

February 6, 2007

ESSAY

## On the Climate Change Beat, Doubt Gives Way to Certainty

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In the decade when I was the lead reporter on [climate change](#) for this newspaper, nearly every blizzard or cold wave that hit the Northeast would bring the same conversation at work.

Somebody in the newsroom would eye me and say something like, “So much for global warming.” This would often, but not always, be accompanied by teasing or malicious expressions, and depending on my mood the person would get either a joking or snappish or explanatory response. Such an exchange might still happen, but now it seems quaint. It would be out of date in light of a potentially historic sea change that appears to have taken place in the state and the status of the global warming issue since I retired from The New York Times in 2000.

Back then I wrote that one day, if mainstream scientists were right about what was going on with the earth’s climate, it would become so obvious that human activity was responsible for a continuing rise in average global temperature that no other explanation would be plausible.

That day may have arrived.

Similarly, it was said in the 1990s that while the available evidence of a serious human impact on the earth’s climate might be preponderant enough to meet the legal test for liability in a civil suit, it fell short of the more stringent “beyond a reasonable doubt” test of guilt in a criminal case.

Now it seems that the steadily strengthening body of evidence about the human connection with global warming is at least approaching the higher standard and may already have satisfied it.

The second element of the sea change, if such it is, consists of a demonstrably heightened awareness and concern among Americans about global warming. The awakening has been energized largely by dramatic reports on the melting Arctic and by fear — generated by the spectacular horror of Hurricane Katrina — that a warmer ocean is making [hurricanes](#) more intense.

Politicians are weighing in on the subject as never before, especially with the advent of a Democratic-led Congress. It appears likely, if not certain, that whoever is elected president in 2008 will treat the issue seriously and act accordingly, thereby bringing the United States into concert with most of the rest of the world. Just last week, Senator [John McCain](#) of Arizona, a presidential aspirant and the co-author of a bill mandating stronger action, asserted that the argument about global warming “is over.” Back in the day, such words from a conservative Republican would have been unimaginable, even if he were something of a maverick.

I've been avidly watching from the sideline as the strengthening evidence of climate change has accumulated, not least the discovery that the Greenland ice cap is melting faster than had been thought. The implications of that are enormous, though the speed with which the melting may catastrophically raise sea levels is uncertain — as are many aspects of what a still hazily discerned climatic future may hold.

Last week, in its first major report since 2001, the world's most authoritative group of climate scientists issued its strongest statement yet on the relationship between global warming and human activity. The Intergovernmental Panel on Climate Change said the likelihood was 90 percent to 99 percent that emissions of heat-trapping greenhouse gases like carbon dioxide, spewed from tailpipes and smokestacks, were the dominant cause of the observed warming of the last 50 years. In the panel's parlance, this level of certainty is labeled "very likely."

Only rarely does scientific odds-making provide a more definite answer than that, at least in this branch of science, and it describes the endpoint, so far, of a progression:

¶ In 1990, in its first report, the panel found evidence of global warming but said its cause could be natural as easily as human.

¶ In a landmark 1995 report, the panel altered its judgment, saying that "the balance of evidence suggests a discernible human influence on global climate."

¶ In 2001, it placed the probability that human activity caused most of the warming of the previous half century at 66 percent to 90 percent — a "likely" rating.

And now it has supplied an even higher, more compelling seal of numerical certainty, which is also one measure of global warming's risk to humanity.

To say that reasonable doubt is vanishing does not mean there is no doubt at all. Many gaps remain in knowledge about the climate system. Scientists do make mistakes, and in any case science continually evolves and changes. That is why the panel's findings, synthesized from a vast body of scientific studies, are generally couched in terms of probabilities and sometimes substantial margins of error. So in the recesses of the mind, there remains a little worm of caution that says all may not be as it seems, or that the situation may somehow miraculously turn around — or, for that matter, that it may turn out worse than projected.

In several respects, the panel's conclusions have gotten progressively stronger in one direction over almost two decades, even as many of its hundreds of key members have left the group and new ones have joined. Many if not most of the major objections of contrarians have evaporated as science works its will, although the contrarians still make themselves heard.

The panel said last week that the fact of global warming itself could now be considered "unequivocal," and certified that 11 of the last 12 years were among the 12 warmest on record worldwide. (The fact of the warming is one thing contrarians no longer deny.)

But perhaps the most striking aspect of the 2007 report is the sheer number and variety of directly observed ways in which global warming is already having a "likely" or "very likely" impact on the earth.

In temperate zones, the frequency of cold days, cold nights and frosts has diminished, while the frequency of hot days, hot nights and heat waves has increased. Droughts in some parts of the world have become longer and more intense. Precipitation has decreased over the subtropics and most of the tropics, but increased elsewhere in the Northern and Southern Hemispheres.

There have been widespread increases in the frequency of “heavy precipitation events,” even in areas where overall precipitation has gone down. What this means is that in many places, it rains and snows less often but harder — well-documented characteristics of a warming atmosphere. Remember this in the future, when the news media report heavy, sometimes catastrophic one-day rainfalls — four, six, eight inches — as has often happened in the United States in recent years. Each one is a data point in an trend toward more extreme downpours and the floods that result.

All of these trends are rated 90 percent to 99 percent likely to continue.

The list goes on.

And for the first time, in the wake of Hurricane Katrina, the panel reported evidence of a trend toward more intense hurricanes since 1970, and said it was likely that this trend, too, would continue.

Some of the panel’s main conclusions have remained fairly stable over the years. One is that if greenhouse gas emissions continue unabated, they will most likely warm the earth by about 3 to 7 degrees Fahrenheit by the end of this century, with a wider range of about 2 to 12 degrees possible. The warming over the Northern Hemisphere is projected to be higher than the global average, as is the case for the modest one-degree warming observed in the last century.

The projected warming is about the same as what the panel estimates would be produced by a doubling of atmospheric concentrations of greenhouse gases, compared with the immediate preindustrial age. It would also be almost as much warming as has occurred since the depths of the last ice age, 20,000 years ago.

Some experts believe that no matter what humans do to try to rein in greenhouse gas emissions, a doubling is all but inevitable by 2100. In this view, the urgent task ahead is to keep them from rising even higher.

If the concentrations were to triple, and even if they just double, there is no telling at this point what the world will really be like as a result, except to speculate that on balance, most of its inhabitants probably won’t like it much. If James E. Hansen, one of the bolder climate scientists of the last two decades, is right, they will be living on a different planet.

It has been pointed out many times, including by me, that we are engaged in a titanic global experiment. The further it proceeds, the clearer the picture should become. At age 71, I’m unlikely to be around when it resolves to everyone’s satisfaction — or dissatisfaction. Many of you may be, and a lot of your descendants undoubtedly will be.

Good luck to you and to them.

