

The allegations . . .

Articles attacking the writing of chapter 8 have appeared in the *Wall Street Journal*, *Financial Times Energy Economist* and *Energy Daily*, among other places, and have also been distributed to reporters and congressional representatives. A nine-page GCC analysis entitled "The IPCC: Institutionalized 'Scientific Cleansing'" compared the 9 October 1995 draft of chapter 8, sent out before the Madrid meeting, to the published version, and repeatedly called the latter "revisionist" and "scientifically cleansed." This analysis claimed that the changes made "change the fundamental character of the chapter, for they obscure, and in several important instances entirely delete, scientific analysis that casts serious doubts about current ability to attribute climate change to human activities." John Schlaes, executive director of the GCC, says, "The context of the report was changed. . . . Words are important." And Donald Rheem, a GCC spokesman, says, "We do not oppose the conclusions of the 1995 SAR. We support more scientific research, and object that the changes [to chapter 8] make the claim [of a human influence on climate] appear to be more certain than it is." Gardner says, "The changes look like political manipulation, and they shift the essence of chapter 8."

Similar charges have been made by others, such as Frederick Seitz, whose impressive résumé includes stints as president of the American Physical Society, president of Rockefeller University and president of the National Academy of Sciences. He is currently the chairman of the George C. Marshall Institute, a conservative Washington, DC-based think tank. "I have never witnessed a more disturbing corruption of the peer-review process than the event that led to this IPCC report," Seitz wrote in an op-ed published in the 12 June *Wall Street Journal*. "If the IPCC is incapable of following its most basic procedures, it would be best to abandon the entire IPCC process, or at least that part that is concerned with the scientific evidence on climate change, and look for more reliable sources of advice to governments on this important question." Santer says that Seitz never contacted him or any of the other lead authors or IPCC officials before writing his op-ed piece.

(The Marshall Institute puts out pamphlets and distributes them on Capitol Hill. The introduction to a 1996 pamphlet, "Are Human Activities Causing Global Warming?" reads, in part: "The most recent Marshall Institute review of scientific evidence on

Global Warming and Chapter 8

The global mean surface temperature of Earth has increased by 0.3–0.6 °C in the past 100 years. This rise in global temperature—which is accompanied by other climate effects such as a rise in sea level—is partly due to perturbations in the Earth-atmosphere energy balance that are associated with "radiative forcing," more popularly known as the greenhouse effect. "Greenhouse gases" such as carbon dioxide, methane and nitrous oxide accumulate in the atmosphere and warm it by absorbing heat that is radiated from Earth, which in turn was absorbed from sunlight. This process results in more longwave radiation being transferred from the atmosphere to Earth's surface, and hence in a warmer climate.

But atmospheric processes are complex and are not yet fully understood. They involve such regional mitigating effects as sulfate aerosols in the atmosphere, which block the Sun's radiation from reaching Earth, and also affect cloud reflectivity.

One of the things that chapter 8 of *Climate Change 1995: The Science of Climate Change*, volume 1 of the three-volume Second Assessment Report of the Intergovernmental Panel on Climate Change (IPCC), is concerned with is the possible impact on climate of human-induced enhancement of the naturally occurring greenhouse effect. The chapter evaluates the detection of changes in the global climate system, and considers the extent to which the observed changes can be attributed to human activities.

Detection of a "change in climate" requires that the observed change be proved statistically significant compared to natural background variability. (Natural variability results from a combination of internal factors—interactions within the coupled atmosphere-ocean-land-biosphere system—and external variables—primarily variability of solar energy input to the atmosphere and effects of volcanic eruptions.)

Attribution is made by carrying out numerical model simulations that consider variables such as the spatial distributions of temperature, trace gas concentrations, wind speed, rainfall and water vapor to determine the climate response signal for different hypothesized causes, and by then comparing these predictions to observed changes. Unique attribution of a detected "significant" climate change to human activities requires consideration and elimination of other plausible mechanisms.

Since the IPCC issued its first comprehensive assessment report in 1990, the observed measurements and simulation models have become more sophisticated: Estimates of natural background variability as well as statistical analysis applied to modeling results have improved; models can now incorporate the effects of sulfate aerosols (from human activity) as well as greenhouse gases; and pattern-based simulations consider spatial variability (rather than global mean temperature). Taken together, the advances increase the confidence level with which attribution can be made.

Chapter 8 discusses the recent advances and the scientific uncertainties. The chapter concludes cautiously: "The body of statistical evidence, when examined in the context of our physical understanding of the climate system, now points towards a discernible human influence on global climate. Our ability to quantify the magnitude of this effect is currently limited by uncertainties of key factors, including the magnitude and patterns of longer-term natural variability and the time-evolving patterns of forcing by (and response to) greenhouse gases and aerosols."

climate change confirms the earlier conclusion that predictions of an anthropogenic global warming have been greatly exaggerated. . . . Spread over a century, a temperature rise of this magnitude will be lost in the noise of natural climate fluctuations." Asked whether such publications are peer reviewed, Seitz said no, but explained that they "represent opinion." This proviso is not noted in the pamphlet, however.)

. . . are called unfounded

Santer takes full responsibility for all changes made to chapter 8 after the WG I meeting in Madrid, and he categorically denies all allegations that the tone or content of the chapter was altered, or that any IPCC rules were broken. Immediately after the Madrid meeting, Santer says, he "spent two days in a hotel room in England re-

viewing comments received between 9 October and up through the Madrid meeting, and revising the chapter." Although the main focus of the Madrid meeting was the SPM, the ambiguities that emerged during extensive discussions inevitably were relevant to the underlying chapters of the report as well, says Santer. "It seemed that some people were willfully misinterpreting things" in chapter 8. All changes, he adds, "were made—and delivered to WG I—before the full plenary session in Rome," held on 11–15 December and attended by all three working groups.

On 25 June the *Wall Street Journal* published a response to Seitz's op-ed. Written by Santer and cosigned by 40 lead authors and contributors to the WG I report, the letter emphasized that "IPCC procedures required changes in response to these comments [those re-