Response of the New Zealand Climate Science Coalition

to comments by Dr. David Wratt - Letter

(Chair, New Zealand Climate Committee, Royal Society of New Zealand)

Important Note:
This is the response that the Royal Society of New Zealand declined to publish on its website, where Dr Wratt posted his comments.

We thank Dr. Wratt for his comments (*Science Alert 433*, July 27) on our letter of July 20 (*Science Alert 432*). This letter was in correction of Dr. Jez Watson's misinterpretation (*Science Alert 431*, July 13) of the reasons behind our July 21 letter to all parliamentarians - in which we recommended that the government convene a Royal Commission on Climate Change.

Dr. Wratt takes particular issue with our assertion that "the science is not settled". He proposes that some reports that we cite "actually support the contention that human activities are affecting the climate system", something that we have never denied, and asserts that he draws very different inferences from these reports than we do. Dr. Wratt concludes by commending the advice given by the IPCC, and implies that IPCC recommendations should continue to be the sole basis for New Zealand's climate policy.

We do not challenge Dr. Wratt's evident belief that human activities may be affecting climate, but that belief does not rebut any of the recommendations that we have made to Parliament, and nor is it relevant to our observation that the science is not settled.

Our letter to parliamentarians stated that it is not known with certainty how much of Earth's continual climate change results from human activities, and how much from natural changes and cycles. Also, that it remains unknown whether any presumed human-caused changes will be more harmful than beneficial for the Earth as a whole. Dr. Wratt does not contest these points. Accordingly, we do not understand his assertion that he draws very different inferences than us from the facts to hand.

Our detailed response to Dr. Wratt's letter (attached) does not address the substantive issue of the need for national climate change policies to have a sound basis in economics and diplomacy, as well as in science. These matters are outlined more fully in the parts of our original statement that Dr. Wratt has chosen to ignore (see http://www.climatescience.org.nz/assets/20060726914350.OpenLetterMPs21July..pdf).

We provide in our response, *inter alia*, a summary of criticisms that have been levelled against the IPCC since the mid-1990s, especially of its inadequate quality assurance, criticisms to which that organization has failed to respond

adequately. We conclude that the IPCC is not a satisfactory body to provide New Zealand with exclusive advice towards the setting of national climate policy.

Finally, we reiterate our recommendation for a wide-ranging investigation by an independent Royal Commission into climate change as it affects New Zealand. We also repeat our request that the Royal Society support our call for the establishment of such a Commission.

Scientific progress is achieved by the application of the scientific method and impartial enquiry, rather than by appeals to authority under the slogan that "the science is settled".

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(Chair, NZCSC Science Panel), on behalf of the *New Zealand Climate Science Coalition*.

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Response of the Climate Science Coalition

to comments by Dr. David Wratt - Discussion

(Chair, New Zealand Climate Committee, Royal Society of New Zealand)

This document contains a detailed response to comments made by Dr. Wratt in *Science Alert 433* (July 27) on an earlier letter of ours in *Science Alert 432* (July 20). The matters discussed all arise from the recommendation for a Royal Commission on Climate Change, contained in a July 21 letter from the Coalition to all parliamentarians.

The comments have been numbered and italicized for ease of reference. Rather than restating the Coalition's entire argument, our response is restricted to the particular points raised by Dr. Wratt.

*1. The New Zealand Climate Science Coalition's letter about climate change in last week's Alert claims "*the science is not settled*". By "*the science*" the Coalition appears to be referring to the body of evidence addressing anthropogenic changes to the global climate system to date, and the question of whether future changes are expected to be large enough to cause concern.*

Yes; and note *"large enough to cause concern".* The Coalition does not deny the possibility of human-caused global climate change, but merely observes that any such effect has not yet been measured and therefore is likely to be small.

Study of the geological record of climate reveals many instances of natural changes of a speed and magnitude that would be hazardous to human life and economic well being should they be revisited upon today's planet. Many of these changes are unpredictable, even in hindsight. That such natural changes will occur again in the future, both coolings and warmings, is certain. To focus on the chimera of human-caused greenhouse warming while ignoring real threats posed by the natural variability of the climate system itself is self-delusory.

Therefore, nothing that the Coalition has said should be construed as denying the need for sensible planning for future natural climate hazards in New Zealand, in a manner analogous to contingency planning for other natural phenomena such as earthquakes and volcanic eruptions. When and if substantive human-caused climate change can be demonstrated empirically, it can and should be included in the planning response.

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2. Contrary to the impression given in the Coalition's letter however, the first two items to which they refer actually support the contention that human activities are affecting the climate system.

The Coalition has never denied that human development can have an effect on local climate, nor that the sum of such local effects represents a hypothetical global signal. The key issues that remain, however, are: (i) whether any human global signal can be measured, and, if so, (ii) whether it might represent dangerous change outside of the range of natural variability. These matters remain undetermined.

Note that we have elaborated on these matters – the uncertainty about how much the global climate is changing, and how much of the change might result from human influence – in reasons 1, 2, 4, 5, and 7 of our open letter to Parliament.

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3. The Coalition's first reference is to a paragraph from the introductory chapter of the IPCC's 2001 Third Assessment Report (3AR), which states that more than just an observed trend in temperature is needed in order to identify an anthropogenic effect on climate. However this IPCC report section is NOT denying that evidence of a human impact exists, it is introducing the approaches necessary to identify such an impact.

The IPCC (2001, p. 61) opinion that we quoted is:

> "*The fact that the global mean temperature has increased since the late 19th century and that other trends have been observed does not necessarily mean that an anthropogenic effect on the climate system has been identified. Climate has always varied on all time-scales, so the observed change may be natural. A more detailed analysis is required to provide evidence of a human impact*."

Dr. Wratt suggests that the meaning of this quotation has been compromised by being removed from context. In contrast, to us the quotation seems crystal-clear in any context, and it remains as true today as when it was written. We therefore reassert it here in its own right.

In any case, Dr. Wratt's comment is irrelevant, since nowhere have we alleged that the IPCC denies the existence of evidence for a human impact on climate, nor have we implied that such evidence is not discussed elsewhere by IPCC (see 4 below).

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4. In fact the next two paragraphs in the chapter describe the evidence provided in the IPCC's 1995 Second Assessment Report (2AR) for a human impact, and refer the reader to a later chapter in the Third Assessment Report (3AR) for more evidence.

The 3AR contains seven main arguments for a human impact on global climate. We have listed these at Attachment A, and added a counterbalancing or explanatory comment for each.

Earth is a dynamic planet. Its climate is constantly changing, and its lithosphere, biosphere, atmosphere and oceans incorporate many complex, homoeostatic, buffering mechanisms.

The evidence for "climate change" adduced by the IPCC, which we discuss in Attachment A, is as yet consistent with natural change. Evidence for human attribution is circumstantial, and, despite intensive research, no necessary global connection with human causation has yet been established for any of the climatic phenomena listed by the IPCC. Conversely, plausible natural explanations exist for all of them.

What the scientific method requires is a testable hypothesis capable of distinguishing between the competing explanations for observed events. In the absence of a conclusive test, there is doubt. That doubt cannot be eliminated simply by making claims that "the science is settled".

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5. *The Coalition's next claim is that the conclusions of a recent National Academy of Sciences report provide "very convincing support for their beliefs". However the Coalition's web reference points to a hearing of the Energy and Commerce Committee, not to the NAS report.*

We thank Dr. Wratt for drawing attention to the fact that we provided the wrong web address for the National Academy of Sciences report. A correct link is: http://newton.nap.edu/catalog/11676.

The NAS report does indeed relate to the question that we raised. For it rebuts the evidence that the IPCC relied on for its claim that the late 20th century warming reached the greatest magnitude of any warming for the last 1,000 years. This claim was then in turn endorsed uncritically by NIWA and the N.Z. National Climate Committee.

Even now, Dr. Wratt appears to be defending Mann et al.'s work rather than acknowledging its deficiencies and modifying his views accordingly. As of July 31 2006, NIWA - above Dr. Wratt's name - continues to present the hockey-stick graph to the public on its website, at http://www.niwascience.co.nz/ncc/clivar/variations

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6. The NAS report describes and assesses the state of scientific efforts to reconstruct surface temperature records for the Earth over approximately the last 2,000 years and the implications of these efforts for our understanding of global climate change.

The NAS (2006) report is important because it confirms criticisms by others of Mann et al.'s (1998; 1999) research. It also shows that the IPCC was unable to detect the critical weaknesses in the Mann study, or to respond effectively when doubts were raised about the validity of the research.

Though useful in these ways, the NAS report nonetheless has a major limitation - which it shares with many other IPCC-related studies - in that it

considers only a very short period of climatic history.

Given the well-established millennial climate cycle of probable solar origin (e.g. Bond et al., 1997, 2001), proxy time-series which rarely go back past 1,000 years do not support clear comparisons of the late 20th Century Warm Period with the immediately prior Medieval and, still less, the Roman Warm Period. In turn, only extremely limited conclusions regarding the context of modern climate change can be drawn from comparisons across such a short time series.

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7. It (the NAS Report) is authored by 12 eminent scientists from fields including statistics, climatology, atmospheric dynamics and paleoclimate.

The eminence of the NAS Report's authors, which we too respect, is nonetheless of less importance than the soundness of their conclusion that the Mann et al. (1998, 1999) research is flawed. Confidence in the correctness of this NAS judgment is high because it is consistent with the original criticisms made of Mann et al.'s work by McIntyre & McKitrick (2003, 2005 a,b,c,d), and with the parallel but independent analysis of Wegman et al. (2006).

Yet, if Dr. Wratt's confidence in these scientists is so high, why does NIWA still publicly endorse the research study that they and others have discredited?

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*8. One of its (the NAS Report's) conclusions is that "*Surface temperature reconstructions for periods prior to the industrial era are only one of multiple lines of evidence supporting the conclusion that climatic warming is occurring in response to human activities, and they are not the primary evidence*".*

Vague assertions like this are often made, but seldom explained in detail. They appear intended mainly to distract from the obvious fact that the IPCC put the hockey stick graph forward as a primary line of evidence of exceptional (and therefore human-caused) late-twentieth century warming. Now that the hockey stick has been discredited, it appears that IPCC authors want to say that it was never important in the first place.

Furthermore, while it has asserted that paleoclimatic reconstructions are not important for proving anthropogenic global warming, the NAS panel fails to commit itself to identifying what is important. The panel devotes a little less than two pages out of its 157 page-long report to listing the "*multiple lines of evidence*" for human-caused warming, and those that are listed turn out to be closely similar to IPCC orthodoxy (Attachment A). Without more elaboration by Dr. Wratt, we remain ignorant as to which argument constitutes the "*primary evidence*" for human-caused global warming. The NAS report also fails to identify any "primary evidence", despite its intriguing - and challengeable - comment (p.28) that "*the attribution of the recent global warming to human activities does not rest solely or even principally upon paleoclimate evidence*".

As a matter of scientific method, evidence in favour of a hypothesis, even if

persuasive, is not proof unless alternative plausible explanations can be eliminated. It is quite clear that the NAS report does not provide conclusive scientific evidence in favour of human-caused global warming, i.e. the science is not settled.

We have discussed these issues in more detail in Attachment A. And, as the late John Daly noted of similar statements in an earlier NAS climate report:

> *"The (2001) NAS committee made many assertions, none of which they chose to justify or explain other than to state it was "their view" - as if their mere authority as representing the National Academy of Science were enough to prevail in the argument.*
>
> *Well it isn't. The days when mere 'authority' could win an argument or debate are long gone. Such deference is more characteristic of a medieval priesthood, not a modern science where every important claim must be justified and explained.*
>
> *Only evidence counts in this modern world."*

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9. *Although the NAS report points out some shortcomings in a 1999 paper (Mann et. al., Geophysical Research Letters 26, 759 62) which was one of the first to report a "hockey-stick" shaped graph of past temperatures, it also identifies other studies undertaken since then which support the general thrust of Mann's conclusions.*

It is not clear what "general thrust" Dr. Wratt is referring to here, nor that any part of Mann et al.'s research remains valid - as he seems to assume.

Dr. Wratt has missed the essential point that the NAS report sets down a series of methodological critiques (concerning flawed statistical practice and use of contaminated data) based on its review of the Mann et al. work. These critiques apply to the entire list of paleoclimate reconstructions cited by the NAS panel, not merely to Mann's. The lack of independence among these studies was subject to explicit criticism in the Wegman report (2006) as follows:

> *"We found that at least 43 authors have direct ties to Dr. Mann by virtue of coauthored papers with him. Our findings from this analysis suggest that authors in the area of this relatively narrow field of paleoclimate studies are closely related. Dr. Mann has an unusually large reach in terms of influence and in particular (to) Drs. Jones, Bradley, Hughes, Briffa, Rutherford and Osborn. Because of these connections, independent studies may not be as independent as they might appear on the surface".*

In his evidence to the Congressional Energy and Commerce Committee, Stephen McIntyre (2006) comments that the other temperature reconstructions cited by the NAS had not been audited or replicated by the review panel. He adds that *"Having examined most of them closely, I do not believe that any of them provide robust or reliable information on relative*

medieval-modern (temperature) levels".

McIntyre also presented specific evidence that adhering to one single recommendation from the NAS panel, that bristlecone pine series should be avoided, would suffice to overturn the findings of all the paleoclimate reconstructions adduced in support of Mann's conclusions in the NAS report

We would welcome clarification from Dr. Wratt as to which conclusions of Mann et al.'s study he believes to have survived these comprehensive criticisms. We would also welcome his explanation of why the IPCC's peer review processes failed to identify the deficiencies in the hockey-stick research.

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*10. The NAS report authors express "*a high level of confidence" *that* "global mean surface temperature was higher during the last few decades of the 20th century than during any comparable period during the preceding four centuries*". The NAS report also concludes that "*presently available proxy evidence indicates that temperatures at many, but not all, individual locations were higher during the past 25 years than during any period of comparable length since A.D. 900*".*

These are unremarkable conclusions that did not require an NAS Report for their substantiation.

The IPCC had made a sweeping claim about the uniqueness of late 20th century climate in the context of the past 1000 years: the NAS effectively dismissed this claim by shortening it to a 400-year interval which was never at issue. Furthermore, they might just as easily have stated that temperatures at many, but not all, individual locations were higher during at least one interval in the Medieval era compared to the present.

Many hundreds of published research papers have identified a period of cold climate - the Little Ice Age - that lasted intermittently between about 1450 and 1860 (e.g. Soon and Baliunas, 2003). Scientific enquiry has yet to disprove the hypothesis that 20th century warming represents mainly natural variability, including climatic recovery from the Little Ice Age.

Furthermore, given the existence of the natural millennial climate cycle referred to in 5 above, the probable correspondence of late 20th Century warming with one of the warm nodes of this cycle made it very likely that temperatures in the years around 2000 AD would reach short-term historic highs.

Such a pattern of recent high average global temperatures therefore bears no *necessary* relation whatsoever to hypothetical human-caused global warming. This is not to deny the possibility or even plausibility of a human effect. What we do deny is the claim that "the science is settled" regarding either the magnitude, or perhaps even the sign, of any human effect.

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11. The third report referred to by the Coalition was commissioned by a political committee in the US which sought comment on the correctness of the

methodology used in a particular scientific paper. The report's authors say they "focused on answering this question and not on whether or not the global climate is changing".

The reference to a "political committee" sounds as if it is intended as a slight against the credentials or motivations of the members of the committee. The NAS panel was also commissioned by a "political committee"—the US House Science Committee. Dr. Wratt does not hold this against the NAS panelists in light of their credentials for the study they undertook. Likewise, he has no basis for questioning or making insinuations against the credentials of Dr. Wegman, his coauthors, or the extensive list of reviewers who were consulted during the Wegman Committee's work.

It is not a valid criticism or limitation of Wegman that he focused on one topic. The work that was under review - the Mann et al. hockey stick temperature reconstruction - was a fundamental part of the argument made in the IPCC 3AR for a discernible human influence on global climate. Indeed, it is arguably the single piece of research that the IPCC and climate change activists have used most widely to influence public opinion towards the alleged danger of human-caused warming. For instance, the hockey stick graph was included as a large banner backdrop at Sir John Houghton's public launch of the Third Assessment Report.

And the view of the genuinely independent expert reviewers on this work (Wegman et al., 2006) was:

> "*In general, we found the writing in MBH98 and MBH99 to be somewhat obscure and incomplete and the criticisms by McIntyre & McKitrick to be valid. The reasons for setting 1902-1995 as the calibration period presented in the narrative of MBH98 sounds plausible, and the error may easily be overlooked by someone not trained in statistical methodology. We note that there is no evidence that Dr. Mann or any of the other authors in palaeoclimate studies have had significant interactions with mainstream statisticians.*"

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12. The third report referred to by the Coalition, the Wegman report, was commissioned by the US House Committee on Energy and Commerce from three statisticians. As requested, the authors focus particularly on the statistical methods used by Mann et al, claiming they make a particular statistical error which has the net effect of producing a "hockey stick" shape. However, an initial response placed on the web last week at http://www.realclimate.org *demonstrates that when the criticised methodology is replaced, the "hockey-stick" shape still remains.*

The materials at hand include peer-reviewed journal articles, a panel report by the NAS and an independent report by three statisticians, led by the chair of the US National Academy of Sciences Committee on Theoretical and Applied Statistics.

In trying to deny the validity of these materials Dr. Wratt cites an unrefereed

weblog posting by the author (Mann) whose work was subject to criticism. In any other context Dr. Wratt would dismiss an appeal to an unpublished internet posting in response to published articles and NAS reports. His usage of the RealClimate posting in this context is pointlessly argumentative and betrays an unwillingness to grapple seriously with valid criticisms.

McIntyre & McKitrick (2003, 2005a,b,c,d), the NAS report (2006) and the Wegman report (Wegman et al., 2006) have all independently ascertained that Mann's PC method produces spurious hockey-stick shapes from a combination of (i) inappropriate centring of the data series, (ii) non-random or biased selection of small data samples, and (iii) inclusion in the calculation of proxies that are known not to reflect a reliable temperature signal (notably, bristle cone pine datasets).

The re-interpeted graph placed on RealClimate was only corrected for error (i). It still incorporates the bristle cone pine data series, and still does not pass the tests of statistical significance originally claimed to have been used. Removal of the bristlecones destroys the hockey stick shape—a point acknowledged by the NAS panel (p. 107).

The NAS Report (p. 50) also stated that inferring temperature from bristle cone pine ring data is fraught with uncertainty:

> *"In old age, these trees can assume a "strip bark" form, characterized by a band of trunk that remains alive and continues to grow after the rest of the stem has died. Such trees are sensitive to higher atmospheric CO2 concentrations (Graybill and Idso, 1993), possibly because of greater water-use efficiency (Knapp et al., 2001, Bunn et al. 2003) or different carbon partitioning among tree parts (Tang et al., 1999). ..... Further evidence comes from a recent review of data for mature trees in four climatic zones, which concluded that pine growth at treeline is limited by factors other than carbon (Körner 2003). While 'strip bark' samples should be avoided for temperature reconstructions, attention should also be paid to the confounding effects of anthropogenic nitrogen deposition (Vitousek et al. 1997), since the nutrient conditions of the soil determine wood growth response to increased atmospheric CO2 (Kostiainen et al. 2004)."*

In conclusion, the RealClimate posting failed to address the substance of the criticisms presented by McIntyre and McKitrick, and upheld by the NAS and Wegman panels.

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13. To sum up: The inferences I draw from the three reports are very different from those claimed by the Climate Science Coalition. The advice I offer to readers of Science Alert is to be wary of placing too much reliance on results from an individual narrowly focussed review, or on science by press release. Evaluating a range of peer reviewed papers exploring various lines of evidence is a much more robust approach. That is what the IPCC is doing in preparing its next science assessment (4AR), which is due out in February 2007.

The NAS and Wegman reports did review a range of peer-reviewed evidence.

In doing so they found the IPCC had made a serious blunder, and in the words of one NAS panellist, had sent a "very misleading message" by focusing on the hockey stick. None of the procedures that led to this problem have been corrected, so it is unacceptable for Dr. Wratt to close his eyes to the situation and counsel continued reliance on the IPCC as a competent and unbiased source of advice.

We summarize some of the historic criticisms that have been made of the IPCC at Attachment B.

IPCC has not implemented significant changes to its procedures in response to these criticisms. Compounding this problem, its authority as a contemporary source of accurate advice on climate change has been thrown into question by two recent, thorough investigations into climate change science by the Select Committee of Economic Affairs of the UK House of Lords (2005) and the US Congressional Committee of Energy and Commerce (2006).

The House of Lords Committee concluded that:

> *"We can see no justification for an IPCC procedure which strikes us as opening the way for climate science and economics to be determined, at least in part, by political requirements rather than by evidence. Sound science cannot emerge from an unsound process",* adding also that *"we are concerned that there may be political interference in the nomination of scientists to the IPCC".*
>
> The procedure to which their Lordships were referring is the way in which government bureaucrats, and not scientists, control the wording of the text of the IPCC's influential Summary for Policymakers volumes.

Stephen McIntyre (2006), in his Testimony to the US Congressional Committee, points out that:

> "*Scientific overviews, such as ones produced by IPCC ... are nearly entirely based on literature review rather than independent due diligence*".
>
> This, of course, is precisely the reason that the 3AR failed to detect the falseness of the Mann et al. (1998, 1999) "hockey stick" depictions of recent climate history, and instead made these a centre piece of IPCC claims of a dangerous human influence on climate.

Wegman (2006), in his evidence to the same Committee, lists as his first recommendation that:

> "*Especially when massive amounts of public monies and human lives are at stake, academic work should have a more intense level of scrutiny and review. <u>It is especially the case</u>* (our emphasis) *that authors of policy-related documents like the IPCC report, 'Climate Change 2001: The Scientific Basis',*

> *should not be the same people as those that constructed the academic papers*".
>
> It is also the case that the forthcoming Fourth Assessment Report of the IPCC has been mostly written, edited and unsatisfactorily refereed by scientists whose audit and due diligence capabilities are blunted in the very way that Wegman has forensically pinpointed.

Therefore we place less store than does Dr. Wratt on the accuracy and impartiality of advice rendered by the IPCC, especially that contained in its "Advice to Policymakers" volumes.

In addition to that, however, it has already been announced that the 4AR will use the same fundamentally misleading socioeconomic scenarios that were deployed in 3AR (cf. Attachment B). Given also the lack of procedural change in IPCC quality control methods, there is no assurance that even the detailed Working Group Reports of 4AR will not contain science or economics that is as unsound as was the Mann et al. hockey stick research.

To question thus the authority of IPCC pronouncements is not to question the integrity, excellence or commitment of the many scientists who contribute to its technical papers. The problem is that technical contributions require evaluation for their usefulness in policy formulation, yet there is no objective basis for determining how such evaluation should be done. Obviously, full scientific objectivity cannot be maintained once politics have intruded.

No human organisation is flawless. This is why appeals to the authority of an organisation, including the IPCC, are inimical to the advance of scientific understanding.

It is self-evident that New Zealand's sovereign and economic interests are not being well served by subservient reliance on the advice of a flawed international body, over which we lack significant control.

The New Zealand public is entitled to accurate and truthful advice on climate change that is tailored to both our regional geographic setting, and to political and economic reality. What is needed is less advocacy from the government's advisers in defence of IPCC or other authority, and for the assertion that 'the science is settled', and a greater willingness to apply the scientific method in the context of New Zealand's particular circumstances.

The Coalition believes that the establishment of a Royal Commission would be the most cost-effective first step towards achieving these ends.

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14. An alternative summing up

The main inferences that we drew in our letter to parliamentarians of July 21 remain. They are:

(i) that the magnitude of likely human-caused global climate change

cannot be measured, has not yet been shown to have a high risk of being dangerous, and remains under strong dispute amongst equally qualified scientific groups;

i.e. the science of climate change is far from settled;

(ii) that the benefits of NZ having signed the Kyoto accord, or of the institution of any other policies intended to avert global climate change (such as a carbon tax), are entirely unclear, and under strong challenge;

i.e. the economics and likely effectiveness of climate change mitigation measures are far from settled; and

(iii) that because of the many special interests involved (amongst which number energy and mining companies, environmental consultants, environmental and other NGOs, scientists employed to research climate change, government bureaucrats and departments, local and regional councils, and national politicians), the best and perhaps only way to get dispassionate advice on this vexed issue is to convene a Royal Commission of enquiry.

New Zealand's participation in Kyoto will cost at least $1 billion more than originally estimated; seeking impartial advice as to the benefit seems only wise.

Professor Augie Auer, BSc (Meteorology), MSc (Atmos. Sci.), CCMAMS
(Chair, NZCSC Science Panel), on behalf of:

Rear Admiral (ret.) Jack Welch, CB
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and

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ATTACHMENT A

Reasons given in the third IPCC Third Assessment Report

for human-caused climate change

The global average surface temperature (GAT) has increased over the 20th century by about 0.6°C.

This statistic is only correct if the ground-based thermometer measurements on which it is based have been successfully corrected for local human-caused heat effects (urban heat islands and other landuse changes), which remains under challenge (e.g. Runnalls and Oke, 2006). Because the full details of how these GAT records are processed are not available in the public domain, calculation of the GAT statistic is unable to be audited by independent scientists.

However, even assuming the surface temperature record is accurate, the 20th century changes represented by the GAT statistic (i) reflect climatic recovery from the Little Ice Age; and (ii) in both magnitude and rate, fall well within previous natural rates of temperature change.

Temperatures have risen during the past four decades in the lowest 8 km of the atmosphere.

This statement was based partly on data which had been inadequately corrected, and it is no longer true. The most recent summary of corrected satellite and radiosonde records was prepared by the US Climate Change Programme (CCSP, 2006). Once the perturbing effects of volcanic eruptions and El Nino oscillations are removed, the tropospheric data show no signficant trend in temperature since 1970 (Gray, 2006). Furthermore, and despite claims to the contrary in CSSP (2006), the discrepancy between the surface temperature measurements (which show warming) and the tropospheric records (which do not) remains, in conflict with all model predictions.

Snow cover and ice extent have decreased.

We do not yet possess an accurate inventory of ice storage on the earth, and only about 240 out of an estimated global total of about 160,000 glaciers are instrumented, most comparatively recently (Kieffer et al., 2000; Braithwaite and Zhang, 2002). Many glaciers, for example in Europe, are indeed retreating (Oerlemans, 2005), but these retreats commenced in the late 19th century, i.e. long before industrial greenhouse gas emissions had risen to high levels. Other glaciers, for example the Franz Josef in New Zealand, are currently advancing.

The major volumes of ice stored in Greenland and Antarctica are close to balanced (Zwally et al., 2005; Remy & Frezzotti, 2006), though in both these cases the interior temperature is cooling and the ice thickening on top of the icecap (e.g. Davis et al., 2005; Khvorostovsky et al., 2005).

Some modern glacial retreats are uncovering fossil remnants of early Holocene (5-10 thousand year-old) trees that grew in upper valley positions prior to late Holocene glacial advance. In many parts of the world, the early Holocene was up to 1-2^0 C warmer than today (e.g. Masson et al., 2000), so it is likely that net ice storage then was less than now.

The amount of ice stored on earth, both in valley glaciers and ice caps, fluctuates naturally in accord with changes in temperature and moisture supply. Though at first sight the apparently widespread nature of recent valley glacier melting might seem alarming, it is consistent with the mild late 20th century warming that has occurred. Despite this warming, the world's two major icecaps appear to be stable, and there is no compelling evidence that modern glacial changes fall outside natural climate cyclicity.

Global average sea level (GAS) has risen and ocean heat content has increased.

GAS has been rising steadily at 1-2 mm/yr for the 200-year period for which we possess port tide-gauge records (e.g. IPCC, 2001). This rise is driven partly by the thermal expansion of sea-water in response to warming, partly by increases in ocean volume caused by ice-melting and perhaps partly by juvenile water

addition. The historic rate of rise shows no sign of acceleration under "global warming", and represents the late stage of natural post-glacial sea-level change.

The ocean is a major transporter of heat around the globe, with a time constant of about 1,000 years. Very little is known about the natural temperature variability of the ocean system on this time scale. An increase in surface ocean temperature is an expected corollary of the rise in atmospheric temperature seen during the late 20th century. There is no particular reason why such a change should not be part of natural variability.

Changes have also occurred in other important aspects of climate; e.g. rainfall, cloud cover, extreme events.

Changes occur in all aspects of local climate, all the time and all over the world. Geological records show that climate also changes continually through time. Change is what climate does.

Despite much research on the relevant topics, no empirical study has yet established a certain link between changes in any major climate parameter and human-caused global warming.

Atmospheric carbon dioxide levels have increased by about 100 ppm from their pre-industrial levels, and their "greenhouse" effect will cause dangerous climatic warming.

There is no dispute that atmospheric carbon dioxide levels have increased materially in the recent past, and that human emissions are one of the major sources for this increase. Nor is there any disagreement that carbon dioxide is a greenhouse gas that exerts a mild initial global warming effect.

That said, there is no agreement amongst scientists as to the likely magnitude of this warming effect, especially once all feedback loops are considered. Relevant points include:

- IPCC models, which invoke a positive feedback loop from water vapour, predict an increase of between 1.4 and 5.8^0 C for a doubling in carbon dioxide (IPCC, 2001); other calculations suggest an increase of only 0.3-1.0^0 C for a doubling;

- IPCC takes numerical account of only the positive feedback effects of increasing carbon dioxide, and neglects negative feedback loops such as the generation of additional low cloud cover; once all known, and probably some unknown, feedbacks are accounted for, the net effect of increasing carbon dioxide in the atmosphere remains uncertain, and could even be negative over certain ranges of value;

- A logarithmic relationship exists between the addition of carbon dioxide to the atmosphere and radiative heating, which causes each incremental amount of carbon dioxide to exert a lesser heating effect; the 100 ppm post-industrial increase in carbon dioxide is therefore estimated to have already caused about 75% of the anticipated 1^0 C warming (Lindzen, 2006), and all that remains to occur is additional warming of an insignificant few tenths of a degree;

- During natural climate cycling, changes in temperature PRECEDE the parallel changes in carbon dioxide (e.g. Mudelsee, 2001); thus carbon dioxide cannot be the primary driver of global temperature change;

- Carbon dioxide reached levels similar to today's only a few thousand years ago, in the early Holocene (Kouwenberg, 2005); prior to that, in earlier geological epochs, atmospheric carbon dioxide attained levels of 1000 ppm or more without known untoward environmental effects (e.g. Haworth et al., 2005).

Faced with this evidence, the obvious conclusion is that further increases of atmospheric carbon dioxide are likely to cause, at the most, slight warming; no strong case exists that such warming will be dangerous, indeed it might be beneficial.

Deterministic computer models predict a steady increase in global temperature between 1990 and 2100 of between 1.4 and 5.8^0 C for a doubling in atmospheric carbon dioxide.

IPCC labels the outputs of its computer models of future temperature as "scenarios", in order to highlight the fact that they are **not** skilled predictions of climate in 2001. The models themselves are unvalidated, and none were able to forecast the now-known path of the GAT statistic between 1990 and 2006.

The amount of warming (or cooling) projected for 2100 by these models varies according to a large number of

input parameters, not all of which are known accurately or even fully understood. The temperature effect of doubling carbon dioxide (termed the "climate sensitivity") is one such parameter. On its own, the doubling carbon dioxide is predicted to cause warming of the order of 1^0 C. Higher warming estimates, such as those quoted by the IPCC, are derived by invoking positive feedback loops involving increased atmospheric water vapour.

Other, empirical, computer models forecast that early 21st temperatures will decline (Kotov, 2001; Klyashtorin and Lyubushin, 2003; Loehle, 2004). This prediction is consistent with the fact that GAT peaked in the El Nino year of 1998, and has remained static or slightly declined since then.

Deterministic computer models are a valuable heuristic tool. However, they do not produce predictive outputs that are suitable for direct application in policy making.

ATTACHMENT B

Indequacies and criticisms of the

Intergovernmental Panel on Climate Change (IPCC)

The IPCC was established in 1988 jointly by the World Meteorological Organization (WPO) and the United Nations Environmental Programme (UNEP), with terms of reference which included:

> assessing the available evidence on climate change and its impacts;
>
> assessing the options for adapting to or mitigating climate change; and
>
> providing advice, both scientific and socio-economic, to the United Nations Framework Convention on Climate Change (UNFCCC).

Because the Framework Convention defines "climate change" as that change which is due to human activity, it is clear that from the outset that the IPCC's role has been to concentrate on presumed anthropogenic change rather than to comment on or prepare for natural variations in the climate system itself.

Governments, business, the media and environmental activists all assume that IPCC reports have provided conclusive evidence that human emissions of greenhouse gases are warming the climate.

The IPCC has provided nothing of the sort, but rather has a predisposition towards that conclusion built into its terms of reference. Indeed, despite the overwhelming public assumption regarding human causation, in its most recent report the IPCC stated (2001, p. 97) that:

> "*The fact that the global mean temperature has increased since the late 19th century and that other trends have been observed does not necessarily mean that an anthropogenic effect on the climate has been identified. Climate has always varied on all time scales, so the observed change may be natural*".

This statement remains true today, in 2006.

Starting in the mid-1990s, during and after the publication of the Second Assessment Report (2AR), the IPCC began to be subjected to increasingly strident criticism.

Particular dissatisfaction at that time centred over the insistence of some bureaucrats, in the face of opposition from expert scientists, to include in the 2AR Summary for Policymakers the phrase "*discernible human influence on climate*". Dr. Robert Stephenson, a distinguished oceanographer with the U.S. Office of Naval Research and NASA, and who from 1987-1995 was Secretary General of the International Association for the Physical Science of the Oceans, expressed his views thus:

"Despite the opposition of many signatory countries and their scientists, the leaders of IPCC published (in their 1995 assessment Report) the phrase "the balance of the evidence suggests that there is a discernible human influence on global climate."

"Even when exposed, the IPCC leaders claimed it was their "right" to change scientific conclusions so that political leaders could better understand the report."

"To the world's geophysical community, these unethical practices and total lack of integrity by the leadership of the IPCC have been enough to reveal that their collective claims were - and are - fraudulent."

Later similar criticisms have come from both IPCC members (some of whom chose to resign over them) and by outsiders, and are summarized under appropriate sub-headings below.

Peer review of IPCC findings

IPCC claims authority for its policy advice by asserting that the advice rests only upon information which has been published in reputable, refereed journals. IPCC also claims to subject the work of its scientists to high standards of peer review.

In fact, the IPCC uses a concept of peer review that differs greatly from the commonly understood meaning of the term. The problem has been well summarised by von Storch (2005), who writes:

"*The IPCC has failed to ensure that the assessment reports, which shall review the existing published knowledge and knowledge claims, should have been prepared by scientists not significantly involved in the research themselves. Instead, the IPCC has chosen to invite scientists who dominate the debate about the considered issues to participate in the assessment. This was already in the Second Assessment Report a contested problem, and the IPCC would have done better in inviting other, considerably more independent scientists for this task. Instead, the IPCC has asked scientists like Professor Mann to review his own work. This does not represent an "*independent*" review.*"

Other scientists who have participated in IPCC review procedures have complained that it is corrupted by:

a failure to incorporate valid critical comments made by some expert reviewers;

chaotic editorial techniques, which have included the preparation and release of a new draft report whilst its first draft was still being reviewed;

in the final stage of review of a Summary for Policymakers, incorporating changes desired by government bureaucrats without recourse to expert scientific assessment; and

an inadequate and dismissive attitude towards informed criticism.

Resignations

During and after the preparation of the 3AR, a number of meritorious scientists who were involved again began to express their dissatisfaction with the process. And, in particular, with what they saw as political interference with the preparation of IPCC reports.

In one such high profile case, on January 15, 2005, Dr. Chris Landsea, an acknowledged world expert on hurricanes/cyclones, withdrew his participation in IPCC. This decision was precipitated by the actions of IPCC Lead Author Dr. Kevin Trenberth (under whom Dr. Landsea worked), who participated in a press conference "*Experts to warn global warming likely to continue spurring more outbreaks of intense hurricane activity*", despite having been expressly briefed to the contrary by Dr. Landsea. Worse, Dr. Trenberth's statements were then supported by the IPCC leadership. In resigning, Dr. Landsea (2005) said:

> *"I personally cannot in good faith continue to contribute to a process that I view as both being motivated by pre-conceived agendas and being scientifically unsound".*

Another senior scientist who has withdrawn from participation in IPCC processes is Dr. Richard Lindzen, who wrote (2004) that "*My experiences over the past 16 years have led me to the discouraging conclusion that we are dealing with the almost insoluble interaction of an iron triangle with an iron rice bowl*". Lindzen's "triangle" comprises environmental activists who distort and misuse science, unchecked by the IPCC, in order to get the attention of the news media and politicians; and the "rice bowl" is the accompanying phenomenon whereby scientist's exploit the activists alarmism in order to maintain or increase their research funding.

Availability of original data and computer codes: audit

Some of the key statistics upon which the IPCC relies for its arguments do not have their original data or methods of calculation disclosed.

This matter first came to the light during the mid-1990s preparation of the 2AR. Then Dr. Pat Michaels, acting as an expert reviewer, requested that he be supplied with the data that underpinned a graph of GAT which was included in his reviewing package. As recounted by Gelbspan (1998, p.212), Michaels received the following astonishing answer from Dr. Tom Wigley, senior author of the paper under review:

> *"First, it is entirely unnecessary to have original "raw" data in order to review a scientific document. I know of no case at all in which such data were required by or provided to a referee …..*
>
> *"Second, while the data in question (model output from the U.K. Hadley Centre's climate model) were generated using taxpayer money, this was U.K. taxpayer money. U.S. scientists therefore have no a priori*

right to such data."

"Furthermore, these data belong to individual scientists who produced them, not to the IPCC, and it is up to those scientists to decide who they give their data to."

Of two other important examples of the unaccountability of IPCC science, we have dealt with the inadequacies of the Mann et al. (1998, 1999) studies in our main commentary. The final release of data and code for this research - so that others could check it - was achieved in 2005, some 7 years after publication, and that only by the intervention of the U.S. Congress. Prior to this intervention, and despite formal requests, neither the publishers of the relevant journals, nor the public agencies that funded the research, were prepared to insist on full disclosure.

The second example is the global average temperature (GAT) statistic that the IPCC accepts as its preferred record of temperature change since 1860. This statistic is provided by the U.K. Hadley Centre's Climate Research Unit (CRU), the version in IPCC (2001) being a slightly updated version of Jones et al. (1999). Despite requests from interested researchers, Dr. Jones refuses to release the full dataset, or disclose details of corrections made for urban heat island effects and other anomalies. In response to one such request, Dr. Jones wrote "*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?*".

In contrast, the equivalent US global surface temperature index, provided by NOAA's National Climatic Data Center, has been subjected to a recent independent check that broadly confirms its accuracy (Smith et al., 2005).

The lack of full disclosure of data and computer code by these and probably other climate research groups is deeply troubling. It is likely that the IPCC will continue to tolerate the practice by reproducing again in 4AR conclusions from datasets and calculations that are not fully in the public domain. Two instances where such secrecy will probably continue are the time-series graphs of GAT (after the CRU), and the deterministic computer model outputs that predict temperature scenarios out to 2100.

The result of these practices is that research in these areas is unauditable. IPCC reports that accept research for which full disclosure has not been made are thereby reduced to the status of unchecked literature reviews.

Inappropriateness of IPCC's economic scenarios

After the publication of the 3AR in 2001, Ian Castles (a statistician) and David Henderson (an economist), amongst others, started expressing strong public concern regarding the soundness of IPCC's economic forecasting. They wrote independent letters to IPCC Chair, Dr. Rajendra Pachauri, Castles saying:

"I believe that it is important that governments be advised as soon as possible that the economic projections used in the IPCC emissions scenarios are technically unsound, having been derived by converting national GDPs in nominal values into a common currency using

exchange rates. This procedure is not permissible under the internationally recognised System of National Accounts, and was recently rejected by an expert group in a report to the UN Statistical Commission. The practice of using exchange rate conversion is especially inappropriate in relation to projections of physical phenomena such as emissions of greenhouse gases and aerosols."

And Henderson following with:

"*Ian Castles has suggested that in the next IPCC Assessment national and international statistical agencies should be brought in and represented. I agree with him: it is high time that these agencies involved themselves in the process. But I would take the argument further. I think that the central economic departments of state--- treasuries, ministries of finance, ministries of economics, and organisations such as the US Council of Economic Advisers---should likewise be taking an active part. Their expertise is pertinent, and the economic stakes are high enough to require their attention. They should not remain on the sidelines*.."

After exchanges of letters, meetings and much public commentary in the international press, the IPCC has failed to heed this criticism. Instead, the Panel has chosen to use the same econometric measures and socio-economic scenarios that are contained in 3AR in its preparation of the draft 4AR. And in this preparation, IPCC has again failed to avail itself of advice from major, independent financial agencies.

A more detailed account of the deficiencies in the IPCC's treatment of socioeconomic matters is available in House of Lords (2005) and Castles and Henderson (2006). The point of substance that emerges, however, is that the Assessment Reports of the IPCC are inadequate not only in their treatment of some science issues, but crucially also in the socioeconomic advice that they contain.