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### **Political "Science"**

Heightened alarm about global warming arose this time last year when the UN's Intergovernmental Panel on Climate Change (IPCC) projected warming of "up to" 5.8 degrees C over the next century. The projected range was only 1 to 3.5 degrees in 1995. The stunning rise in the upper-end forecast got worldwide attention, prompting headlines worldwide to the effect that the world was warming "faster than expected."

Reporters at the time did not ask why the warming projections rose so much. The estimated sensitivity of the climate to changes in the CO<sub>2</sub> concentration did not change between the IPCC Report in 1995 and the Third Assessment Report (TAR) last year. Nor, for that matter, did satellite-borne instruments pick up any distinct warming of the troposphere, the region climate models say will bear the first fingerprints of any CO<sub>2</sub>-induced warming. So why did the warming forecast jump?

The answer lies with the new scenarios used for the recent report. These are based on fictional "storylines" (the official term) drawn up by an IPCC subgroup in 1996 for the Special Report on Emission Scenarios (SRES). The SRES group wrote the scenarios which scientists were then told to analyse. They were specifically instructed not to comment on the likelihood of the scenarios but to treat them all as equally probable.

To fix in your mind the range of reasonable emission scenarios, examine the graph. Since 1970, global CO<sub>2</sub> emissions per capita have been remarkably constant at about 1.14 tC (metric tons of carbon equivalent) per person per year. Emissions per capita are higher in industrialized countries than in poor countries. Income growth generates two offsetting effects. As poor countries grow rich they produce more CO<sub>2</sub> per person, but they also get more efficient in their energy use. These effects seem to cancel, leaving the global average remarkably constant over the past three decades.

A few weeks ago the UN released their latest population growth forecasts. The world population over the coming century is now expected to reach just over 9 billion souls by the middle of this century. Depending on fertility trends it could peak out at or around this level.

So we can construct a simple CO<sub>2</sub> emissions scenario for the next century. If global emissions per capita remain at 1.14 tC, and population peaks at 10 billion in 2050, total emissions will rise from the current level of about 6.7 billion tons to about 11.4 billion tons, then decline through the latter half of the century. If emissions per capita were to increase to, say, 1.2 or 1.3 tC per person, the peak could be 12 or 13 billion tons. Or if energy efficiency improvements accelerate, the peak may be lower: maybe 8 to 10 billion tons. But we could reasonably expect a peak emissions rate of about 9 to 12 billion tons sometime in the middle of the coming century.

By comparison, the SRES group instructed modelers to examine peak 21<sup>st</sup> century global emission levels ranging from a low of 11.7 billion tons to a high of

(get this) 29 billion tons. The "up to 6 degrees" warming forecast followed directly from feeding this range of emissions into climate models with the standard assumptions about CO<sub>2</sub> sensitivity.

This range is based on a family of emission projections. The "B1" scenario is the low end, projecting emissions growth to 11.7 billion tons mid-century followed by steady decline thereafter. The "A1FI" scenario projects emissions rising to an astonishing 24 billion tons by 2050, and rising further to almost 29 billion tons through the rest of the century. That would imply global per capita emissions somehow triple in the next few decades! The fantastic increase in wealth and consumption around the world needed to accomplish this would, in any other context, be considered a dream come true.

The biggest source of CO<sub>2</sub> emissions is coal use. The scenarios were dated to begin at 1990, and consumption levels were guesstimated at 10 year intervals. Over the 1990s coal consumption was projected to grow by a minimum of 4 percent (in the B1 scenario) to a maximum of 31 percent (in A1FI). The final model simulations for the Third Assessment Report were done in 2000, so it would have been easy to verify these assumptions against data available from the International Energy Agency. Those data show that actual global coal consumption fell by over 10 percent during the 1990s. Yet none of the scenarios were revised downwards to reflect this fact.

The projected increase in coal use for the three decades from 2000 to 2030 ranges from a low of 50 percent (B1) to a high of 160 percent (A1FI). By comparison, actual world coal consumption grew only 40 percent in the three decades from 1970 to 1999. Again, none of the scenarios were revised to bring projections into line with past trends.

So the world could warm up to 6 degrees this century. Likewise, pigs can fly up to 6 miles a day.

The A1FI scenario was not included in the draft report released in November 1999 for expert review. The projected warming range at that point was 1.5 to 4.0 C, virtually the same as five years previous. But the final draft released in October 2000 included the new A1FI scenario run on a set of models with a wider range of (assumed) climate sensitivities, yielding a new warming range of 1.4 to 5.8 C.

The upper end of the warming forecasts rose almost 2 degrees in 11 months, not by any change in the science but by inclusion of an extreme emissions scenario.

One of the experts invited to review the IPCC Report was Dr. Vincent Gray, a climatologist in New Zealand. When he saw the final report with its astonishing new upper end he wrote a letter of protest to fellow New Zealander Dr. Martin Manning, Vice-Chairman of one of the IPCC Working Groups.

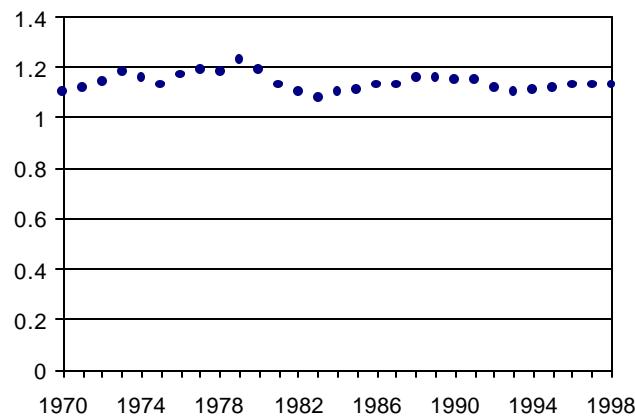
Manning replied to Gray with a widely cc'd e-mail. He confirmed that "The higher warming projections that arose towards the end of the TAR process are due to a high fossil fuel emissions scenario rather than changes to climate models." He emphasized that the A1FI scenario was not produced by climate modelers nor any of the scientists working on the Report, but "came from the

SRES community and in particular was a response to final government review comments for the SRES." He also emphasized that he and many of his colleagues think the A1FI emissions are "unrealistically high."

It is a curious feature of the IPCC process that the final review stage is not done by scientists but by government bureaucrats. The fact that they could arrange the warming forecast to be bumped upwards by two degrees gives you an idea of how political the report-writing process has become.

Without the new fossil-intensive scenarios we get the same warming range as was reported in 1995. And extrapolations based on historical per-capita emissions gives us the low end of the forecast range. Why didn't they just say so?

Perhaps because this would have shown that the fundamental uncertainties surrounding climate modeling are not going to get resolved any time soon. And perhaps announcing the same old news wouldn't get the kind of attention the IPCC likes. As political theater, the announcement of the 5.8 degree warming limit succeeded brilliantly. But as an exercise in science? It's only when people have a wobbly argument that they have to resort to theatrical stunts.



Global CO<sub>2</sub> Emissions per capita. Source: Oak Ridge National Laboratory.