries¹ signed a voluntary agreement to cut emissions to 1990 levels by the year 2000. After it became clear that most countries would not meet these targets, representatives agreed to meet in December 1997 in Kyoto, Japan to negotiate a treaty that would bind countries to specific emission reductions.

Many are convinced of another untested proposition: global warming is occurring as a result of human activity. So why does

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a treaty with binding commitments to reduce carbon dioxide remain controversial? Largely because any treaty that attempts to control greenhouse gas emissions will have substantial economic costs, at least in the short run: since carbon dioxide, the principal suspect, is emitted during the burning of fossil fuels, trying to reduce these emissions would affect the economies of the entire developed world.

As bureaucrats from around the world search for a solution to this environmental crisis that they have identified, discussions about global warming focus on how reductions in greenhouse gases can be achieved with minimal impact on the economy. In these discussions, the doomsayers' version of climate change is accepted as representing the "scientific consensus," scientists with legitimate criticisms of the apocalyptic theory are ignored and, as a result, fundamental scientific questions are being side-stepped in the public discussion of greenhouse gas emissions. In this case, does it make sense to take actions that we can be reasonably certain will have a high economic costs?

Background

The greenhouse effect and the enhanced greenhouse effect

In order fully to understand the popular global warming debate, one must appreciate the distinction between the greenhouse effect and the enhanced greenhouse effect. Scientists agree that there is a greenhouse effect that causes the earth to be warm. This effect occurs because greenhouse gases such as carbon dioxide, water vapour, nitrous oxide, and methane are transparent to the short wavelength radiation from the sun but opaque to the longer wavelength radiation emitted from the earth (Bate and Morris 1994: 11–14; Bailey 1995: 85–87). In simple terms, greenhouse gases trap the heat from the sun and this warms the earth.

The popular global warming debate concerns whether humans, through their additions of greenhouse gases to the atmosphere,² contribute to the greenhouse effect that occurs naturally. The idea that humans are enhancing the natural greenhouse effect dates to an article written by Svente Arrhenius in 1896. In this article, Arrhenius presents calculations suggesting that a doubling of carbon dioxide (CO₂) could lead to a temperature rise of around 5°C (Bate and Morris 1994: 13–14).

The theory of the enhanced greenhouse effect gained many advocates in the 1950s but lost popularity in the 1960s and

1970s when average temperatures fell. During the 1970s, the idea that pollution was causing global cooling by reflecting sunlight away from the earth's surface was supported by many who had earlier promoted the theory of the enhanced greenhouse effect (Bate and Morris 1994: 14). And, like the present supporters of this theory, many who then believed the theory of global cooling strongly advocated taking action to prevent global cooling—all in the absence of reliable, scientific evidence to support the hypothesis.

Two events in 1988 revived the enhanced greenhouse theory. After an unusually warm summer in the United States, James Hansen, director of the Goddard Institute for Space Studies, testified before the Senate Committee on Science, Technology, and Space that he was 99 percent certain that temperatures had increased and that there was some global warming. (Lindzen 1997: 5) This statement received widespread media attention. Also in 1988, the IPCC, a joint venture of the World Meteorological Organisation (WMO) and the United Nations Environment Programme (UNEP), was founded to assess the scientific information on climate change. Two reports have been produced by the IPCC: the first and second scientific assessments on climate change. These reports are important because they guide United Nations policy on climate change and because they have been interpreted by the media and policymakers in a way that lends credibility to the enhanced greenhouse scare while minimizing the idea that there are competing views.

The IPCC Reports

The first scientific assessment report, released in 1990, was the first declaration by the United Nations that global warming was occurring. It laid the foundations for the UN Framework Convention on Climate Change, a treaty produced at the 1992 United Nations Conference on Environment and Development in Rio de Janeiro, Brazil. This treaty calls for countries to reduce voluntarily their greenhouse gas emissions to 1990 levels by the year 2000. Although it has been signed by over 150 countries, most will not meet their targets.

The IPCC's second scientific assessment report was produced in 1996. The failure to stabilize greenhouse emissions to 1990 levels as well as the statement in the official summary of the 1996 report that "the balance of evidence suggests that there is

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a discernible human influence on climate” have brought calls for further action to be taken to mitigate climate change. Developed countries are currently considering implementing mandatory reductions in greenhouse gas emissions.

The IPCC reports provide the impetus for policy. However, these reports rely primarily on global circulation models (GC-Ms) that have been heavily criticized on the grounds that they are incapable of capturing the complexity of the atmospheric system. Since many of these complexities are not well understood, the models rely on numerous assumptions. When the assumptions change, so do the conclusions generated by the models—sometimes wildly. For example, a few years ago a climate model developed at the British Meteorological Office predicted that doubling CO₂ levels from pre-industrial levels would warm the earth by 5.2°C. After several improvements were made in the way the model captured the effects of clouds upon the climate system, the model’s response to a doubling of carbon dioxide dropped from 5.2°C to only 1.9°C. (Kerr 1997:1041).

Furthermore, the IPCC reports are huge documents filled with many caveats about the uncertainties that surround climate change. Policymakers and the media, however, often miss the caveats because they tend to rely upon summaries of the reports, which many scientists consider too distilled to reflect the appropriate levels of uncertainty about climate change. These summaries of the reports are further condensed when reported by the media to the public, and the result is a gross overstatement of the scientific consensus that the enhanced greenhouse effect is occurring and that it is significant. These reports understate the uncertainty, dissension, and controversy surrounding the issue. Complex scientific debate does not make good headlines.

Richard Lindzen, a climatologist at the Massachusetts Institute of Technology, explains some of the problems with the IPCC’s 1990 report.

The report, as such, has both positive and negative features. Methodologically, the report is deeply committed to reliance on large models. Given that models are known to agree more with each other than with nature (even after “tuning”), that approach does not seem promising. In addition, a number of the participants have testified to the pressures placed on them to emphasize results supportive of the current scenario

and to suppress other results. That pressure has frequently been effective, and a survey of participants reveals substantial disagreement with the final report. (Lindzen 1997: 7)

Lindzen goes on to explain how the summary for policymakers fails to convey the uncertainty expressed in the larger report. The summary, written by the editor, Sir John Houghton, largely ignores the uncertainties and caveats of the full report and tries to present the anticipation of substantial warming as firmly based science. Since, the summary was also published as a separate document and policymakers are unlikely to read anything more, one frequently hears people say, on the basis of the summary, that hundreds of the world's leading climate scientists have all agreed that we can expect any of several extreme scenarios for global warming. To be fair, the summary does not, in fact, support the more extreme scenarios.

Scientific consensus?

There are many scientists, including those who have contributed chapters to this book, who disagree with what has been popularized as the consensus. In fact, the only real consensus in the global warming debate is that there is a great deal of uncertainty about predicting future climate changes and it is difficult to determine why these changes occur. According to a 1992 Gallup poll of members of the American Geophysical Union and the American Meteorological Society (the two professional societies whose members are most likely to be involved in climate research), only 18 percent thought some global warming had occurred, 33 percent said insufficient information existed to tell, and 49 percent believed no warming had taken place (Bast, Hill, and Rue, 1994: 55). Even before the Rio conference in 1992 and the appearance of wide-spread agitation for emissions controls, many scientists were concerned about how political the scientific reporting had become. A letter signed by over 50 scientists states:

As independent scientists researching atmospheric and climate problems, we are concerned by the United Nations Conference on Environment and Development (to be held in June 1992 in Rio de Janeiro), being developed by environmental activist groups and certain political leaders . . . [T]he

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policy initiatives derive from highly uncertain scientific theories. They are based on the unsupported assumption that catastrophic global warming follows from the burning of fossil fuel and requires immediate action. We do not agree. (Bast, Hill, and Rue 1994: 55)

Another survey of state climatologists done in the United States found that by a 44 percent to 17 percent margin, climatologists agreed that “recent global warming is a largely natural phenomenon.” According to the results of the same survey, 9 of 10 climatologists agreed that “scientific evidence indicates variations in global temperature are likely to be naturally occurring and cyclical over very long periods of time” and 89 percent agreed that “current science is unable to isolate and measure variations in global temperatures caused only by man-made factors” (CSE 1997).

This lack of consensus is found even among scientists who have contributed to the IPCC reports. Indeed, according to a recent issue of *Science* magazine: “IPCC scientists now say that neither the public nor many scientists appreciate how many if’s, and’s, and but’s peppered the report” (Kerr 1997: 1040). The article goes on to explain that uncertainties about the models used to predict future climate change have increased.

The models are key to detecting the arrival of global warming, because they enable researchers to predict how the planet’s climate should respond to increasing levels of greenhouse gases. And while predicting climate has always been an uncertain business, some scientists assert that developments since the IPCC completed its report have, if anything, magnified the uncertainties ... Indeed, most modelers now agree that the climate models will not be able to link greenhouse warming unambiguously to human actions for a decade or more. (Kerr 1997: 1040)

Promoting apocalypse

If there is no scientific consensus, why are countries considering adopting costly policies based on the shaky hypothesis that human additions of carbon dioxide to the atmosphere are significantly affecting climate? The standard explanation for the influence of the global warming movement is that politicians are

catering to constituents who have been convinced of a crisis by environmentalists and the media. Although this formula describes how action on many environmental issues has developed, it does not adequately explain the push to adopt policies to curb climate change. Global warming does not have the strong grassroots support of many, more local, environmental issues such as saving trees, whales, or spotted owls. Because the case for checking global warming has less direct appeal, the loudest call to action is coming not from the electorate but from a powerful coalition of bureaucrats, politicians, and those environmentalists who see an opportunity to attack economic growth.

There are a number of groups promoting greenhouse gas reductions. As Richard Lindzen points out,

carbon dioxide is vitally central to industry, transportation, modern life, and life in general . . . The remarkable centrality of carbon dioxide means that dealing with the threat of warming fits in with a great variety of preexisting agendas—some legitimate, some less so: energy efficiency, reduced dependence on Middle Eastern oil, dissatisfaction with industrial society (neopastoralism), international competition, government desires for enhanced revenues (carbon taxes), and bureaucratic desires for enhanced power. (1997: 9)

Promoting apocalypse: the bureaucratic/political agenda

Perhaps those with the most to gain from promoting the idea that carbon dioxide is a pollutant are bureaucrats. According to public-choice models, bureaucrats, unlike firms in the private sector, face incentives to maximize the resources at their disposal rather than to use resources efficiently. “For a government department, doing business requires spending as much as you can in as many areas as you can. Ministries view their activities as having benefits for which no ‘price’ can exceed the value of the service and with no one goal having a greater value than another” (Mihlar 1995: 13). Since the only real scarcity that is faced when building a regulatory empire is the tax revenue to support it, it is easy to understand why bureaucrats are mostly in favour of taking action on climate change. That resources used to combat the supposed greenhouse gas crisis would no longer be available for other potentially more important social goals is not a concern. Devising, implementing, and enforcing plans to control

carbon dioxide would require an enormous expansion in regulation at both the national and international levels. In addition, a carbon tax, which would be the most straightforward way to control emissions, could easily fund this regulatory expansion.

There is another interesting explanation for the appeal of international agreements like the one being proposed for the meeting in Kyoto. It has become easier for firms to relocate in order to avoid cumbersome regulations and escape taxation. For example, many Canadian mining companies have stopped investing in Canada as more worldwide opportunities become available. Governments then face a choice: either compete or form an agreement to have the same rules. The European Union refers to this kind of regulatory co-operation as “harmonization.”

While the motives of civil servants may be quite clear, those of politicians are less so. Why would any politician support measures that are likely to harm economic growth? While the economy is always an important political consideration, it is never popular to oppose environmental regulation on the grounds that it might cost too much. Since the environment is a motherhood issue, no politician wants to take a position against saving the earth and it is difficult to oppose the bureaucratic agenda without appearing anti-environment. Instead, politicians debate and consider the possible economic alternatives while never challenging the premise that there is a need to take action.

Many in the business community have also been co-opted in this debate. Business leaders, like politicians, are reluctant to appear anti-environment. In addition, industries less dependent upon carbon see an opportunity to gain an advantage over their competitors. Finally, some in the business community are under the false impression that if there is a level playing field—as long as everyone has to pay the same tax or abide by the same regulations—there will be no negative consequences.

Is it any surprise that the scientific questions get short shrift in the debate and that the discussions that do occur about economic considerations only lend more credibility to the idea that there is a crisis? After all, why would politicians be considering costly remedies, if there were no serious problem?

Promoting apocalypse: the role of the media

Statements such as the following from the *Globe and Mail* now appear regularly in news reports:

There is a growing scientific consensus that heat-trapping gases are building up in the atmosphere, and that if no significant action is taken to curb them, temperatures could rise and disrupt the climate. The risks of a hotter world include wilder weather such as hurricanes and tropical storms, and the spread of tropical diseases such as malaria. (Greenspan and McIlroy 1997: A17)

The same article quotes two environmentalists and a Health Minister, who claims—with one eye, no doubt, on the expansion of his Ministry's empire—that “the health implications of global warming are serious and the cost of not taking action is too high.” No scientists are directly quoted in the article.

Chris Cragg, editor of the *Financial Times Energy World*, advances several explanations why the media coverage on global warming has been so one-sided. According to Cragg, there are 4 rules followed in journalism: (1) make things simple, (2) make things variable, (3) make things easy to read and (4), if possible, make things sensational (Cragg 1997: 14). Several of these rules are in direct conflict with good scientific reporting. Bad news sells newspapers and complex, scientific debate does not make for catchy headlines. As a result, many caveats found in the scientific reports on climate change disappear. The media have bought into the ill-founded idea that the world is facing a climatic disaster, and the consensus about apocalyptic global warming that they have manufactured is more easily accepted since many “experts” whom they interview are not climatologists; some are not even scientists.

Promoting apocalypse: the environmentalist agenda

Global warming is an issue particularly attractive to environmental advocacy groups because, even if they did not believe that CO₂ is a pollutant or that global warming is a serious threat brought about by human activity, limiting carbon dioxide emissions is an excellent way to stop economic growth. Why this desire to halt economic progress?—because they presume environmental degradation is the result of such progress.

Michael M’Gonigle, a long-term Greenpeace activist captures the sentiment of many environmentalists in the following statement “the market—the very nature of the free market—is inherently anti-environmental. Free trade and the growth mechanism . . . we can tag all the environmental caveats [onto them] that we

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want, but the direction of ever increasing free trade is by its very nature, anti-environmental” (Dale 1996: 51–52). This belief that free markets, economic growth, and free trade are inherently anti-environmental prompts environmental activists to demand increased regulations that will stifle economic growth and reduce economic activity.

The crusade against economic growth has led some environmentalists to be the most vocal advocates of global disaster. David Suzuki and Anita Gordon, for example, devote a chapter of their book, *It's a Matter of Survival*, to describing a warmer world in 2040. According to their book, forests will disappear, fisheries will be affected, and there will be widespread starvation as agricultural productivity declines. In addition, as sea waters rise, coastal towns will be destroyed. For Canada? They predict that, by the year 2040, as a direct result of global warming

the three largest cities—Toronto, Vancouver, and Montreal—[will have] populations of well over 10 million each, the majority living in shanty-town slums on the outskirts or in the decayed inner-city cores. But in addition there [will be] refugee tent cities in various parts of the country, and an estimated two million or three million people [will be] roaming the country, searching for food and shelter. (Gordon and Suzuki 1990: 21).

Could Hollywood do better?

In the face of this scenario, it is important to note that several recent studies support the idea that higher incomes lead to less pollution. According to the World Bank, pollution rates for particulate matter and sulphur dioxide begin to fall when per-capita incomes reach US\$3,280 and US\$3,670 respectively (Goklany 1995: 342). Access to safe drinking water and the availability of sanitation improve almost immediately as incomes rise. A study by economists Gene Grossman and Alan Krueger (1995) finds that most indicators of pollution start to fall before a country reaches a per-capita income of \$8,000 (1985\$US). In other words, once people can afford to meet their most basic needs, amenities like environmental quality start to become a priority. In a paradoxical way, then, carbon controls, like other environmental regulations that reduce the pace of economic development, may actually increase the extent of environmental degradation and its tangible local effects.

The Economics of Global Warming

Many environmentalists argue that we must take action to mitigate the effects of global warming even if we are uncertain about what those effects may be. They refer to the precautionary principle to defend the idea that “we cannot afford not to act now.” But, economic resources are scarce and, in light of that scarcity, choices are constantly being made that involve trade-offs. For example, if we spend more money on health care, less may be available for education. Thus, it is impossible to apply the precautionary principle uniformly. We simply do not have the economic resources to address all the potential crises that we might imagine.

In the debate over global warming, the relevant economic concern is to weigh the costs of taking action against the costs of doing nothing. As global warming is a theory and not a fact, doing nothing about it might indeed be costless. But, even if global warming is occurring, many scientists agree that delaying action by 15 to 25 years would not impose serious additional costs (Balling 1995: 103). Furthermore, the costs of any global warming that might be occurring (whether the result of human activities or not) are likely to be exaggerated. Several of the authors in this book show that there may be benefits from warming.

Much attention in the debate over global warming has been focused on economic questions like the following. How much is reducing carbon dioxide emissions likely to cost? Should targets for countries be uniform or differentiated? What is the best way to achieve the proposed reductions? Carbon taxes? Emissions permits? Command-and-control style regulation? It is important to note that many of the economic models suffer from the same problem that the models of climatic change do: they are all predictions based on a particular set of assumptions. If the assumptions are changed, the predictions of the economic models change as well. These assumptions concern the model structure, demographic projections, economic growth projections, policy options chosen, and the cost and availability of long-term supply options. There is a wide range of possible outcomes including those that predict that some form of carbon reduction would improve economic performance. However, given current dependence on fossil fuel, economists are reasonably certain that in the absence of any major technological breakthroughs, dramatically reducing carbon dioxide emissions would be very costly, at least in the short term.

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A study done for Industry Canada by DRI, for example, found that a carbon tax of \$150 (1990 \$CAN) per tonne would be required to stabilize CO₂ emissions at their 1990 levels by the year 2000. This would result in a loss in real GDP of 2.4 percent (Mcgraw Hill 1997: 21). Another study suggests that to stabilize CO₂ emissions at 1990 levels by the year 2000 would require a carbon tax of US\$16 per barrel of oil or 40 cents per gallon of gasoline. This type of tax could reduce GDP in the United States by as much as 2.3 percent per year; it would be like living through the oil crisis of the 1970s again. These types of taxes, of course, hit those at the lowest incomes hardest (Business Round Table 1997: 12–13). Most of the economic studies predict that it would be more costly for Canada to meet emission reductions than for other countries because of our energy-intensive economy.

Even if developed countries agree to stabilize emissions of CO₂ and other greenhouse gases to 1990 levels, this is unlikely to have much effect because most of the increase in those emissions will come from the countries of the developing world, which are not able to control emissions and unlikely to agree to try to do so. In fact, the treaty likely to come out of Kyoto may increase air pollution of all kinds since energy-intensive industries that want to avoid the restrictions put in place in the developed countries are likely to migrate to countries that are exempt and that, even now, are home to inefficiency and pollution.

For example, India, the fifth largest emitter of CO₂, uses approximately three times the energy and emits four times the CO₂ per unit of gross domestic product as the United States. China is even less efficient, using approximately five times the energy and emitting eight times the CO₂ per unit of GDP as the United States. (Adler 1997: 1–2).

Do such exemptions really make sense?

Back to the science

This book attempts to redress some of the imbalance in the debate about global warming by refocusing on some fundamental questions. The authors are scientists from well known institutions across the North America. Many of them have contributed to IPCC reports.

Patrick Michaels details the scientific evolution of global warming. He provides a good overview of the scientific evidence on global warming and explains why “mandatory reductions in greenhouse-gas emissions are increasingly difficult to justify in light of what is now known about greenhouse science.”

Roger Pocklington emphasizes that trend analysis of surface temperatures in and around the extratropical North Atlantic Ocean shows that cooling has prevailed in the region during the latter half of this century and that such warming as has occurred in the present century is not exceptional in an historic context. These empirical data do not support the hypothesis that the world is warming to an unprecedented degree.

John Christy details evidence from satellite records. His paper shows that global temperature measurements from satellites since 1979 indicate the earth’s atmosphere is not warming at a rate comparable with predictions from recent models of the enhanced greenhouse climate. He also explains why natural variability of the climate and uncertainty in our understanding of the earth’s climate system make it difficult to identify the causes and effects of climate fluctuations attributable to the greenhouse effect. Finally, he shows that the conclusions of the 1996 IPCC report concerning global warming are consistent with these statements.

Sallie Baliunas and **Willie Soon** give evidence that indicators of change in the surface magnetism of the sun, or the length of the sunspot cycle, are correlated extremely closely with the combined instrumental and reconstructed temperature records extending back to *ca.*1750 C.E. Observations of the sun and sunlike stars suggest that change in the total irradiance of the sun, which corresponds to variation of its surface magnetism, is a plausible mechanism for terrestrial climate change on time scales of decades to centuries. Results from climate simulations show that changes in the total solar irradiance may be an important factor in explaining the variance of temperature records, especially over the last 100 years.

In *Real-World Constraints on Global Warming*, **Sherwood Idso** reviews the negative feedbacks that are believed by the detractors of global warming to reduce or reverse initial warming greatly. He explains that it is not the CO₂ greenhouse effect that is in question and that, *in isolation*, rising concentrations of atmospheric CO₂ do have a tendency to cause warming. However, the

feedbacks that occur in response to this warming are of a negative kind. He discusses three major categories of negative feedback mechanisms: (1) rising temperatures may strengthen the cooling properties of clouds; (2) rising temperatures can intensify biological processes that eventually can enhance some of the cloud cooling properties; (3) some of these biological processes are enhanced by the rise in CO₂ and are not dependent upon an initial warming to set the cloud-cooling processes in motion.

Robert Davis examines one of the most common myths associated with a hypothetical human-induced climate change. His chapter, *Extreme Weather, Atmospheric Circulation and Global Warming*, challenges the idea that warming would cause our future climate to be more extreme. According to Davis, observations and theory indicate that a warmer climate would be less extreme than at present. Careful examination of atmospheric circulation (winds near the surface and in the upper air) suggests that the historical changes are not associated with the kind of signal we would expect from global warming.

Robert Balling gives a thorough explanation of the development of the supposed connection between hurricanes and global warming. As with many areas in the debate, it is fascinating to get some insight into how science differs from the public perception. Balling explains how the debate was given credibility after the publication of an article by Kerry Emanuel. That article, which provided a theoretical discussion of the upper limit of hurricane intensity, was taken out of context and interpreted by the media (and, therefore, the public) to mean that hurricanes would increase in frequency and intensity. He then explains how the work of many scientists casts doubt on this conclusion: research done by hurricane scientist William Gray, for example, shows that Atlantic hurricane activity from 1970 to 1987 was less than half the activity observed between 1947 and 1969. Gray discovered that hurricanes did not show the increase in number or intensity that had been claimed by doomsayers. Other research that Balling discusses finds that when the relationship between temperature and hurricane activity is examined, it is warmer years that produce the lowest number of hurricane days while cooler years produce a greater-than-average number of hurricane days.

Although Balling points out that there have been articles in journals both supporting and challenging the prediction of increased hurricane activity in response to the increase in green-

house gases, he also makes clear that the substantial body of evidence challenging the doomsayers' predictions receives very little attention. He concludes that "a highly popular view has developed that the buildup of greenhouse gases will cause the sea surface and atmospheric temperatures to rise, and this will result in an increase in the number and intensity of damaging hurricanes around the world. But, as with so many other elements in the greenhouse debate, the theoretical and empirical evidence is not very supportive of this claim. Indeed, there is plenty of evidence to argue that the greenhouse effect will suppress hurricane activity."

In the final chapter, **Sherwood Idso** attacks the idea that increases in CO₂ emissions will be a universally destructive phenomenon. He argues that the increasing concentration of CO₂ in the atmosphere since the industrial revolution has had significant beneficial effects upon plant growth and upon efficiency of water use by plants. Idso reviews some of the hundreds of little-publicized experiments that show that the more carbon dioxide there is in the air, the better plants perform their vital functions. He stresses the importance of these results "for they are the only consequences of the rising CO₂ content of earth's atmosphere about which we can be truly confident." He points out that "[i]n spite of the impressive body of evidence that has established the reality of the many biological benefits of atmospheric CO₂ enrichment, many people find it difficult to believe that a gaseous effluent of our industrial society might actually be good for the biosphere (Gore 1992)."

The papers in this volume make it clear that global warming is not a settled issue. The scientists raise important questions about the validity of the hysteria over global-warming. It is time to revisit these questions.

Notes

- 1 When the treaty was open for signing at the Earth Summit, representatives from 154 states signed. By the time the treaty was closed on June 19, 1993, 165 states had signed. (www.globalwarming.org/brief/inbrief.htm)

- 2 Scientists do not dispute that the increase in equivalent CO₂ has occurred. Since the Industrial Revolution, equivalent CO₂ levels have risen from approximately 290 ppm to nearly 440 ppm in 1994 (Bailey 1994: 87). Humans do not, however, contribute to the main absorbers of infrared light in the atmosphere. Water vapour and clouds are responsible for over 98 percent of the current greenhouse effect (Lindzen 1997: 2).

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