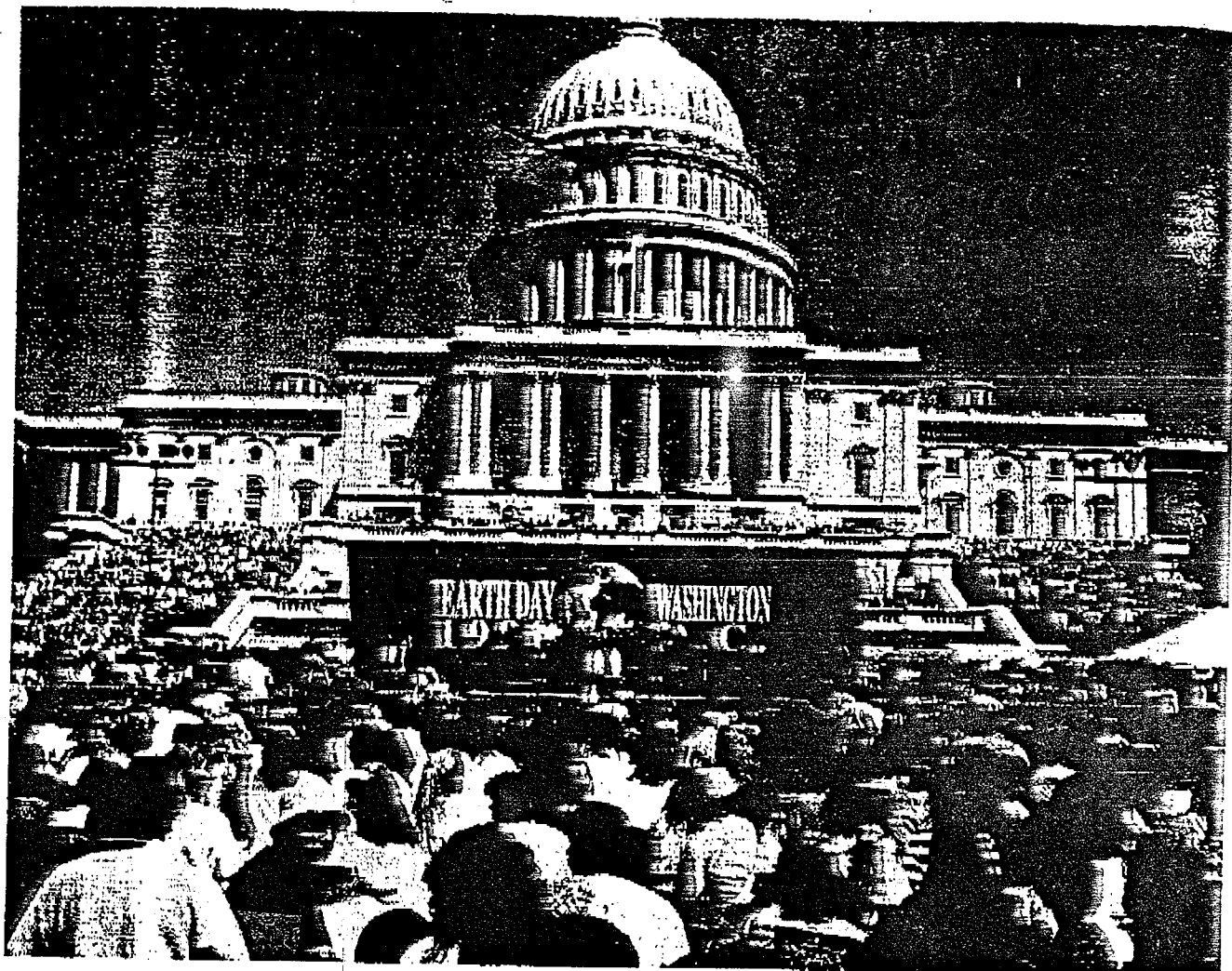


# What to do about greenhouse warming



By S. Fred Singer

Earth Day celebrations and a White House Environment Conference held in April 1990 focused attention on the possibility of greenhouse warming (GHW) being the issue of the 1990s. The easing of international tension with the Soviet Union could make GHW one of the most important foreign policy issues.

The wide acceptance of the Montreal Protocol—which limits and rolls back the manufacture of chlorofluorocarbons (CFCs), considered a threat to the stratospheric ozone layer—has encouraged environmental activists at conferences in Toronto (1988) and The Hague (1989) to call for similar controls on carbon dioxide. They have expressed disappointment with the White House for not supporting immediate action on CO<sub>2</sub>, which is produced by the

burning of oil, gas, and coal and is presumed to be the major greenhouse gas. But should the United States assume "leadership" in this campaign, or would it be wiser to first ensure through scientific research that the problem is both real and urgent?

The scientific base for GHW includes some facts, lots of uncertainty, and just plain ignorance; it needs more observations, better theories, and more extensive calculations. Specifically, there is consensus about an increase in so-called greenhouse gases (CO<sub>2</sub>, CFCs, methane, nitrous oxide, ozone) in the Earth's atmosphere as a result of human activities. There is some uncertainty about the strength of sources and sinks for these gases and their rates of generation and removal.

There is major uncertainty and dis-

agreement about whether this increase has caused a change in the climate during the past 100 years; observations simply don't fit the theory. There is also major disagreement in the scientific community about predicted changes from further increases in greenhouse gases; the models used to calculate future climate are not yet refined enough to simulate nature. As a consequence, we cannot be sure whether the next century will bring a warming that is negligible or a warming that is significant.

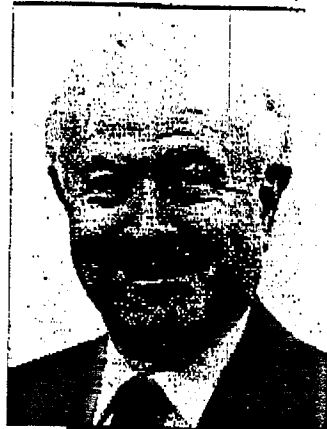
Finally, even if there is a warming and associated climate changes, it is debatable whether the consequences will be good or bad; likely we will get some of each. (The good consequences of GHW would be more rapid plant growth, longer growing seasons, and improved global food production.)

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S. Fred Singer

### The climate record

Has there been a climate effect caused by the observed increase of greenhouse gases in the last decades—about 50%, when expressed in CO<sub>2</sub>-equivalent terms? The data are ambiguous to say the least. Advocates of immediate action profess to see a global warming of about 0.5 °C since 1880 and point to record temperatures experienced in the 1980s. Others, especially scientists, tend to be more cautious. They call attention to the fact that there has been no increasing-temperature trend during the 1980s (as recently confirmed by satellite observations); the strongest increase occurred before 1940, before the major rise in greenhouse gas concentration, and it was followed by a quarter-century decrease, between 1940 and 1965, when concern arose about an approaching ice age.

It is therefore fair to say that we haven't seen the expected greenhouse warming in the temperature record. But why not? Suggested solutions to this scientific puzzle include the following.

- The GHW has been "soaked up" by the ocean and will appear after a delay of some decades. Plausible, but there is no evidence to support this theory.
- The GHW exists as predicted, but has been hidden by offsetting climate changes caused by volcanoes, solar variations, or other causes as yet unspecified—such as the cooling from an approaching ice age. Some scientists consider the warming observed before 1940 to be a recovery from the "Little Ice Age" that prevailed from 1600 to about 1850. Each of these causes has vocal proponents and opponents in the scientific community, but the jury is out until better data become available.
- The GHW has been overestimated by the existing models. Meteorologists Hugh Ellisasser and Richard Lindzen demonstrate that the models cannot properly account for tropical

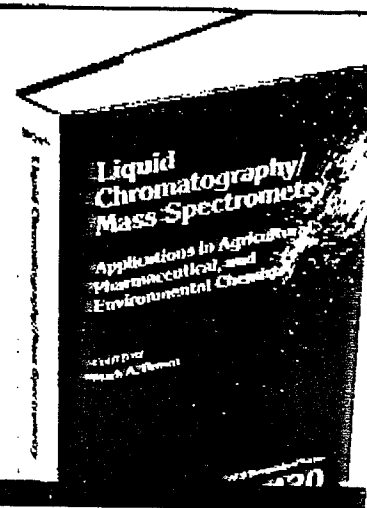
convection and thereby overestimate the amplifying effects of water vapor—the most important greenhouse gas. Other atmospheric scientists suggest that the extent of cloudiness may increase as ocean temperatures try to rise and as evaporation increases. Clouds reflect incoming solar radiation; the resultant cooling could off-set much of the greenhouse warming.

My conclusion can be summed up in a simple message: *The scientific base for a greenhouse warming is too uncertain to justify drastic action at this time.* There is little risk in delaying policy responses to this century-old problem because there is every expectation that scientific understanding will be substantially improved within a few years. Instead of taking premature actions that are likely to be ineffective, we may prefer to use the same resources—a few trillion dollars by some estimates—to increase our economic resilience so that we can then apply specific remedies if and as necessary. That is not to say that some steps cannot be taken now; indeed, many kinds of energy conservation and efficiency increases make economic sense even without the threat of greenhouse warming.

Drastic, precipitous, and especially, unilateral steps to delay the putative greenhouse impacts can cost jobs and prosperity without being effective. Yale economist William Nordhaus, one of the few who has been trying to deal quantitatively with the economics of the greenhouse effect, has pointed out that "... those who argue for strong measures to slow greenhouse warming have reached their conclusion without any discernible analysis of the costs and benefits. . . ." (His paper was presented at an AAAS symposium in New Orleans, February 1990.)

It would be prudent to complete the ongoing and recently expanded research so that we will know what we are doing before we act. "Look before you leap" may still be good advice.

*S. Fred Singer, professor of environmental sciences at the University of Virginia, has served as chief scientist of the Department of Transportation, as deputy assistant administrator of the Environmental Protection Agency, and as the first director of the U.S. weather satellite program in the Department of Commerce. An atmospheric and space physicist, he developed satellites and instruments and predicted the increase of atmospheric methane due to human activities. His most recent book is Global Climate Change, published by Paragon House, New York, NY, 1989.*



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Mark A. Brown, Editor, California Department of Health Services

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