

# Truth and Certainty in the Climate Debate

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It has been said that people don't want the truth, they want certainty. Whatever the provenance of this statement it is particularly relevant where science meets public policy.

A broad definition of science makes it the pursuit of demonstrable truth but useful truths are rarely certain. Calculations involving the conditions of life on our planet's surface are inevitably constrained by the sheer complexity of the problem, lack of adequate data and incomplete theory.

For the practising scientist, these problems are a challenge to collect more data, test different models and reinforce your favoured theory. A complex and publicly popular problem can provide the personal satisfaction of a life goal and a steady, secure career. Differences of opinion and conflict can provide the spice that counters what is often a monotonous day-to-day existence. This conflict is, ideally, temperate but often degenerates into unseemly rows and long standing enmity.

When science is applied to expensive commercial development or far-reaching public policy, uncertainty must be confronted. Clarity and confidence are demanded. Commercial or political pressures force a consensus - often prematurely and to the consternation of conscientious scientists who realise that more time is required. The relatively orderly processes of science are disrupted.

When looking at the interface between science and policy it is easy to ignore the day-to-day successes and focus on the problems, and disasters, that occur but the failures cause anxiety or suffering and attract attention. In their book *Scared to Death*, Booker and North [2007] list a series of episodes in which the nexus between science, journalism, politics and public administration has caused extreme public alarm, flawed policy and, tragically, destroyed the lives of many innocent individuals caught up in the events.

While I disagree with much of their scientific analysis I find much to agree with in their general conclusions. Uncertainty, and the fear that it usually provokes, is a highly volatile component of public opinion. Journalists revel in it. Politicians both respond to it and promote it - there is nothing like fear to muster support for authority. Bureaucrats cover up and, when their efforts are later exposed, provide fuel for distrust, paranoia and overreaction. Some scientists shrink from publicity and look to peak bodies and the relative certainty of consensus for shelter. Others, driven by genuine concern or personal glory, pander to the journalists' feeding frenzy - there is nothing quite like the feeling that you are saving the world. Often the science is incomplete, exaggerated and sometimes downright wrong. Groups of scientists are just as prone to being carried away by bubble thinking as share traders and bankers – possibly more so.

The ultimate scare example given by Booker and North is Global Warming. At the centre of this issue has been the Intergovernmental Panel on Climate Change (IPCC). Reading their reports left me feeling shocked and dismayed, not at the enormity of the environmental problems we face, I learned little that I wasn't already aware of, but I

found myself increasingly resistant to believing anything they said. The bias and obfuscation of the reports was obvious and the connection between research and policy conclusion opaque or missing.

The scientific approach allows for the statement of an hypothesis followed by the presentation of the facts that support it, leaving others to critique the arguments and present alternatives in an atmosphere of open, rational and dispassionate debate. At the very least, the IPCC should have declared its underlying hypothesis: that the world faces imminent catastrophic global warming primarily caused by the burning of fossil fuels. It attempts to present conclusions as balanced and comprehensive which they are not.

Much of the key analysis supporting the IPCC position is seriously deficient. Conclusions on the temperature analysis rely heavily on meteorological data that is questionable. I tried some modelling thirty years ago and dismissed my own results as unreliable on the grounds that meteorological measurements weren't suited to long term climate analysis. That aside, you can't talk sensibly about climate change over a period of decades. You need to include at least a few significant climatic events for comparison.

The IPCC 2007 Synthesis Report gives a global temperature graph spanning the last 150 years. It appears to show a startling picture of warming. Go deeper to the Technical Summary and thirteen centuries are shown, which include the medieval warming and little ice age events. There we see that the warming over the last century is comparable in both size and rate to that of the medieval event. Data from ice cores [Vimeux] show no recent (decadal) upsurge and evidence from the Sargasso Sea [Keigwin] suggest medieval temperatures one degree higher than contemporary temperatures. Keigwin concludes: '*...the warming during the 20th century (0.5°C) is not unprecedented. However, it is important to distinguish natural climate change from anthropogenic effects because human influence may be occurring at a time when the climate system is on the warming limb of a natural cycle.*'

The heat of the debate is based on recordings of the last few decades (i.e. weather not climate) with the last decade being particularly problematic (stable or a possible cooling) but for now uncertain.

In the IPCC analysis of CO<sub>2</sub> sources there is the serious omission of an anthropogenic source - soil degradation. Fossil fuel emissions are relatively easy to estimate but estimating soil carbon stores and the associated dynamics is very difficult. We don't have reliable contemporary estimates for global soil organic matter let alone historical data. The IPCC assumes long term stability with only major land use changes as significant. This reflects another scientific bubble of the late twentieth century where simplified laboratory based models of agriculture contrast starkly with the real world complexities considered in earlier scientific thinking [e.g. Allison] built from lifetimes of practical experience and broadly based science.

Neglecting the potential impact of this source of CO<sub>2</sub> emissions distorts the conclusions and, importantly, hides the valuable response option of reversing a CO<sub>2</sub> emission trend by boosting global soil fertility, making soils a net sink rather than a source of CO<sub>2</sub>.

As we move up the hierarchy of IPCC documentation from research to Synthesis Report to Summary for Policy Makers, we see a clear transition from partial truth

through to certainty. There are comforting references to 'high confidence' and 'very high confidence' but these are personal judgements from a partisan body. There is no systematic, let alone rigorous, error analysis.

The IPCC's conclusions are not based on direct measurements but climate prediction models. Evaluation of computer models is bound to be problematic [e.g. Dambeck]. At best they are as good as the data they are based on which, in this case, is both unreliable and sparse. In the IPCC reporting, models are compared with each other which tells us little, given that they were not independently developed.

The credibility of modelling climate fifty to one hundred years into the future is close to zero. Fundamental requirements for modelling are extensive and reliable historical data along with stability in the underlying, real world, system. Adequate data is not available and, by its own criteria for alarm, the IPCC claims that we are moving into uncharted waters - i.e. the underlying model is changing. The only thing that we can say with any certainty about the year 2100 is that we will still be struggling with the models.

Consensus has always had a difficult role in science. Some scientists appear to be motivated by a quest for absolute truth which blinds them to opposing ideas. This is bad science. Others, including many non-scientists, look to science as the basis for a form of religion. This is bad science and poor religion. We should all be wary of absolutism and intolerance toward opposing views. Too often it reflects uncertainties in our own views rather than a real, practical threat and we need to remember that measures to quash opposition may also be used in reverse.

Booker and North recognise the degree to which global warming differs both quantitatively and qualitatively from the other shock-and-fear issues they discuss. Global warming extends the ground of globalisation from trade and co-operation to imminent global coercion and conflict on a grand scale.

While the shock of global warming may be exaggerated, there is clear cause for concern. The greenhouse effect is basic, incontrovertible physics, as is the fact that CO<sub>2</sub> is a significant contributor. While the actual current impact may be uncertain we will need to address the issue at some stage and, given the potential economic impact, the sooner the better. We need to move from the shock-and-fear stage to one of inform-and-react. So what should, or can, we do now?

We can put the debate on a more rational and balanced footing. The issue of global warming is neither new nor isolated. Much of what is suggested as remedial action for global warming is needed on more general environmental and equity grounds.

The world is facing the consequences of an equation that doesn't compute: the equitable division of the earth's resources among a population of nine billion people (plus future generations). Fortunately, not all will aspire to our profligate developed world lifestyles but most will demand, and get, a larger slice of the cake.

To the saying 'truth will out' might well be added 'equity will out'. The global liberalisation of trade has almost certainly given rise to an increase in global prosperity. It has also meant that an accelerated move toward global equity is not so much a moral issue any more as an inevitable consequence.

We can ramp up activities that are likely to have general benefits, such as energy conservation and sensibly selected renewable energy with constrained subsidies that do not create excessive market distortions, while bearing in mind the subsidies that

coal and nuclear energy have already received. The economics and options for responses are being continually revised [e.g. Giles, 2009] and creative thinking is showing new paths that we can take without catastrophic economic disruption. We need to consider jobs gained in new industries as well as jobs lost from the old.

We can push toward revitalising the planet's beleaguered soils, simultaneously improving fertility, increasing food production and sequestering carbon. In that context we should question the wisdom of using food crops, or land that may be needed in the future for food crops, as a source of fuel. We need to dramatically improve our soil inventories and make soil fertility a standard component of our evaluation of land use and the value of the land itself.

We need to improve global modelling by expanding the scope of models to include the earth's biota. We also need to look at a diverse range of models that deal better with complex inter-domain (atmosphere, ocean, biota) interactions than the current models do.

We could consider trialing the use of upper atmosphere sulphate aerosols as a short to medium term cooling influence. Crutzen [2006], in discussing the option, concluded: *'Finally, I repeat: the very best would be if emissions of the greenhouse gases could be reduced so much that the stratospheric sulfur release experiment would not need to take place. Currently, this looks like a pious wish.'*

We need an increased awareness of rational risk analysis within the scientific community, the general public and policy makers. Risk is the probability of an event times its impact. In the case of global warming absolute certainty is not required. A small probability of anthropogenically enhanced warming can still lead to a significant risk if the potential impact is great.

We can provide for more balanced, structured and accessible information and debate. The push for absolute consensus inevitably causes polarisation and loss of credibility. We need to recognise the existence of multiple consensus positions and work toward developing islands of relative certainty within the common ground. We need degrees of consensus for stability combined with rational competition to ensure their healthy evolution.

To assist this process we could establish a broadly based Global Climate Wiki and develop it as a foundation for twenty-first century knowledge technologies. Readily achievable systems would allow common interest groups, or any individual, to provide information, evaluation and comment down to the level of sentences (or words, if need be). We need a means of tracing the logical progression from the relative, partial truth of raw research through to quantified certainties needed for policy foundations. Graphical abstractions of information evaluation could provide overviews of areas of consensus or hot dispute.

Currently we have a serious problem with information access. Judith Curry [2009] in her response to Climategate said as her first point: *'Transparency. Climate data needs to be publicly available and well documented.'* Meaningful public debate is only possible if information is universally available. This should be mandated in policy debate - no public access, no reference. To access all the research referenced by the IPCC would cost a six figure sum. Currently most of the research articles used are hidden from the public by \$20-\$30 per article charges (sometimes per day). We need to reverse the Great Knowledge Heist in which unjustifiable profits are made from the

results of publicly funded research. There is no good argument against them being freely available.

Curry concluded: *'The need for public credibility and transparency has dramatically increased in recent years as the policy relevance of climate research has increased. The climate research enterprise has not yet adapted to this need, and our institutions need to strategize to respond to this need.'*

In conclusion, as a move away from ad hominem attack and extremism and as a gesture toward objectivity we should give the word 'denier' a red card and exclude it from public matches for a few years. Any player can tire if overused but use of this word should be treated as a foul.

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