Fact and Fancy on Greenhouse Earth
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By S. Fred Singer

A hot summer, plus drought in parts of the U.S., has renewed longstanding concerns about the atmospheric greenhouse effect and spawned both doomsday scenarios and legislative proposals to stabilize the climate. As usual, we are dealing with a mixture of fact and fancy. Here are some of the facts:

• The concentration of several minor atmospheric constituents is increasing because of human activities. These trace gases include carbon dioxide, mainly from fossil-fuel burning and cutting down of forests; nitrous oxide, mainly from fertilizers; methane from a variety of natural and human sources; and chlorofluorocarbons (CFCs), synthetic chemicals widely used in refrigeration, air conditioning and plastic-foam manufacture.

• These molecules, because of their inherent radiative properties, enhance the normal greenhouse effect of the atmosphere that relies mainly on existing water vapor and carbon dioxide.

• The enhanced greenhouse effect should increase the earth's average temperature *provided that all other factors remain the same.* Any climatic change has a multitude of consequences; some are beneficial, many are not.

Aside from these facts, all the rest is theory at best, speculation at worst. The crucial issue is to what extent "other factors remain the same." In technical language: Will changes in the atmosphere, ocean or land surface reinforce the climate change (thus causing positive feedback) or will these changes counteract and partly cancel the climate warming (negative feedback)? For example, as oceans warm and more water vapor enters the atmosphere, the greenhouse effect will increase somewhat, but so should cloudiness—which can keep out incoming solar radiation and thereby reduce the warming.

More Research Is Needed

The theory of climate change is not yet good enough to provide a sure answer to the fundamental question: How important is the enhanced greenhouse effect? More research is needed on atmospheric physics and on modeling the atmosphere-ocean system. Nor can observations over the past century positively disentangle climate fluctuations from long-term trends.

Observed trends do not agree with expectations from greenhouse theory. A large temperature increase of 0.6 degree Celsius, or about 1 degree Fahrenheit occurred between 1880 and 1940, well before human influences were important. (Despite the growth of heavy industry during that period, the amount of fossil fuels burned for energy was small compared with those burned today.) A temperature decline occurred between 1940 and 1965, followed by a sudden warming of about 0.3 degree Fahrenheit since 1975—too short a period to discern a trend.

We have had more than enough examples of inadequate theories during the past decades:

• In the early 1970s it was believed that a fleet of supersonic transports could destroy the stratospheric ozone layer. Now we suspect that the opposite is true—thanks to better data and theories. In fact, SST exhausts are likely to counteract the damaging effects of CFCs on ozone.

• Only a few years ago it was thought that acid rain could be reduced just by cutting smokestack emissions of sulfur dioxide. Now we recognize nitrogen oxides as a culprit as well; without cutting nitrogen oxides, reductions in sulfur dioxide may not be effective.

• "Nuclear winter" was supposed to freeze the earth and possibly destroy all human existence. Now we realize that while smoke clouds from fires can darken the sky, the temperature may not fall by much. The theory had neglected the possibility that the smoke cloud may act as a heat blanket, causing its own greenhouse effect. Under some circumstances, a low-altitude smoke cloud would even warm the earth, not cool it.

These examples should induce a certain amount of skepticism and make us somewhat more humble about the ability of theory to predict the future of the atmosphere and of climate.

In the meantime however, a cottage industry has sprung up on "climate policy"—not climate science—populated by professional regulators, environmental activists and assorted scientists—all heavily supported by foundations. They attend delightful international conferences, write repetitive papers and testify before important congressional committees—all about a problem that may or may not be real—and which in any case may defy any easy solution.

Consider some of the remedies proposed:

• Drastically limiting the emission of carbon dioxide means cutting deeply into global energy use. But limiting economic growth condemns the poor, especially in the Third World, to continued poverty, if not outright starvation.

• Substitutes for fossils, such as hydro, geothermal, solar energy and wind, are all useful in particular applications but are not enough to reverse the growth of atmospheric carbon dioxide. In addition, their wide use would require exorbitant capital investments and could be environmentally damaging. (For example, the energy needs of a three-member household could be met by solar cells covering a whole football field's worth of vegetation.) Curiously, the N-word is only occasionally mentioned—yet nuclear energy is the only realistic, abundant, economic and widely accepted energy source that produces no greenhouse effect and little environmental impact—if properly handled.

• Energy conservation is much to be desired, and there are many unexploited opportunities, to be sure. But there are also great costs involved if carried too far, and even environmental problems—such as indoor air pollution, including radon, in energy-efficient buildings. Realistically speaking, more conservation can only nibble at the carbon dioxide problem, not solve it.

• While we might limit the emissions of CFCs, and even carbon dioxide and nitrous oxide, by drastic controls and world-wide regulation, no one has figured out what to do about the growing atmospheric concentration of methane, an important greenhouse gas, contributing about 20% of the effect—as against 50% for carbon dioxide. Scientific data from the past tell us that methane has been increasing steadily from sources and for reasons we don't fully understand. There is little point in making extreme efforts to control one set of gases while leaving another untouched.

No Palm Trees in New York

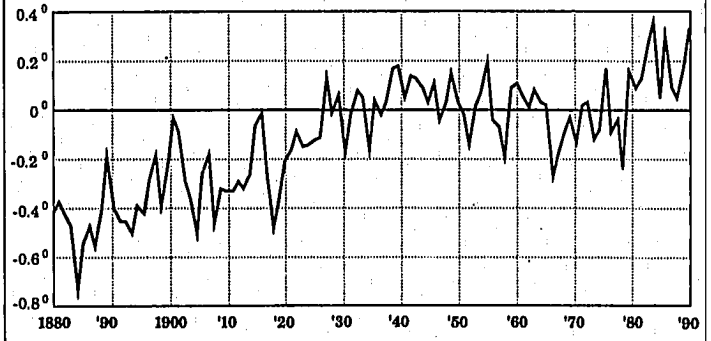
But the climate can and does change—and we should be aware of the need to adjust to change. In the last interglacial period, 125,000 years ago, sea level was up 20 feet—all without any human help. What should concern us most is a very rapid change in climate, one to which our economy cannot adjust. Adjustment problems certainly would exist for agricultural soils, which require hundreds or thousands of years for their generation. Climate may indeed change, with or without human interference, but there won't be palm trees in New York, cotton in Toronto, or wheat in Labrador—even by the year 2100.

Congress has heard from a reputable scientist, James E. Hansen of NASA's Goddard Institute, who is "99 percent sure" that the greenhouse effect "is here." Perhaps this means the temperature should rise according to the prediction of standard greenhouse theory. That rise is at least 1 degree Fahrenheit per decade; we won't be able to miss it if it happens. Other reputable but less vocal atmospheric scientists estimate the rise as much less, however.

Public policy about whether to take immediate drastic actions thus faces the perennial problem of decision-making with incomplete and conflicting scientific information. We need an analysis that weighs the risk from a delay in instituting far-reaching controls against the possibility of substantially improving the science so that predictions will be more certain.

Changes in the Global Surface Air Temperature

(In degrees Celsius)



Source: Dr. James E. Hansen, NASA-Goddard Institute for Space Studies