

Global Warming Experts Call Human Role Likely: Evidence Has Mounted ...

By WILLIAM K. STEVENS

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pg. 1

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In an important shift of scientific judgment, experts advising the world's governments on climate change are saying for the first time that human activity is a likely cause of the warming of the global atmosphere.

While many climatologists have thought this to be the case, all but a few have held until now that the climate is so naturally variable that they could not be sure they were seeing a clear signal of the feared greenhouse effect — the heating of the atmosphere because of the carbon dioxide released by burning coal, oil and wood.

Even the string of very warm years in the 1980's and 1990's could have been just a natural swing of the climatic pendulum, the experts have said.

But a growing body of data and analysis now suggests that the warming of the last century, and

Evidence Has Mounted That Fuel Emissions Heat Atmosphere

especially of the last few years, "is unlikely to be entirely due to natural causes and that a pattern of climatic response to human activities is identifiable in the climatological record," says a draft summary of a new report by the Intergovernmental Panel on Climate Change.

The panel's role is to advise governments now negotiating reductions in emissions of greenhouse gases like carbon dioxide under the 1992 treaty on climate change.

The panel's draft summary, although intended for internal use, was recently made available on the Internet. The draft has been through at least one round of scientific review but its wording may change, since it

is now being reviewed by governments. Scientists who prepared the full chapter on which the summary statement is based say they do not expect any substantial change in their basic assessment. The chapter has gone through extensive review by scientists around the world.

"I think the scientific justification for the statement is there, unequivocally," said Dr. Tom M. L. Wigley, a climatologist at the National Center for Atmospheric Research in Boulder, Colo., one of the chapter's authors.

The scientific community "has discovered the smoking gun," said Dr. Michael Oppenheimer, an atmospheric scientist with the Environmental Defense Fund, who is familiar with the draft report. "This finding is of paramount importance. For many years, policy makers have asked, 'Where's the signal?'" The intergovernmental panel, he said, "is telling us that the signal is here."

But Dr. Wigley and others involved in the reassessment say it is not yet known how much of the last century's warming can be attributed to human activity and how much is part of the earth's natural fluctuation that leads to ice ages at one extreme and warm periods at the other.

Nevertheless, the panel's conclusion marks a watershed in the views of climatologists, who with the notable exception of Dr. James E. Han-

Continued on Page 8, Column 1

Experts on Global Warming Say Human Role Is Likely

Continued From Page 1

sen of the NASA Goddard Institute for Space Studies in New York have until now refused to declare publicly that they can discern the signature of the greenhouse effect.

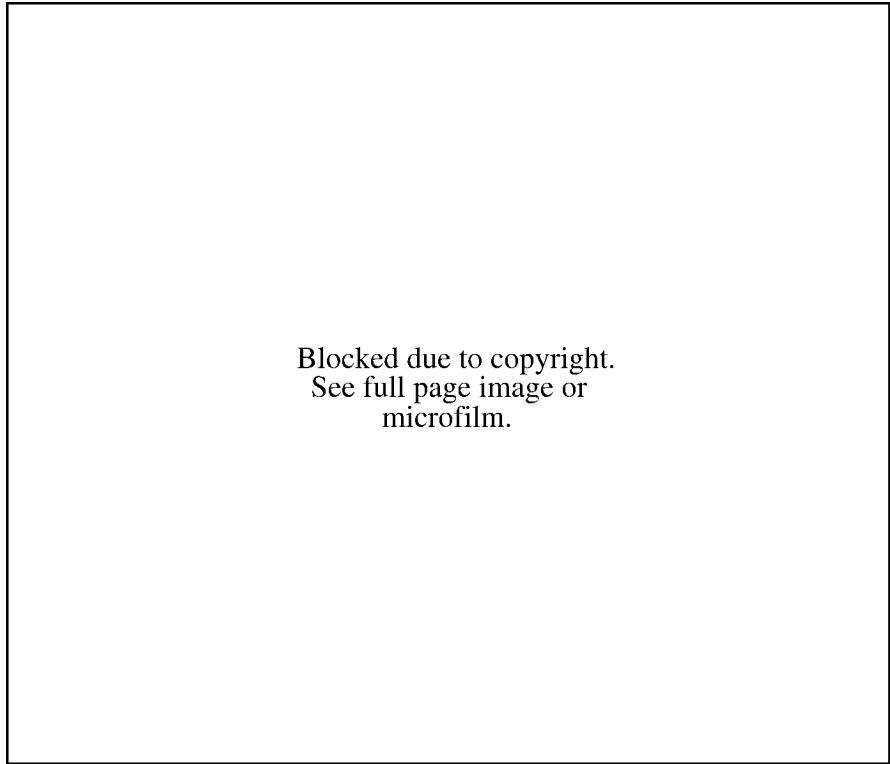
The new consensus, as represented by the intergovernmental panel, seems likely to stimulate more public debate over how seriously the threat of climate change should be taken.

As for the future, the draft summary forecasts an increase in the average global temperature of 1.44 degrees to 6.3 degrees Fahrenheit by the year 2100 if there is no further action to curb emissions of greenhouse gases. But that represents only 50 to 70 percent of the eventual warming, it says. These changes would be more rapid than any in the last 10,000 years, the period in which civilization developed, the panel says.

And it says that whatever action is taken in the future, the world still faces a further average temperature increase of 1 to 3.6 degrees.

By comparison, according to varying estimates, the average global temperature is 5 to 9 degrees warmer now than in the last ice age.

While a warmer world could be beneficial in some ways, the draft says, there would be many adverse effects. These include more extreme weather and possibly more intense tropical storms, destruction of some communities by rising seas, damage to and loss of natural ecosystems that cannot adapt rapidly enough, diminished agricultural output in some places and an increase in some tropical diseases.



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Experts agree that the average surface temperature of the globe has already risen about 1 degree Fahrenheit in the last century, but there has long been debate over the cause.

Much of the argument has involved the computerized models of the atmosphere that have been climatologists' main tools in analyzing the warming problem. The models have many imperfections, but the panel scientists say they have improved and are being used more effectively.

Scientists say that a major reason for the change in view marked by the new report, in fact, is that a new generation of studies has enhanced their confidence in computer simulations of the atmosphere, creating a much better agreement between predicted patterns of climate change and those actually observed.

One study in particular, led by Dr. Benjamin B. Santer of the Lawrence Livermore National Laboratory, found a good match between the temperature differences from region to region predicted by computerized simulations of the atmosphere's response to increased carbon dioxide and those actually measured.

Dr. Santer is also an author of the intergovernmental panel's chapter on causes of the warming, along with Dr. Wigley, Dr. Tim P. Barnett of the Scripps Institution of Oceanography at La Jolla, Calif., and Dr. Ebby Anyamba, a Kenyan scientist currently at the NASA Goddard Space Flight Center in Greenbelt, Md. Twenty-seven other scientists contributed to the chapter.

The new generation of computer modeling studies employs more detailed and sophisticated representations of the atmosphere than when the intergovernmental panel made its first assessment of the climate problem in 1990. Scientists' confidence in the results of the comparisons between model predictions and observations has been boosted by

more powerful statistical techniques used to validate the comparison between model predictions and observations, Dr. Wigley said.

Despite the new consensus among panel scientists, some skeptics, like Dr. Richard S. Lindzen of the Massachusetts Institute of Technology, remain unconvinced.

Dr. Lindzen said the panel's identification of the greenhouse signal "depends on the model estimate of natural variability being correct" — that is, the natural variability of the climate system on time scales of decades and centuries. The computer models do not reflect this well, he said, and therefore there is "no basis" yet for saying that a human influence on the climate has been detected.

Political views on climate change are considerably more diverse than those of the panel experts. Negotiations to reduce carbon dioxide emissions have been going on since they were begun in April by the parties to the climate treaty, but they are inching along. One reason has been the lack of scientific proof that human activities are responsible for the warming.

The Clinton Administration supports some reductions, while not specifying what kind or how much. But the ascendancy of conservatives in Congress, has strengthened the hand of those who oppose reductions, mainly the fossil-fuel and related in-