

COMMENTS ON *STERN REVIEW ON THE ECONOMICS OF CLIMATE CHANGE*

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My comments are largely directed towards a major scientific shortcoming in the current manuscript and a lack of attention to the political and economic milieu influencing global warming science.

1. Observed Greenhouse Warming and Climate Models

The major scientific flaw in this report is that it ignores the observed response of climate to known changes in infrared absorption caused by increasing amounts of carbon dioxide, water vapor, and other more minor greenhouse gases in the atmosphere. The observed warming gives a strong indication that changes within the policy-foreseeable future will be modest.

Paragraph 14 acknowledges a long history of greenhouse-effect science, but nowhere in this report have I seen mention that the response of lower atmospheric temperature to a change in a given greenhouse gas (or, more specifically, at certain wavelengths) is logarithmic. The first increments produce more warming than later ones.

This is why greenhouse warming is relatively easy to demonstrate in today's atmosphere. Because water vapor and carbon dioxide absorption bands have some overlap, placing either in a dry (low water vapor) atmosphere results in enhanced warming. Consequently temperature observations (and climate models) show their largest warming in mid-to-high latitude continental regions in the winter. A winter atmosphere has much less water vapor, generally, than a summer atmosphere, owing to the much higher vapor pressure of water at higher temperature.

This report relies on projections that *cannot* be the true consensus of scientists. That is because, in science, we only have two things to work with: Observations (data) and hypotheses (models). For the future, we only have the latter, but they can be tuned with knowledge from the past.

Figure 1 shows a typical result from a "Coupled Model Intercomparison Project", or CMIP (Meehl et al., 2000). There have been four to date. All have been quite similar. They show that once human warming is initiated in the atmosphere, it tends to take place at a constant rate. That fact can be used to great advantage for future estimation.

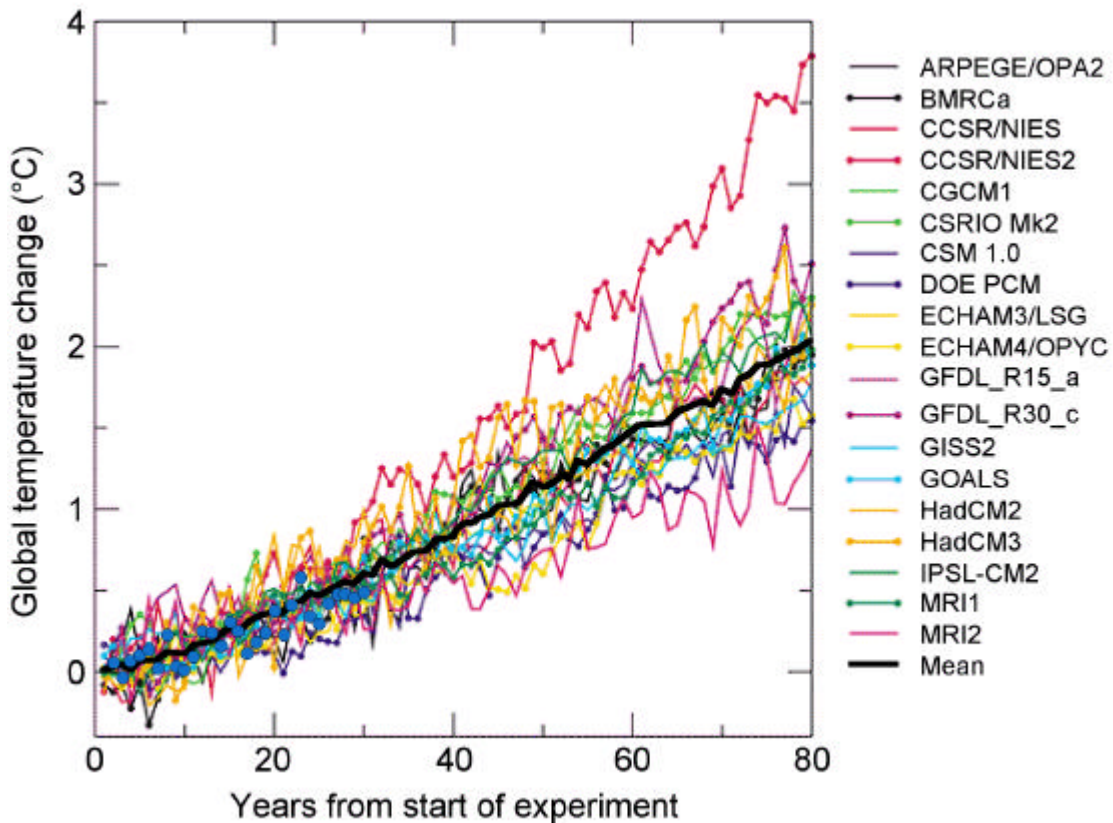


Figure 1. Temperature projections made from a collection of climate models, each run with atmospheric carbon dioxide concentrations increasing at a rate of 1%/yr.

Note, that on a 100-year basis, the mean and median warming projected by the consensus of hypotheses is about 2.3°C. Now note Figure 2, from the IPCC's *Third Assessment Report* (IPCC, 2001). The mean 100-year warming is 3.6°. This is simply *not* the consensus of intercompared models.

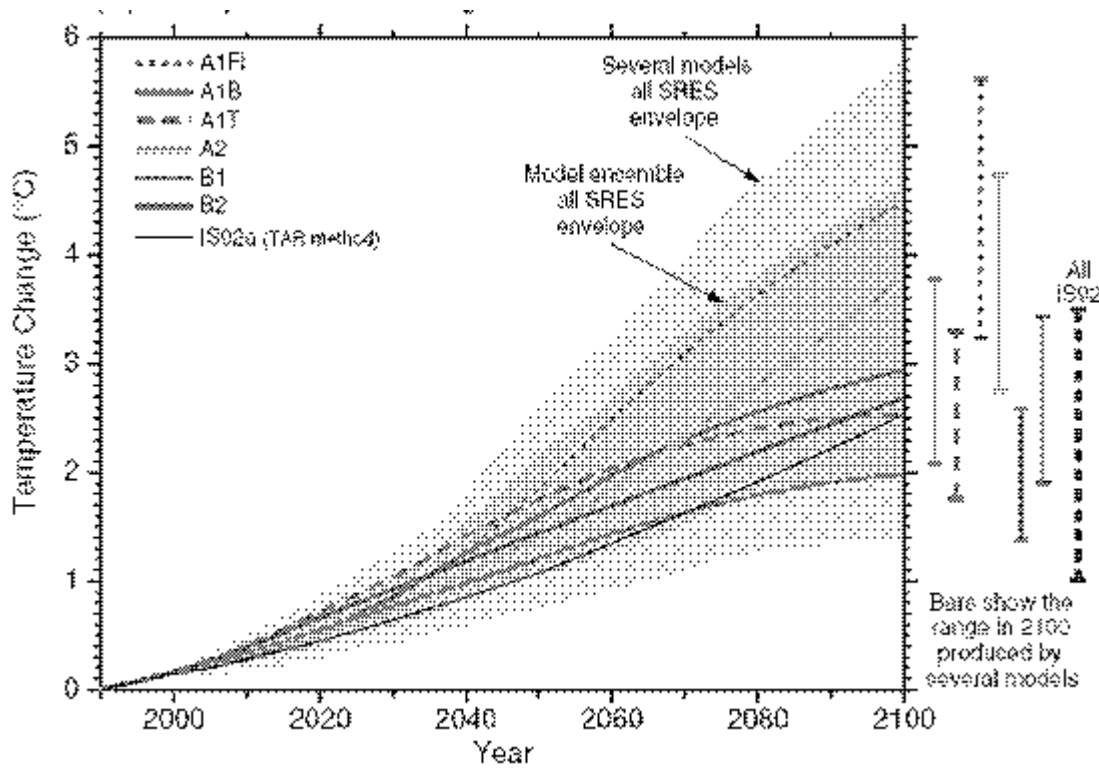


Figure 2. Projections of the range of temperature rise between 1990 and 2100 given in the *Third Assessment Report* of the Intergovernmental Panel on Climate Change.

The CMIP study shown uses models that have an annual increase in carbon dioxide of 1% per year. This number is itself *wrong*. The percent increase, per year, for the last ten years, was 0.49%; For the ten years before that, 0.42%; for the ten years before that 0.43% (Keeling and Wharf, 2005).

That means that these models are themselves overpredicting warming. The time for warming to be largely realized from an increment of carbon dioxide is in the range of 50 years (Schlesinger and Jiang, 1990), which must mean that these models are predicting too much warming for at least the next half-century.

The quasi-linear behavior of the consensus of models is a simply consequence of the fact that the addition of a logarithmic response to a low-order exponential increase in carbon dioxide concentration can easily sum to something like a linear response.

Obviously, though, the models produce different rates of largely linear response. In order to arrive at the most likely future warming, one needs to demonstrate a) the existence of anthropogenerated warming, and b) a linear response. The first is well-acknowledged in the scientific literature, including by this reviewer (e.g., Michaels et al., 2000; Michaels et al., 2002). And, as figure 3 shows the observed warming trend superimposed upon a CMIP study, the response indeed has been remarkably linear.

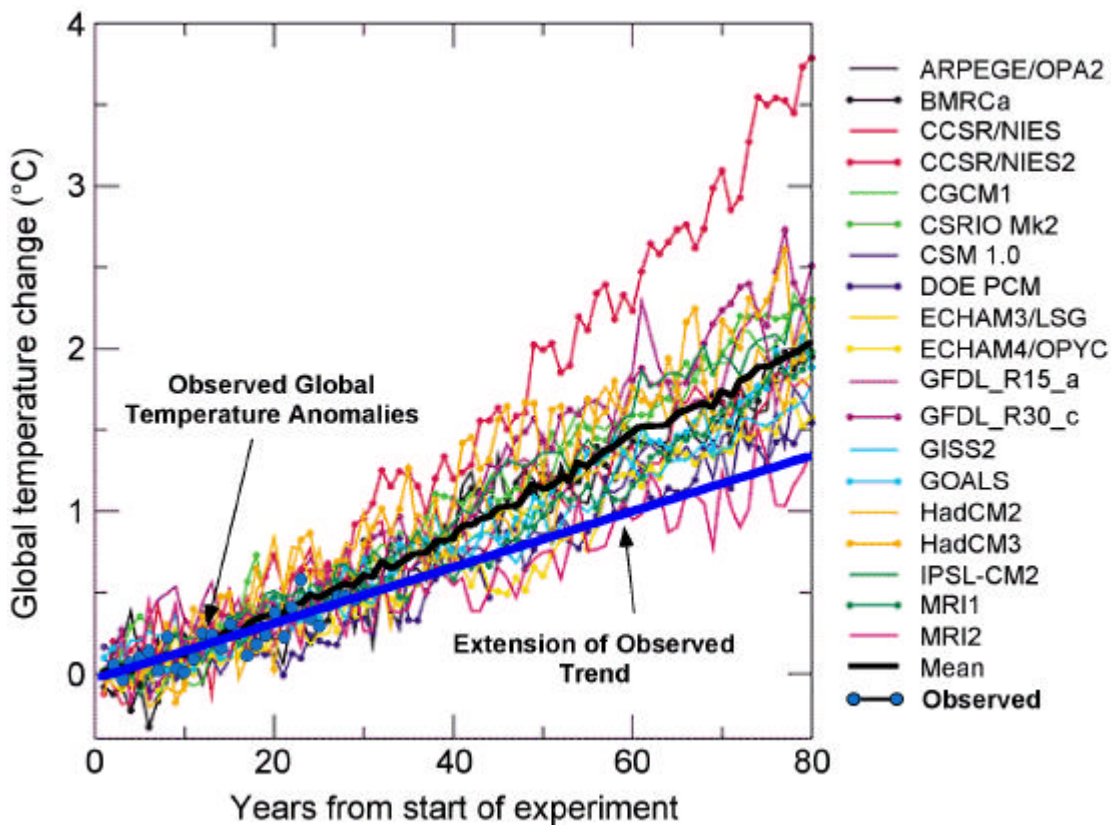


Figure 3. Observed global average annual temperature anomalies for the past 30 years superimposed upon the model projections from Figure 1. The trend through the observations has been extended into the future.

One can only therefore only support the dramatic warming statements made in the Stern document by *disallowing the consensus of hypotheses*.

2. Inherent Bias in Global Warming Science

This report repeatedly states that “some of the risks are more serious than previously thought”. In fact, there is a pervasive analytical bias in global warming research that is a logical consequence of “public choice” influences.

The addition of any new piece of information to a forecast (unless the forecast itself is biased) has an equal probability of making the forecast “worse”, or “better”, from an impact point of view. The fact that virtually all of the impacts indicated in this report become “worse” is a mathematically demonstrable bias.

That is because of the information that went into this report: studies from the refereed and “grey” scientific literatures. I performed a content analysis on the daily stream of global warming reports in early December, 2005, examining news reports, press releases

from major scientific journals, and press releases from government agencies and universities. The ratio of “it’s worse than we thought” to “better” reports was 14 to 1. Given the equal probability of new information giving one or the other, this is equivalent to throwing a coin 15 times and coming up with only one “head” or “tail”. The chance of this is approximately one in 2000. So one must accept at the start that the current Stern document, based upon a similar literature, is a drastically biased document, and the information therein can only be discounted accordingly.

In fact, there are several reasons for this bias within science itself, largely based in Public Choice theory and the fact that climate change competes with other important issues for public attention.

Note that by far the largest source of research funds for global warming are from governments. But the amount of funding available for various scientific issues (say, global warming, AIDS, cancer, etc...) is finite, and issues compete with each other. The only successful way to win this competition is to present an individual issue as one of paramount importance; i.e. one which is a grave threat to society unless it is given substantial fiscal attention.

Thus large-scale scientific programs become dependent upon the portrayal of global warming as an extremely threatening issue. This is beginning to have ramifications in the peer-review process, which is what the Stern report is dependent upon.

As an example of this bias, consider that neither the scientific community nor this report has made (at least to date) any credible attempt at defining the benefits of a fossil-fuel developed economy versus the risks. Consider reports of warming-related deaths, largely in poorly developed countries. Patz estimated approximately 150,000 per year (Patz, 2005). That work received much attention and is a summary of other work that serves as the basis for several statements in the Stern report on health, mortality and warming.

The information bias on global warming led no reviewer of this work (or, perhaps, no editor) to ask about the “other” side of the equation: how many lives have been *saved* by the technology associated with the emissions putatively causing 150,000 deaths per year?

Note that most people accept that the warming of the early 20th century was largely solar-driven, while the warming since 1975, which is of similar magnitude, is largely a result of greenhouse gas changes. Obviously the putative deaths from warming did not start out immediately at the current value; assume, instead, that the average per-year deaths over the last thirty years is 75,000, leading to mortality of nearly 19,000,000.

However, in the industrialized democracies, life expectancy rose from approximately 40 to 80 years from 1900 to 2000. Assume, as a gross estimate, that 2,000,000,000 people were affected. Doubling the life expectancy of 2 billion people is the same as saving one billion lives! And, certainly, as this technology diffuses into the developing and underdeveloped world, it far outweighs the number of putative deaths.

That argument was intended as a jarring example to demonstrate the scientific and cultural milieu in which the Stern Review is mired.

It should also be noted that there is also a substantial Public Choice component in the first point of this essay. Why is it not common knowledge that adjusting the suite of models for the observed linearity in warming yields a value far below mean projections of the IPCC? Why do scientists not routinely inform the public that warming is clearly at the low end of the projected range?

3. Is there a Solution?

The Stern Review must include a substantial new section on the influence of Public Choice on programmatic science, and the resulting implications. It needs credible economists to demonstrate that the information stream used to create syntheses such as these will inevitably paint a darker picture of any issue than is warranted by reality. It needs to demonstrate that the information content in any synthesis is therefore biased in a negative direction.

The Stern Review must also demonstrate that the combination of modeled and observed temperature changes dictates a warming that is at the low end of projected ranges, at least for the coming several decades. Further, that warming rate will not increase substantially unless the annual percent increase in atmospheric carbon dioxide doubles beyond its current value. Finally, economists need to explain why, in spite of rapid economic development, the increase in atmospheric carbon dioxide percentage per year has remained so constant, and at a number half of what is in the consensus estimates used for model intercomparison.

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