

Comments on the Discussion Papers Published by the Stern Review On the Economics of Climate Change

By

David Holland MIEE

13 March 2006

Summary

1. Without demonstrating a better understanding of the science than is evidenced in these 'Oxonia papers', the Stern Review will do little to inform policy. Far from being a hundred years old, the new consensus in climate science that has prompted this Review is barely five years old and full of uncertainty. Many of the departments and institutions where it is studied are little more than 20 years old, lacking in maturity. The scientists and institutions that promote the new consensus have strong incentives for doing so.
2. The purpose of these comments is to highlight, largely from publicly available sources, not just the uncertainties that exist within it, but the almost total lack of due process, disclosure, and verification in the new theory of anthropogenic global warming (AGW) that demands the world undertake expensive and difficult collaborative measures.
3. Uncertainty in Climate Science is inevitable from the scale of the field of study and its lack of maturity. Looking carefully at the way science is conducted and making efforts to speed up publication of new research while ensuring the highest standards of disclosure and verification can reduce some of the uncertainty.
4. The present standard of disclosure in climate science is a scandal. The Stern Review should not shrink from saying so and should acknowledge the real uncertainties in the science itself.
5. Given the uncertainties, it should not be assumed that a case for costly programmes of 'mitigation' has been made out. Adaptation to climate change, whatever its causes may be, is in the present state of knowledge a more sensible approach.

Bias and Inaccuracy in the Discussion Papers

6. The many errors in the treatment of science in the Discussion Paper and the Technical Annex are examined in excellent detail in the Comments to the Review by the Australian Lavoisier Group and will not be discussed in detail here. Some are misconceptions that those not familiar with this field often make. Some, though elementary, have little bearing upon public conception but others greatly exaggerate the scale of the problem or the extent of our scientific knowledge. Critics of climate science can fairly suggest that many of these misconceptions are actively promoted and amount to propaganda.
7. The second sentence of the second paragraph of the Technical Annex¹ says "*The rate and scale of 20th century warming has been unprecedented for at least the past 1,000 years*". A scientific paper² is referenced (presumably) as the source but the paper actually says "*Thus, proxy-derived series suggest that twentieth century warming is unique in the last millennium for both its mean value and probably for its rapidity of change*". The addition by the Technical Annex of the words "at least" to the time scale implies that paper says something about earlier times, which it does not. In a scientific discussion the words "suggest" and "probably" are of great importance and not semantics. They are pointers to

uncertainty. The Stern Review should read the paragraph headed “The last millennium” on page 1294 of the referenced paper to understand why there is uncertainty.

8. On page 24 of the Discussion Paper³ it states the first key question for the Stern Review as: “*How should one assess the degree of uncertainty about aspects of climate change?*” More will be said on this matter but the Review should not just edit it out or ignore it. The systematic denial of uncertainty in summaries for policymakers on a topic as important as climate change is dishonest and is a significant factor in growth of scepticism.
9. Sir Nicholas says that much of his understanding of climate science and its history has come from the Hadley Centre, which was only established in 1990. This may account for the misleading statement in the second sentence of the Discussion Paper, which says: “*The underlying science of global warming through greenhouse gases has been understood for more than a century*”. It could also be said that rocket science has been understood since the 12th century. Both statements are disingenuous and should have no place in an objective review of the science. It is true that the physics of radiation and absorption and the chemistry of the atmosphere have been well known and little disputed for at least a century but they comprise a tiny fraction of modern climate science and are not where the controversy and uncertainty lie.
10. The “jet stream”⁴ and the “southern oscillation”⁵ for instance were poorly understood until comparatively recently. The role of clouds is still not fully understood⁶. We do not know if, overall, the ice sheets are growing or shrinking⁷. The output of the sun, which drives the climate, has only been measured with accuracy for a couple of decades. The “time constants” of major components of the climate system are not known with any accuracy⁸. Complex computer models are also new to science but their outputs are cited as fact even though different models make different projections.

Modern Climate Science

11. Climatology is a young branch of science that evolved after the last world war from metrology. The Climate Research Unit (CRU) at the University of Norwich was set up in 1972. In his book “Climate History and the Modern World, H H Lamb”, the founder of CRU, presented voluminous evidence of earlier times since the last ice age when the climate was warmer than today. The effect of the doubling of CO₂ (in the absence of feedbacks), which Arrhenius got badly wrong, was recalculated by Plass⁹, in the 50’s, as around 1°C and its effects were largely believed to be benign.

The First Scare – A New Ice Age

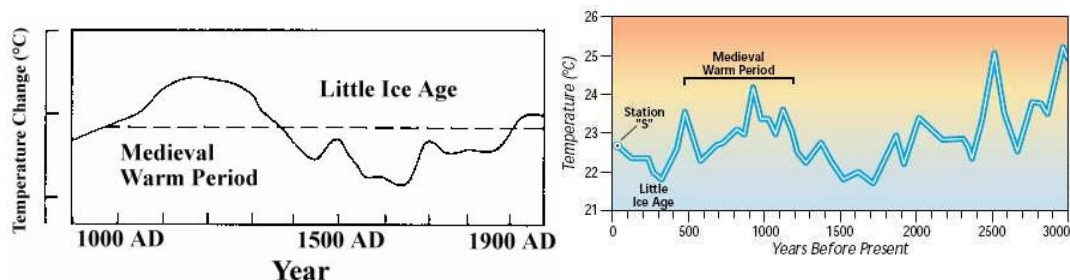
12. Many of us will remember the Ice Age scare, which came from the 1971 peer reviewed paper¹⁰ in the journal “Science” by Rasool and Schneider. It is true that other papers were published suggesting substantial warming due to CO₂ but there was no consensus.

A New Consensus Emerges

13. In the 60’s there were only a few computers in each university, by end of the 70’s individual departments had several and by the end of the 80’s most scientists had their own. The advent of computers enabled large data sets to be easily analysed enabling theories to be tested. Facilities for archiving and disseminating data remained primitive until the advent of the Internet and but few papers even now provide full disclosure. Using computers led to the large climate models from which alarming projections emanate. However, without

much effort, goodwill and full disclosure from the originators of these computer projections they are impossible to verify. The evidence from a computer model given by James Hansen to a US Senate Committee in 1988 can be considered the beginning of the formation of a new consensus view on the effects of CO₂.

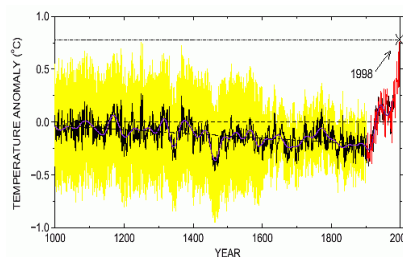
14. However the consensus view of past climate variability remained much as Hubert Lamb originally described and indeed the first assessment report from the IPCC in 1991 included the figure¹¹ below left suggesting that current temperatures were still below those of the medieval warm period. A proxy study by Keigwin¹² in 1996 produced the reconstruction below right, which also suggested this. (Note



the reversed time scale on the Keigwin graph.)

The “Hockey Stick”

15. The proposition that the world has been warmer than it now is with lower concentrations of carbon dioxide in the atmosphere points to greater natural variability and is directly relevant to the Stern Review. If a substantial part of 20th century warming is natural, addressing it by reducing CO₂ will be far less effective. Herein lies the fundamental importance of the paper by Drs. Mann, Bradley and Hughes published in 1998 (MBH98)¹³ and its subsequent revisions. The iconic “hockey stick” reconstruction was used by the IPCC in 2001 as shown on the right to suggest that 20th century warming was exceptional in the last 1000 years and thereby provide circumstantial evidence (still not proof) that the coincidental increase in CO₂ was its principle cause.



16. Thus we can see that far from being a century old, the current concern of global warming in historic terms is almost brand new. For many people, even those like the writer that follows scientific news, the problem of anthropogenic global warming has appeared almost from nowhere in the last six years.

Uncertainty

17. The Discussion Paper is wrong in its executive summary to suggest that the only uncertainty lies in “nature and scale of impacts”. One has to ask, if the climate science is settled, why the EU has funded the SO&P¹⁴ project “to provide an important test of the climate models and an improved estimate of natural climate variability”. One has to ask why Rep. Sherwood Boehlert, the Chairman of US House of Representatives Committee on Science, found it necessary to ask¹⁵ the president of the US National Academy of Sciences to “empanel a balanced group of scientists to provide Congress with expert guidance on the current scientific consensus on the paleoclimate record, particularly the work of of Drs. Michael Mann, Raymond Bradley and Malcolm Hughes (the so-called “hockey stick” thesis)”.

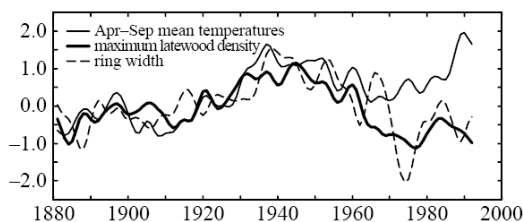
18. Another uncertainty, “the surface record”, is regularly aired in the popular media as well as the scientific journals and should be recognised by the Stern Review. Daily temperature readings from weather stations around the world are archived by the World Meteorological Organisation (WMO). Some of these data are selected, adjusted and averaged to determine the temperature of grid cells (5°latitude x 5°longitude). The cells are averaged to give global temperatures by CRU in the UK and GISS in the US. These two records agree well but disagree with the global temperatures derived from weather balloons and from satellite observations, which separately agree well. The underlying data for the balloons and satellites are available to critics and, despite intense scrutiny and consequent minor corrections, the global temperature rises they show is significantly less than those of CRU/GISS. No independent audit of the CRU calculations is possible because Dr. Jones will not provide or identify the data and the adjustments.

19. In the initial submission to the Review, the writer included a copy of a letter¹⁶ to Minister of the Environment repeating the question (still unanswered after two years): “Can it really be the case that we ratified the Kyoto treaty without checking the sums upon which the key scientific findings were based?” The letter pointed out that there existed peer-reviewed criticisms of the “hockey stick” not only from McIntyre and McKittrick¹⁷ who they considered an outsider but from Hans von Storch¹⁸ a respected scientist and a member of the EU SO&P project team. The letter also asked the Minister if he would arrange to make available the data and methodology that Dr Phil Jones of CRU uses to compute global average temperatures.

20. The Review should also take note of the open letter¹⁹ to “Science” urging them to persuade the authors of several key proxy studies to make their data available to their critics.

21. The Stern Review should note that many of the proxy reconstructions, like Dr. Mann’s MBH98 which suggest the 20th century is exceptional in the last millennium, are based largely on the width of tree rings. Most of us know that trees grow better when it is warmer but we also know that they need water and sun light and of course CO₂. Factors like age, disease and local competition also affect growth. Thus the width of a tree ring may vary in a linear way in relation to average temperature over a range of temperatures, providing all the other factors that affect it remain constant. In very few places and only for limited time spans can it be said that tree rings may respond linearly to average temperature. Dr. John Brignell has an excellent essay²⁰ on why non- linear processes such as plant growth do not lend themselves to analysis using linear algebra upon which statistical analysis relies.

22. Tree ring width data was collected for dendochronology long before climate change was an issue but few temperature reconstructions use those after the 1960’s. The Stern Review should understand why. In 1998, Briffa et al²¹ presented a paper entitled “Trees tell of past climates: but are they speaking less clearly today?” In a graph from it, shown right, it can be seen that after 1960 tree rings are poor proxies for temperature. This is euphemistically referred to as the “Divergence Problem.” However, it does not prevent the same data being used in other papers to corroborate the “hockey stick”. The inconvenient data after 1960 is simply omitted. In other fields leaving out contrary indications as significant as



this would be considered dishonest. This data is included in the “spaghetti” diagrams shown in paper referenced² by the Technical Annex and in the IPCC TAR 2001 as corroboration of Dr Mann’s hockey stick.

23. Clearly substantial uncertainty exists over reconstructions of past global temperatures based on proxies and particularly tree rings. Tree ring series, or parts thereof, are selected or cherry-picked for use in reconstructions. Series from the same area can exhibit differing trends and without seeing the selection criteria, which are rarely available, it is reasonable to suggest that there is bias in their selection.

Hearings at the US National Academies of Science (NAS)

24. The request of Rep. Boehlert to NAS was a consequence of the public refusal²² of Dr. Mann to disclose his computer programme and other data to allow the MBH98 paper to be audited by McIntyre and McKittrick. Dr Mann has previously claimed, on the Today programme²³, that he had disclosed all the methodology. However when obliged by another US House committee to publish his Fortran programme it became clear that he had not reported the results of R^2 calculations for the critical and disputed mediaeval section of his reconstruction. The low values of the withheld R^2 calculations show that there is no statistical significance to that part of his reconstruction. Dr. Mann has still not disclosed all his data and methodology.
25. The panel of the NAS held two days of hearing on 2/3 March 2006. At the time of writing only Hans von Storch who presented with Eduardo Zorita on 2nd March 2006 has published any evidence²⁴. Their presentation was highly critical not only of Dr. Mann’s “hockey stick” and his methodology but the fact that the prominence that the IPCC gave to it “stifled instead of encouraging debate”.
26. Rep. Boehlert had specifically asked NAS, among other things, “Has the information needed to replicate their work been available?” Drs. Storch and Zorita say in their presentation: “No, the information required for replication was not made available in a suitable manner. The original publication in “Nature” did not provide this information and was obviously published without careful review of the methodology”. Drs. Storch and Zorita were emphatic (as are the overwhelming majority of all scientists) that the peer review process for scientific papers should ensure that there is “*no publication without reproducible description of complex methodology*”.
27. Drs Storch and Zorita were also critical of the fact that that Dr. Mann had been the lead author and a reviewer of the section of the IPCC report that used his paper. They say, “IPCC and related processes should have independent scientists doing the review not the key authors in the field.”
28. They also brought to the attention of the committee Dr. Phil Jones’ email response to a request for data: “*We have 25 or so years invested in the work. Why should I make the data available to you, when your aim is to try and find something wrong with it.*” Drs Storch and Zorita say “Data access: Relevant data and details of algorithms need to be made public even to “adversaries”.”
29. In Stephen McIntyre’s account²⁵ of the evidence he says that most of the presenters to the NAS panel were asked whether the science was such that we could determine the average century-scale temperature 1000 years ago within 0.5 degrees centigrade. Every presenter said ‘no’ – except for Dr. Mann who claimed we know the average century-scale temperature 1000 years ago within 0.2 degrees centigrade. This should bring home to the Review the difficulty of

this area of science since we are asked to regard the 0.6°C rise in 20th century temperatures as exceptional.

30. On tree rings Mr. McIntyre reports a telling comment from Roseanne D'Arrigo who "started talking about cherry-picking and explained to the panel - if you want to make cherry pie, you have to cherry pick."

Minimising Uncertainty and Scientific Dispute

31. Only further and better research can remove uncertainty. In disputed areas further may not be better unless bias is removed. In medical research we have come to demand far higher standards including double blind trials. The proponents of the alarmist view of climate change point to multiple independent studies, indeed the paper² referenced by the Technical Annex is on this very point, but as McIntyre and McKittrick demonstrate in their peer reviewed paper²⁶ this claim is false. The authors in the main are drawn from a small milieu whose members act as co-authors for each other, share data and review each other's work. Much of the data is included in more than one paper.
32. Almost all critics of the current consensus accept that a small amount of warming may result from CO₂ emissions. Most will readily agree that land use changes and urbanisation have resulted in some anthropogenic warming. The roots of scepticism lie in the lack of full and plain disclosure by those scientists and politicians promoting increasingly scary theories. The Review could well look briefly at the economics of climate research. In science, prestige and advancement come from publishing papers that attract public interest. A market exists for alarmist papers. The small milieu of climate scientists have benefited from massive public funding yet their standard of disclosure and archiving of relevant data would not be tolerated in a village cricket club.
33. The Stern Review will know from the volume and source of contributions that interest in climate change is widespread in both the scientific community and the public at large. The Review should encourage this and discourage the notion that only climate scientists can make valid comments. Few of the disputes in climate are on the science itself but rather on the mathematics and statistics used to turn large datasets into projections or reconstructions. Far more scientists and members of the public are qualified to assess the processing but are prevented from doing so by the lack of disclosure.

Conclusions

34. The Stern Review should have the courage to state unequivocally that climate science is in its infancy and still contains uncertainties in the known areas of study. It should recognise that there are some areas in which there have been few studies.
35. The Review should also discuss the science, statistical methods and standards of disclosure with some of the many qualified people less identified with the alarmist view such as Hans von Storch²⁷, Ian Jolliffe²⁸ and John Butler²⁹.
36. The Stern Review should state emphatically that prompt, full and free disclosure of all data and methodology pertaining to climate research must be mandatory if doubt and dispute are to be overcome. As these comments show several important papers that are normally "subscription only" have found their way onto the Internet. The writer believes that the science journals would suffer little commercial disadvantage if the funding authority (usually the taxpayer) were to require Internet publishing of important papers with their data and methodology within, say, 3 months of print publication.

37. The net consequence of the uncertainty is not only that the range of possible global warming scenarios is wide, but also that it is very difficult to assess the relative probabilities of each. Unless there is certainty in the role of CO₂ there can be no certainty in the effect of reducing it. We could spend a lot and achieve little. Beyond the scientific uncertainties, political and economic uncertainties make international efforts to reduce CO₂ very difficult to achieve. This should point the Review in the direction of only encouraging cost justified steps to save energy and convert to CO₂ free sources. The argument for reducing dependence on imported energy should not be conflated with concerns over climate change.
38. The Stern Review should point out that adaptation is free of systemic doubt and will produce the planned results regardless of the extent to which global warming is anthropogenic. Moreover the success of our adaptation does not depend upon persuading the world of our viewpoint.

End Notes

- ¹ http://www.hm-treasury.gov.uk/media/695/0E/Oxonia_Technical_Annex_FINAL.pdf
- ² <http://www.cru.uea.ac.uk/~nathan/pdf/idag.pdf>
- ³ http://www.hm-treasury.gov.uk/media/213/42/What_is_the_Economics_of_Climate_Change.pdf
- ⁴ <http://www-das.uwyo.edu/~geerts/cwx/notes/chap12/jetstream.html>
- ⁵ http://ess.geology.ufl.edu/usra_esse/ENSO_History.html
- ⁶ http://www.giss.nasa.gov/research/briefs/rossow_01/role.html
- ⁷ <http://www.realclimate.org/index.php?p=267>
- ⁸ A Slippery Slope: How much global warming constitutes "dangerous anthropogenic interference"? http://www.columbia.edu/~jeh1/hansen_slippery.pdf
- ⁹ Plass, G.N., 1956: The carbon dioxide theory of climatic change. *Tellus*, 8, 140-54
- ¹⁰ Rasool S. & Schneider S., "Atmospheric Carbon Dioxide and Aerosols - Effects of Large Increases on Global Climate", *Science*, vol.173, 9 July 1971, p.138-141
- ¹¹ J T Houghton, G J Jenkins, J J Ephraums, Eds., "Climate Change; The IPCC Scientific Assessment". 1990 . Cambridge University Press, p.202
- ¹² Keigwin L.D., "The Little Ice Age and Medieval Warm Period in the Sargasso Sea", *Science*, v.274 pp.1504-1508, 1996
- ¹³ Mann, M. E., Bradley, R. S. & Hughes, M. K. Global-scale temperature patterns and climate forcing over the past six centuries. *Nature* 392, 779–787 (1998).
- ¹⁴ <http://www.cru.uea.ac.uk/projects/soap/intro.htm>
- ¹⁵ <http://www.house.gov/science/hot/climate%20dispute/NAS%20letter.pdf>
- ¹⁶ http://www.hm-treasury.gov.uk/media/F85/5F/climatechange_holland_2.pdf
- ¹⁷ DOI: 10.1260/0958305053516226
- ¹⁸ <http://www.cru.uea.ac.uk/cru/projects/soap/partic/>
- ¹⁹ <http://www.staff.livjm.ac.uk/spsbpeis/Open!%20letter%20to%20Science.htm>
- ²⁰ <http://www.numberwatch.co.uk/linearity.htm>
- ²¹ <http://www.journals.royalsoc.ac.uk/> DOI: 10.1098/rstb.1998.0191
- ²² February 14, 2005 article in *The Wall Street Journal*,
- ²³ Today programme interview with Sarah Montague 24/02/05
- ²⁴ <http://w3g.gkss.de/staff/storch/PPT/ipcc/060302.washington.nrc.ppt> NB 8MBytes
- ²⁵ <http://www.climateaudit.org/>
- ²⁶ *Energy & Environment* · Vol. 16, No. 1, 2005 <http://www.multi-science.co.uk/mcintyre-mckitrick.pdf> see Section 5.5
- ²⁷ <http://w3g.gkss.de/G/Mitarbeiter/storch/>
- ²⁸ <http://www.met.rdg.ac.uk/~swx03itj/>
- ²⁹ <http://star.arm.ac.uk/staff/johnb.html>