

# Policy Analysis

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## LONG HOT YEAR

*Latest Science Debunks  
Global Warming Hysteria*

by Patrick J. Michaels

### Executive Summary

The national media have given tremendous play to the claims of Vice President Al Gore, some federal scientists, and environmental activists that the unseasonably warm temperatures of this past summer were proof positive of the arrival of dramatic and devastating global warming. In fact, the record temperatures were largely the result of a strong El Niño superimposed on a decade in which temperatures continue to reflect a warming that largely took place in the first half of this century.

Observed global warming remains far below the amount predicted by computer models that served as the basis for the United Nations Framework Convention on Climate Change. Whatever record is used, the largest portion of the warming of the second half of this century has mainly been confined to winter in the very coldest continental air masses of Siberia and northwestern North America, as predicted by basic greenhouse effect physics. The unpredictability of seasonal and annual temperatures has declined significantly. There has been no change in precipitation variability. In the United States, drought has decreased while flooding has not increased.

Moreover, carbon dioxide is increasing in the atmosphere at a rate below that of most climate-change scenarios because it is being increasingly captured by growing vegetation. The second most important human greenhouse enhancer--methane--is not likely to increase appreciably in the next 100 years. And perhaps most important, the direct warming effect of carbon dioxide was overestimated. Even global warming alarmists in the scientific establishment now say that the Kyoto Protocol will have no discernible impact on global climate.

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### Introduction

Nearly 10 years ago I first testified on climate change before the U.S. House of Representatives. At that time I argued that forecasts of dramatic and disastrous global warming were likely to be in error because of the very modest climate changes that had been observed to date. Further, it would eventually be recognized that the more moderate climate change would occur overwhelmingly in the winter and at night, rather than in summer, and that it could be benign or even beneficial. I testified that the likely warming, based on the observed data, would be between 1.0 and 1.5 degree Celsius (1.8-2.7 degrees Fahrenheit) as a result of doubling the natural carbon dioxide greenhouse effect.<sup>1</sup>

The most recent scientific findings published in the refereed literature prove the validity of my testimony of nearly a decade ago. Those studies document the following:

- Observed warming is only a fraction of the amount predicted by the climate models that served as the basis for the Framework Convention on Climate Change.<sup>2</sup>
- Observed warming is most pronounced in winter in the very coldest continental air masses of Siberia and northwestern North America.<sup>3</sup>
- The variation, or unpredictability, of regional temperatures has declined significantly on a global basis while there has been no change in precipitation variability.<sup>4</sup>
- Drought in the United States has decreased while flooding has not increased.<sup>5</sup>
- Carbon dioxide is increasing in the atmosphere at a rate below that of most UN scenarios, because it is being increasingly captured by growing vegetation.<sup>6</sup>
- The second most important human greenhouse enhancer--methane--is not likely to increase appreciably in the next 100 years.<sup>7</sup>
- The direct warming effect of carbon dioxide was overestimated.<sup>8</sup>
- The Kyoto Protocol to the UN Framework Convention on Climate Change will have no discernible impact on

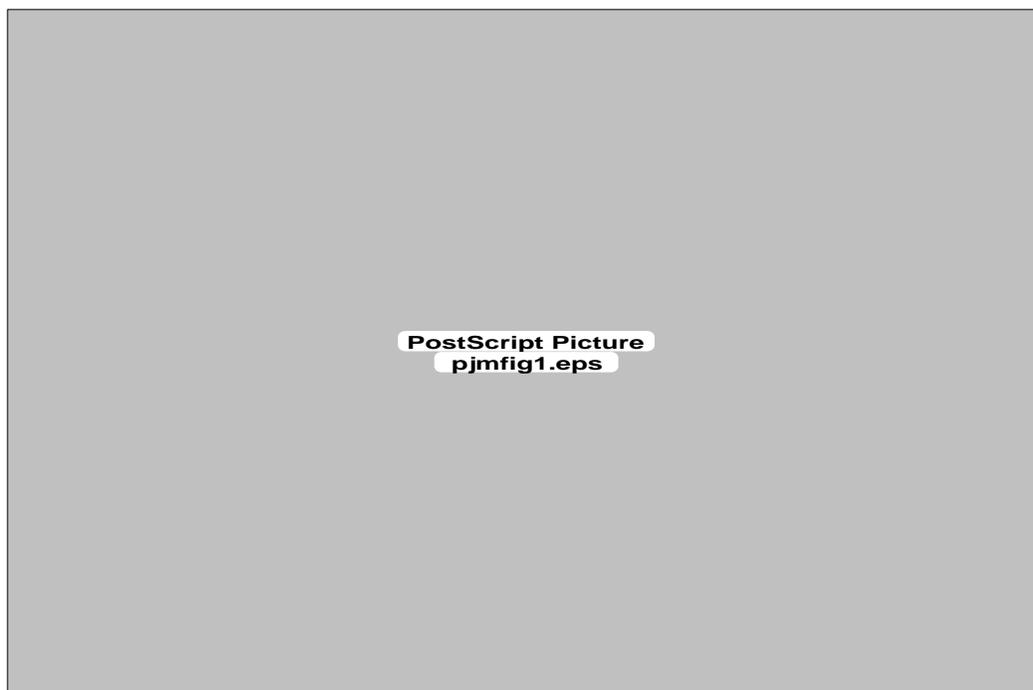
global climate within any reasonable policy time frame.<sup>9</sup>

In toto, those findings lead inescapably to the conclusion that the magnitude of the threat from global warming is greatly diminished. They should provoke a reexamination of the need for the UN Framework Convention on Climate Change and the subsequent Kyoto Protocol.

### **Historical Background**

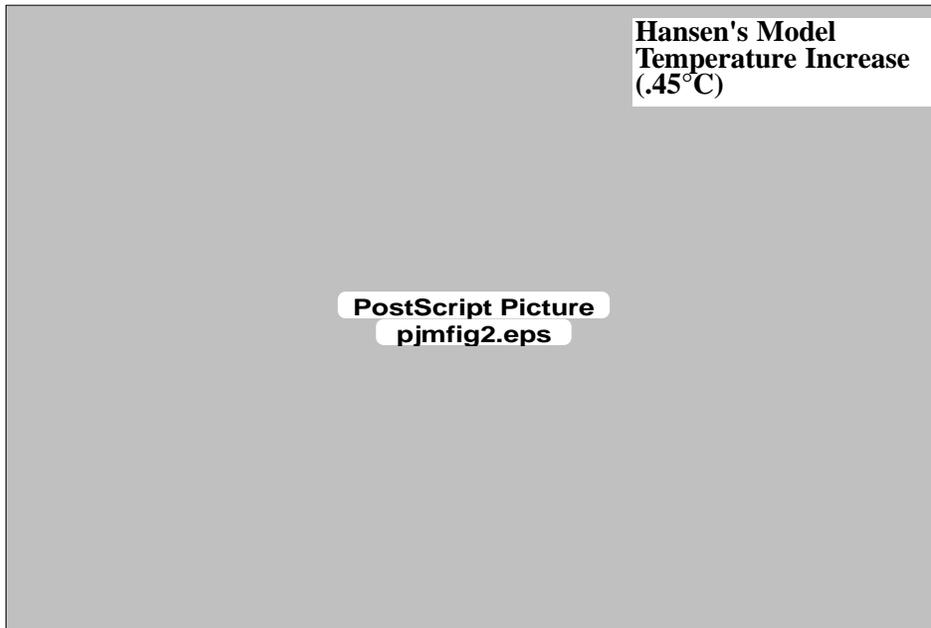
Ten years ago, on June 23, 1988, NASA scientist James Hansen testified before the House of Representatives that there was a strong "cause and effect relationship between observed temperatures" and human emissions into the atmosphere.<sup>10</sup> His testimony coincided with a very hot, dry summer in the United States (much worse than the summer of 1998), and subsequent polls showed that, as a result of his testimony, nearly 70 percent of the public believed that the 1988 drought was caused by human-induced global warming.<sup>11</sup>

Figure 1  
Hansen's Global Temperature Projections from His 1998 Model



Source: James Hansen et al., "Global Climate Changes as Forecast by Goddard Institute for Space Studies Three-Dimensional Model," Journal of Geophysical Research 93 (August 20, 1988): 9341-64.

Figure 2  
Temperature Projections and Observations: 1988-97



Sources: Surface temperatures are the global history used by the IPCC; weather balloon data are from J. K. Angell, "Global, Hemispheric and Zonal Temperature Anomalies Derived from Radiosonde Records," U.S. Department of Energy Trends 93 (1994): 631-72, and updates; and satellite data are from Roy Spencer and John Christy, "Precise Monitoring of Global Temperatures from Satellites," Science 247 (1990): 1558-60, and updates.

That model (depicted in Figure 1) predicted that global temperature between 1988 and 1997 would rise by 0.45°C (0.81°F).

At that time, Hansen also produced a model of the future behavior of the globe's temperature, which he had turned into a video that was circulated widely in Congress. That model was one of many similar calculations that were used in the First Scientific Assessment of the UN Intergovernmental Panel on Climate Change (known as the IPCC), which stated that "when the latest atmospheric models are run with the present concentrations of greenhouse gases, their simulation of climate is generally realistic on large scales."<sup>12</sup>

Figure 2 compares Hansen's prediction with the observed temperature changes from three independent sources. Ground-based temperatures compiled by the IPCC show a rise of 0.11°C (0.2°F), or only one-quarter of what Hansen predicted. Lower-atmosphere temperatures measured by weather balloons show a decline of 0.36°C (0.65°F), and

satellites measuring the same layer (our only truly global measure) show a decline of 0.24°C (0.43°F).

Hansen's 1988 forecast proved astoundingly inaccurate, and the IPCC's 1990 statement about the realistic nature of those projections was simply wrong.

That failure did not surprise me. On a 100-year time scale, the models were predicting a warming of about 1.5°C (2.7°F) by 1988, although the observed change was only 0.5°C (0.9°F) at that time. That the models failed to predict the change of the last 10 years, as they failed to predict changes in the previous century, was strong evidence for my original thesis. How much might we have saved, including the notorious Kyoto Protocol, if we had just listened to nature instead of a man-made computer?

### **Why Did It Not Warm As Predicted?**

By 1995, in its second full assessment of climate change, the IPCC admitted the validity of its critics' position: "When increases in greenhouse gases only are taken into account . . . most [climate models] produce a greater mean warming than has been observed to date, unless a lower climate sensitivity [to the greenhouse effect] is used. . . . There is growing evidence that increases in sulfate aerosols are partially counteracting the [warming] due to increases in greenhouse gases."<sup>13</sup>

The IPCC presented two alternative hypotheses: either the base warming was simply overestimated, or some other industrial pollutant is preventing the warming from being observed. The IPCC, however, omitted a third source for the error: perhaps the greenhouse gases were not increasing at the projected rate.

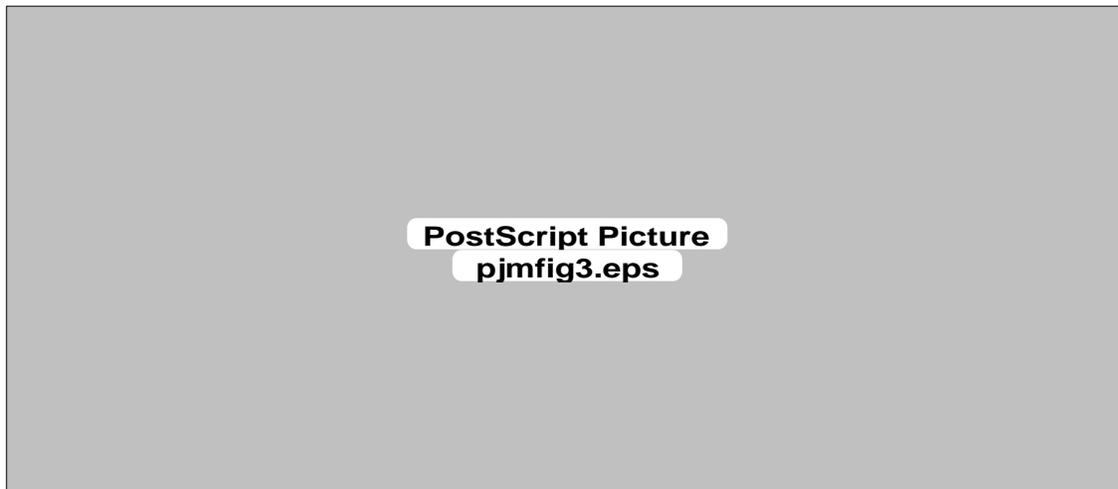
As evidence comes in, the first and third reasons appear to be carrying the day. The direct warming effect of carbon dioxide was overestimated.<sup>14</sup> Carbon dioxide is not accumulating in the atmosphere at the median rate estimated by IPCC in 1992,<sup>15</sup> and the rate of increase of the second most important greenhouse emission, methane, began to decrease in 1981,<sup>16</sup> some 15 years before the recent IPCC report that projects an increased rate of emissions over the next 50 years.

### The Sulfate Hypothesis

Only the sulfate hypothesis allows the exaggerated notion of climate change any credibility. It is not surprising that this is the explanation that the IPCC continues to champion because it raises the specter of "dangerous" interference in the climate system, which is what the Framework Convention on Climate Change was designed to prevent. If there is no "dangerous" interference, there is no need for the convention, or the subsequent Kyoto Protocol, and the IPCC has failed in its mission. The UN General Assembly, more than 10 years ago, directed the IPCC to provide the basis for a possible convention on climate change.<sup>17</sup>

Are sulfate aerosols responsible for the now-admitted dearth of warming? In previous writings Chip Knappenberger and I have shown how poorly this argument stands the critical test of the data.<sup>18</sup> Suffice it to say that the entire record of three-dimensional atmospheric temperature does not appear consistent with this hypothesis. Instead of repeating that argument, I would simply point out that the southern half of the planet is virtually devoid of sulfates and should have warmed at a prodigious and consistent rate for the last two decades. Unfortunately, we have very few long-term weather records from that half of the planet, and almost all come from the relatively uncommon landmasses (90 percent of the Southern Hemisphere is water). However, we do have nearly two decades of satellite data (Figure 3). After the orbital drift first noted by Frank Wentz and Matthias Schabel is

Figure 3  
Satellite-Measured Temperatures for the Southern Hemisphere



accounted for,<sup>19</sup> the satellite records show no change in temperature rather than the rapid warming that should be occurring.

If sulfates do not explain the lack of warming, then the best explanation is that the sensitivity to climate change was overestimated. The failed models that back the Framework Convention predicted a roughly threefold multiplication of carbon dioxide warming because of increased atmospheric moisture. Yet researchers have found that the expected moisture is not there.<sup>20</sup> Perhaps that is why there is so much "missing" warming.

Perhaps even more remarkable is that the amount of direct warming caused by carbon dioxide was also overestimated.<sup>21</sup>

### **Was the Increase in Greenhouse Gases Overestimated?**

A recent study by E. J. Dlugokencky and his colleagues found that the concentration of methane in the atmosphere--currently 30 percent of the human greenhouse potential--is rapidly stabilizing, because it is coming into chemical equilibrium with other atmospheric reactants.<sup>22</sup> The study strongly suggests that methane concentrations will remain stable in the future. The IPCC assumed that, without any controls, the methane warming effect would double by 2050 and increase by 125 percent by 2100.

James Hansen recently calculated that the concentrations of carbon dioxide in the atmosphere are increasing at approximately 60 percent of the rate that is normally projected.<sup>23</sup> Notably, he argues that the biosphere is absorbing carbon dioxide at a much faster rate than anticipated. "Apparently the rate of uptake by CO<sub>2</sub> sinks, either the ocean, or, more likely the forests and soils has increased."<sup>24</sup>

In the 10 years since my first testimony, estimates of global warming to the year 2100 have declined. When the latest findings are factored in, the projected warming is now at the median value I noted in 1989. Table 1 gives a summary of that decline in median projected warming for the next century.

Table 1  
Decline in Median Projected Warming

Estimate	Value
IPCC 1990 initial estimate	3.2°C (5.7°F)
IPCC revised 1992 estimate	2.6°C (4.7°F)
IPCC revised 1995 estimate	2.0°C (3.6°F)
After allowing for overestimation of direct CO <sub>2</sub> warming	1.75°C (3.2°F)
After allowing for flattening of methane concentration	1.5°C (2.7°F)
After allowing for decrease in carbon dioxide accumulation	1.25°C (2.3°F)

### **The Nature of Observed Warming**

How enhanced greenhouse warming will be distributed through time and space is as important a question as how much warming will occur. While the debate regarding the latter dominates the public discussion, the debate surrounding the former is less controversial and pregnant with implications for policymakers.

### **Winter Warming**

Greenhouse physics predicts that the driest air masses should respond first and most strongly to changes induced by human activities. Those air masses, in fact, are generally the coldest, such as the great high-pressure system that dominates Siberia in the winter and its only slightly more benign cousin in northwestern North America (Alaska and the Yukon Territories). When the jet stream attains a particular orientation, it is the latter air mass that migrates south and kills orange trees in Florida.

A look at the trends in the satellite data--our only truly global record of lower-atmosphere temperature--is remarkably revealing. While there is no overall global warming trend, there is a pronounced warming trend in the regions with the coldest winters.

An examination of surface temperature records since 1945 also finds that warming was largely confined to the coldest winter air masses.<sup>25</sup> A warming of the coldest, driest air masses is by definition a relative warming of the nights compared to the days (nights are longer in the winter). And, by extension, this is the type of climate change that slightly lengthens the growing season, as the coldest temperature occurs at night.

### **The Summer of 1998**

Recent reports indicate that temperatures in the first half of 1998 averaged above previously recorded record-high mean temperatures. Those record-high global temperatures are found both in satellite data (see Figure 3, for example) and in a new temperature history compiled by federal climatologists. Curiously, however, this new temperature history has not yet been published in the peer-reviewed scientific literature and is riddled with serious problems, most of which suggest that the warming has been overstated.<sup>26</sup>

Regardless, 1998 is clearly much warmer than normal on a global scale. But is this warming a product of industrial emissions of greenhouse gases?

As shown in the adjusted satellite data, the warmth of 1998 is an anomalous spike rather than a continuation of a warming trend. That is clear testimony to its El Niño relation.

At the same time, surface temperatures (see Figure 2) have warmed slightly (0.11°C in the last decade). Imposing an El Niño upon an already warm decade creates the illusion of rapid global warming that I forecast would occur when a strong El Niño occurred in the 1990s.<sup>27</sup>

### **Whither the Satellite Data?**

Much of this paper makes reference to global temperatures measured by NASA satellites. A paper was published this summer in Nature by atmospheric physicists Frank Wentz and Matthias Schnabel, however, suggesting that "orbital decay" in the satellites has resulted in temperature readings that are colder than they should be.<sup>28</sup> Consequently, some observers have concluded that the planet has warmed far more than global warming skeptics would have us believe and that Hansen and company were right all along.

But University of Alabama climatologist John Christy, the originator and keeper of the satellite data, has demonstrated that, even after accounting for the orbital decay noted by Wentz and Schnabel, there remains no significant warming in the satellite record.<sup>29</sup>

The real problem with any attempt to compromise the integrity of the satellite record is that it matches up perfectly, on a year-to-year basis, with temperatures of the lower atmosphere taken by weather balloons, a totally independent measure. (A portion of this remarkable correspondence can be seen in Figure 2.) If the satellite data are in error, then the weather balloons, launched from nearly 100 locations around the planet, are somehow making exactly the same errors in measurement, day after day and year after year.

Regardless, it must be remembered that few scientists actually dispute the fact that the globe has warmed over the last 100 years and that industrial greenhouse gas emissions are probably the main reason for warming in the last 50 years.<sup>30</sup> The central issue is not whether it has warmed or not, nor is it whether industrial emissions are responsible for that warming. The issue is how much warming will occur and how it will be distributed through time and space and whether it will prove harmful. Wentz and Schnabel's criticism of the satellite data, even were it compelling, would still yield a deficit of observed warming compared with the predictions that formed the basis of the Kyoto treaty.

### **Climate Variability**

Virtually every out-of-the-ordinary weather event in recent years has been linked by the Clinton administration to global warming.<sup>31</sup> But anomalous weather events are the rule, not the exception, given the natural variability of weather. As Arizona State University climatologist Robert Balling has noted, "I can find you every day of the year something that's happening worldwide that is 'the worst in 100 years.'"<sup>32</sup> Regarding the recent drought in Texas, for example, Gerald North, chairman of the Meteorology Department at Texas A&M, maintained that the best explanation was a high-pressure air mass that hovered over the state for weeks. Said North, "I am a subscriber to the theory of global warming. But I'm not buying everything."<sup>33</sup>

Some colleagues and I recently examined the surface temperature history in order to answer three questions:<sup>34</sup>

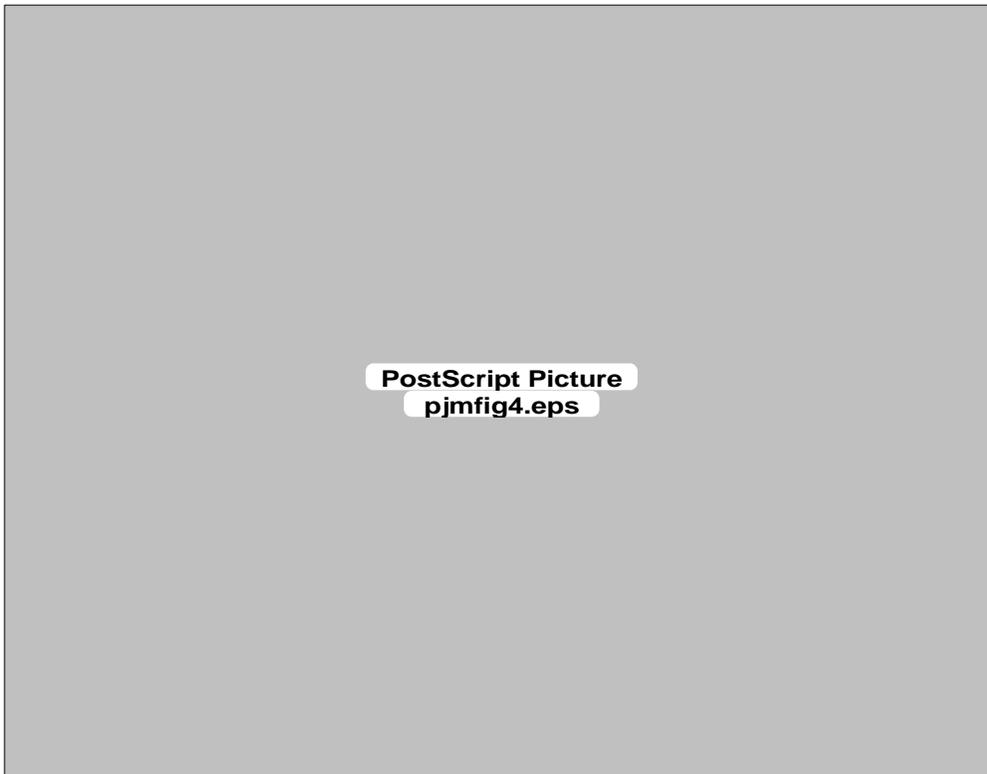
Is the Temperature Becoming More Variable from Year to Year? We found a statistically significant decline in interannual variability worldwide (Figure 4).

Is the Variation from Day to Day Increasing? We found no statistically significant change.

Is the Number of Record High or Low Temperatures Increasing? We found no statistically significant change.

In summary, here is how the climate has changed over the past several decades: the coldest wintertime air masses in Siberia and North America have warmed, and the only change in temperature variability has been a tendency toward reduced year-to-year variability.

Figure 4  
Annual Temperature Variation Is Declining, Not Increasing, on a Global Scale



Source: Patrick Michaels et al., "Analysis of Trends in the Variability of Daily and Monthly Historical Temperature Measurements," Climate Research 10 (1998): 30.

These results should be integrated with a recent study of U.S. streamflow by Harry Lins and J. R. Slack of the U.S. Geological Survey. In an investigation of undisturbed sites, they they found no change in the frequency of highest flow (flood) events, but a decrease in the frequency lowest flow (drought) events.<sup>35</sup>

We are not entering a world of increased variability, unpredictability, and peril but rather the opposite. If this is human interference with climate, it is hardly "dangerous."

### **The Kyoto Protocol: How Much Warming Is Prevented?**

What if we postulate, regardless of the analysis above, that the IPCC's "consensus" estimate of 2.0°C (3.6°F) of warming by the year 2100 is correct? The Kyoto Protocol requires that the United States reduce its 2008-2012 average overall greenhouse gas emissions by about a third of what they would be if we continued on the trajectory established in the last two decades.<sup>36</sup> The economic costs are quite significant. What are the climate benefits?

Tom Wigley, a senior scientist at the U.S. National Center for Atmospheric Research, recently calculated the "saved" warming, under the assumptions noted above, that would accrue if every nation met its obligations under the Kyoto Protocol. According to his calculations, the earth's temperature in 2050 would be 0.07°C lower as a result.<sup>37</sup> My own calculations produced a similar answer.<sup>38</sup>

A warming of 0.07°C is so small that it cannot be reliably measured by ground-based thermometers. If one assumes the more likely scenario--that warming to the year 2100 will be 1.25°C--the saved warming drops to 0.04°C over the next 50 years. The benefits of Kyoto are so minuscule as to be unmeasurable. The costs, on the other hand, are not.

### **Conclusion**

The observed data on climate and recent emissions trends clearly indicate that the concept of "dangerous" interference in the climate system is outmoded within any reasonable horizon. That makes the Kyoto Protocol a useless appendage to a treaty that has been bypassed by scientific discovery. It is time to reconsider the Framework Convention.

**Notes**

1. Patrick Michaels, Testimony before the Subcommittee on Energy and Power of the House Committee on Energy and Commerce, 101st Cong., 1st sess., February 21, 1989, pp. 78-111.
2. James Hansen et al., "A Common-Sense Climate Index: Is Climate Changing Noticeably?" Proceedings of the National Academy of Sciences 95 (1998): 4113-20.
3. Robert Balling Jr. et al., "Analysis of Winter and Summer Warming Rates in Gridded Temperature Time-Series," Climate Research 9 (1998): 175-81.
4. Patrick Michaels et al., "Analysis of Trends in the Variability of Daily and Monthly Historical Temperature Measurements," Climate Research 10 (1998): 27-33.
5. H. Lins and J. R. Slack, "A Flood of Perception," American Geophysical Union Abstract, December 8, 1997.
6. Hansen et al.
7. E. J. Dlugokencky et al., "Continuing Decline in the Growth Rate of the Atmospheric Methane Burden," Nature 393 (1998): 447-50.
8. G. Myhre et al., "New Estimates of Radiative Forcing due to Well-Mixed Greenhouse Gasses," Geophysical Research Letter 25 (1998): 2715-18.
9. Thomas Wigley, "The Kyoto Protocol: CO<sub>2</sub>, CH<sub>4</sub>, and Climate Implications," Geophysical Research Letter 25 (1998): 2285-88.
10. James Hansen, Testimony before the Subcommittee on Energy and Power of the House Committee on Energy and Commerce, 100th Cong., 2d sess., June 23, 1988, pp. 26-52.
11. CNN call-in poll, July, 1988, discussed in Patrick Michaels, Sound and Fury: The Science and Politics of Global Warming (Washington: Cato Institute, 1992), pp. 6, 19.
12. Intergovernmental Panel on Climate Change, The IPCC Scientific Assessment (Cambridge: Cambridge University Press, 1990), p. xxviii.

13. Intergovernmental Panel on Climate Change, The Science of Climate Change (Cambridge: Cambridge University Press, 1996), p. 295.
14. Myhre et al.
15. Hansen et al.
16. D. M. Etheridge et al., "Atmospheric Methane between 1000 A.D. and Present: Evidence of Anthropogenic Emissions and Climatic Variability," Journal of Geophysical Research 103 (1998): 15979-95.
17. Daniel Bodansky, "Prologue to the Climate Change Convention," in Negotiating Climate Change: The Inside Story of the Rio Convention, ed. Irving Mintzer and J. A. Leonard (Cambridge: Cambridge University Press, 1994), p. 53.
18. Patrick Michaels and Chip Knappenberger, "Human Effect on Global Climate?" Nature 384 (1996): 522-23.
19. Frank Wentz and Matthias Schabel, "Effects of Orbital Decay on Satellite-Derived Temperature Trends," Nature 384 (1998): 661-64.
20. Roy Spencer and W. D. Braswell, "How Dry Is the Tropical Free Troposphere? Implications for Global Warming Theory," Bulletin of the American Meteorological Society 78 (1997): 1097-1106.
21. Myhre et al.
22. Dlugokencky et al. Emphasis added.
23. Hansen et al.
24. Ibid., p. 4119. Emphasis added.
25. Balling et al.
26. There is in fact very little documentation on the nature of this new history, but it is known to be a combination of sea-surface temperatures measured by ships, a new set of buoy data over the tropical Pacific and Indian oceans that began in 1984, and measurements at traditional land stations. In order to create a "departure from average" (the only way we can tell how unusual temperatures might be), the buoy data were referenced to a long-standing record of sea-surface temperatures (SST) that in fact does not match another record of air temperatures taken

above the sea surface known as the Night Marine Air Temperature (NMAT) history.

The choice of this non-NMAT reference history is important because the NMAT data show very little warming in the tropical Indian and Pacific Oceans, compared to the record that was used. But the NMAT record, on a year-to-year basis, matches much better with the satellite measures of Spencer and Christy and weather balloon data. In other words, there are three sets of reference data that show much reduced warming that are in year-to-year agreement (the satellite, weather balloon, and NMAT histories) and one "odd man out" showing warming (the SST). It was the anomalous record that was used by federal climatologists as the reference standard.

27. Michaels, Sound and Fury, p. 188.

28. Wentz and Schnabel.

29. John Christy, manuscript in review, Journal of Climate (on file with the author).

30. Sallie Baliunas of the Harvard-Smithsonian Center for Astrophysics, however, has forwarded compelling evidence that variation in the sun's radiance corresponds almost perfectly with global temperature readings and might well be the agent responsible for the observed warming this century. See Sallie Baliunas and W. Soon, "Beyond the Wild Frontier: The Sun-Climate Link," World Climate Report 3, no. 3 (1997): 6-7.

31. Pat Michaels, "Yelling 'Fire' in a Crowded Greenhouse," Richmond Times-Dispatch, August 16, 1998.

32. Scott Allen, "As Weather Heats Up, So Does Climate Debate," Boston Globe, August 10, 1998.

33. Quoted in *ibid*.

34. Michaels et al.

35. Lins and Slack.

36. Estimates range from 31 percent (Energy Information Administration, U.S. Department of Energy) to 41 percent ("It's Not Global and It Won't Work," World Climate Report 13, no. 3 (March 16, 1998): 2).

37. Wigley.

38. Patrick J. Michaels, "The Consequences of Kyoto," Cato Institute Policy Analysis no. 307, May 7, 1998.

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