

## Checking climate forecasts

By Mark Lawson\*

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The four major reports produced by the Intergovernmental Panel on Climate Change since 1990 have repeatedly forecast a dire temperature future for the earth. But despite nearly 20 years of consuming these forecasts, government officials and politicians have not thought to ask for an independent check of whether any of the IPCC's forecasts to date have been borne out. In other words, have any of its dire forecasts been proved right by events?

Instead of taking this surprisingly simple step which, at its basic level, requires common sense and some graph work, officials, politicians and the public have taken the assurance of the IPCC that the forecasts have been peer-reviewed. That is, other scientists have checked the forecasts and approved them. But peer review simply has no relevance to forecasts. All it does is assure us, the consumers of these forecast, that they have been made according to the scientific orthodoxy of the time. We still have no idea whether the orthodoxy is right, or whether the forecasting system itself is of any use.

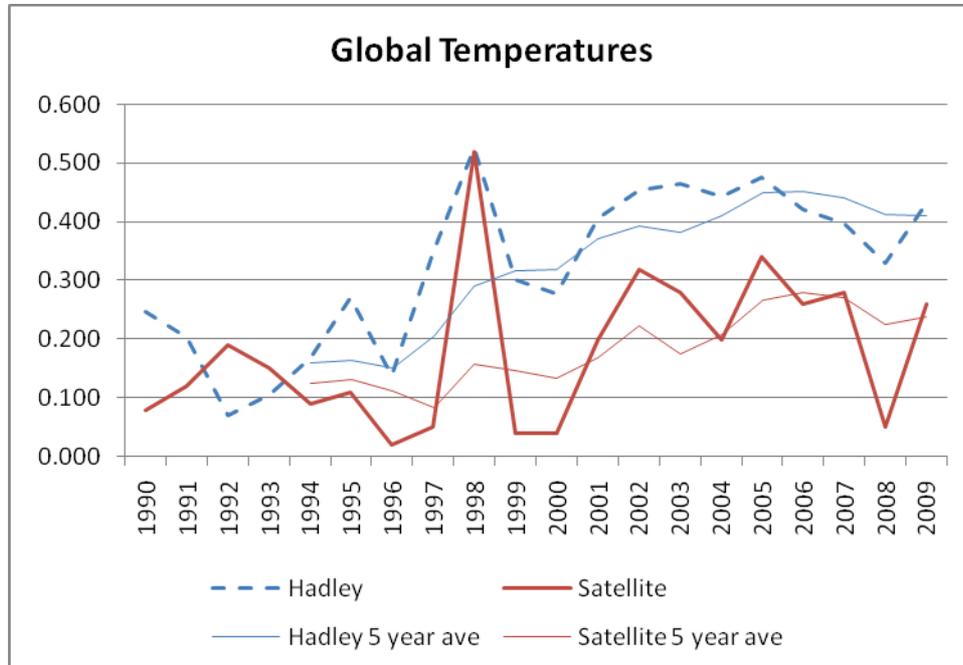
We can make our own, commonsense evaluation, and that evaluation is far from favourable to the IPCC. But the results remain arguable because there is no agreed way to measure the success or failure of the forecasts – a point that really should have been hammered out before any of these forecasts were made.

The panel has issued reports in 1990, 1995, 2001 and 2007. The first report, issued 20 years ago, should be a good place to start in our common sense review of results, if we could find it. The IPCC does not carry the 1990 and the 1995 reports on its web site. A check of the internet turned up this fragment.

*“Based on current models, we predict: under [BAU – business as usual] an increase of global mean temperature during the [21st] century of about 0.3 °C per decade (with an uncertainty range of 0.2 to 0.5 °C per decade).”*

That seems to read that the panel is expecting an increase of a minimum of 0.2 degrees (two tenths of a degree) per decade, so by that forecast temperatures should have increased by at least four tenths of a degree (0.2 degrees per decade for two decades) since 1990. Or perhaps it means just 0.2 degrees for the decade just gone? As the rest of the report cannot be found it is difficult to say but, however it is read, clearly the forecast is wrong. In this article we will use two main sources for temperature history. One is compiled by the Hadley Centre in the UK, a part of the UK Meteorological Office and associated with the Climate Research Unit of the University of East Anglia. The HadCRUTv3 (Hadley CRU Temperatures version three) data series is by far the most widely used, but many questions have been raised about the Hadley data in recent months. The so called “climategate” was the most highly publicised but just one of a number of issues concerning that data set. So we

will also refer to a temperatures series compiled by the University of Alabama in Huntsville (UAH) from a NASA satellite, which is audited. These are set out below in graph form.



Both graphs tell a similar story, incidentally, of a general increase in temperatures up to the turn of the century, with a sharp peak around 1998 thanks to the El Nino effect, and nothing much happening since apart from a slight decline in the past few years. But it is also clear from both graphs, taken straight from the data provided by Hadley and UAH, that the 1990 IPCC forecast is wrong. The temperatures measured by satellite may have moved by 0.15 between 1990 and 2010, depending on how you want to measure it, and perhaps 0.25 degrees on the more favourable Hadley series. One response I have encountered to this bleak assessment is that only trained climatologist can declare climate forecasts right or wrong. Another is that the 2000 and 2007 reports are considerably more sophisticated, so we should forget about the 1990 report.

Readers can make what they want of the first point, but the last two reports are undoubtedly more sophisticated. In fact the 2000 and 2007 two reports are not just one but three, connected forecasting systems, with the first two dealing with the issue of emissions. To forecast dire temperatures increases you first need dire industrial emission forecasts. The earliest forecasts looked at the undoubted increase in CO2 concentrations in the atmosphere, leapt to the conclusion that they would double by 2100 (it was quite a leap, as we shall see), and worked from that. To make that process more rigorous the IPCC set some economists to work, with the result being a host of emissions scenarios for different growth rates, changes in energy intensity and population. Set out in the IPCC's *Special Report on Emissions Scenarios* released in 2000, those scenarios then had to be fed into another computer model setting out what scientists think they know about how long industrial emissions hang around in the atmosphere before being absorbed in some way.

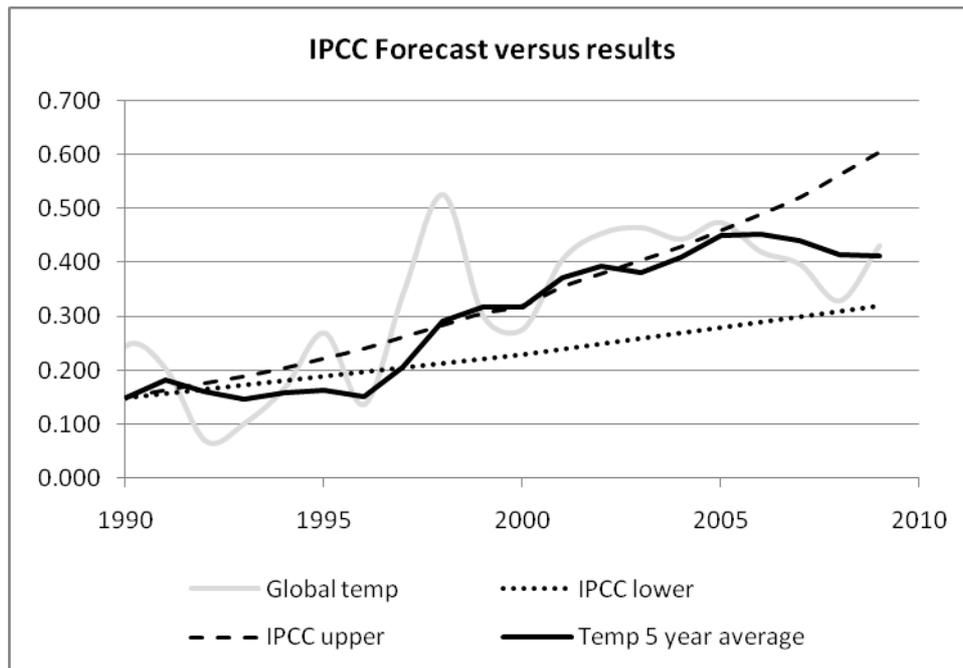
The IPCC's approach in both of those steps have been criticised, but what can we say about the results? Tables appended to the IPCC's 2001 report gives the result in expected concentrations in the atmosphere in parts per million for carbon dioxide and parts per billion for methane, the only two industrial gases that matter. Ten years later a comparison of the forecasts with the actual results shows that there is a problem.

The lowest projection for Methane for 2010 is 1,839 parts per billion (the forecast is given in 10 year increments), and the highest is for nearly 2000. But the actual result for mid 2010 is about 1,790. In other words, just 10 years out the projections for methane are wrong. The panel's economists used very sophisticated analytical techniques and economic modelling but, in essence, they forecast that the increase in methane concentrations evident in the decades before 2000 would continue and even increase. Instead the growth in methane concentrations stopped; no-one knows why.

The forecasts for CO<sub>2</sub> concentrations are better, but still short of the horror story the IPCC wants to sell. CO<sub>2</sub> concentrations in mid-2010 are about 388 parts per million (0.0388 per cent of air), which is a little ahead of the lowest IPCC projections of 381 ppm. But the mid range projections are mostly above 390 ppm and the highest is nearly 400 ppm. Again the panel economists calculations forecast, in effect, that a slight acceleration in rate of increase of CO<sub>2</sub> levels evident in the years before 2000 would not only continue but increase. Instead that acceleration died away, with the increase levelling off to around 2 ppm a year. The US National Office of Atmospheric Administration has graphs of the trends in both gases in the atmosphere at <http://www.esrl.noaa.gov/gmd/aggi/> .

An annual increase of that order, assuming it continues, is not going to double CO<sub>2</sub> concentrations by 2100. In fact, with Methane falling seriously short of forecasts, industrial gases are not going to meet any of the targets occasionally quoted by assorted scientists and politicians, at the recent meeting at Copenhagen and elsewhere. They all seem to be trusting to repeated public assurances that emissions are running at the top range of the 2000 SRES projections, and assuming that concentrations have followed suit. Emissions may well be running at the top of the forecast range, although it is not clear how anyone knows this, but the concentrations of CO<sub>2</sub> and methane in the atmosphere are just not following script.

What about the actual temperature increases? Here the record is mixed for it is possible to argue that projections are completely wrong or still on track, by choosing the right settings. Let us start with a basic graph I constructed of projections from the 2000 report compared with actual results.



The above comparisons are started from 1990, as that's how its set out in the IPCC report and in the one attempt in the literature of which I am aware to compare forecasts with track records. This is *Recent Climate Observations Compared to Predictions* (Science, May 4, 2007), which lists nine authors led by Stefan Rahmstorf, a Professor of Physics of the Oceans at Potsadm University in Germany and including the arch prophet of global warming, James Hansen. This has occasionally been cited as evidence that the earth is warming faster than expected.

At first glance this does not seem so bad for the global warming side, and is a little better if we add in the first half of 2010 which has shown distinctly warmer tempratures due to a now passing El Nino effect. Up until about two years ago it was possible for global warmers to claim that temperatures were running at the top of projections in the IPCC's 2000 report. The comparison is even better if we use data compiled by the Goddard Institute of Space Sciences, run by Hanson, which, despite being part of NASA, uses mainly ground based instruments to compile a global temperature time series. Although the raw data it uses is very similar to the data used by Hadley the results are somewhat higher and shows a slight warming trend in recent years, as opposed to the slight cooling trend shown by both Hadley and the satellite data.

The comparison is better again if we change the "smoothing" period. Instead of a five year average, we can bump it up to seven or even 11 years, which would be eminently defensible in climate science. That much longer period includes more of the evident increases in temperatures that occured before 2000. But then we could change tack entirely and make the comparison look bad by using the satellite data (where the pre-2000 warming is not nearly as pronounced) and shortening the smoothing period to three years. If the time periods are shorter the cooling at the end of the series has more effect.

An informally produced *Cherry-Picker's Guide To Temperature Trends (down, flat and even up)* by Chris Knappenberger on Master Resource, an energy blog (<http://masterresource.org>), points out in some detail that it is possible to make cases for current temperatures being both almost in line with 2001 forecasts, or well below forecasts, by picking the temperature series and the smoothing interval.

But global warmers have a distinct problem. Despite the graph above and the paper in *Science*, the only true test of a forecasting system is in comparing its output against material unknown at the time of the report. The compilers of the IPCC 2001 report would have known the 2000 results and, as you can see above, the five year average is already at the top of the IPCC forecast band at the time the report was made. Given that starting point – Rahmstorf's graph is similar although he uses a different smoothing period and a combination of GISS and Hadley - it is hardly surprising that it took several years to diverge from the top line.

A common sense test, and never mind the fancy graph work, is that temperatures are supposed to have gone up since the 2001 and 2007 reports thanks to all the CO<sub>2</sub> pouring into the atmosphere, and they have not. Temperatures are still pretty much the same or a little lower than they were a decade ago. The 2000 and 2007 projections cannot really be described as successful, although the point is certainly still arguable.

There are other ways to assess the forecasts including looking at how well the models used forecast patterns of heating in the upper atmosphere, on the earth's surface or in the oceans. The record here is also mixed but would require a major investigation to sort through all the claims and counter-claims. However, as we have seen, the real weakness remains the forecasts for concentrations of industrial gases in the atmosphere which now need to be updated.

There is considerable knowledge about forecasting, which is a separate subject in its own right, but policy makers and politicians seem to have very little awareness of the subject. They have certainly not called the IPCC to account by requiring an audit of their forecasting procedures.