**From ATTACHMENT A**

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# Critique of Reasons given in the IPCC Third Assessment Report for human-caused climate change

**Claims are underlined and in italics, responses in normal text**

*The global average surface temperature (GAT) has increased over the 20th century by about 0.6 deg. 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 land use 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

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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 deg. 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

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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 deg. C for a doubling in carbon dioxide (IPCC, 2001); other calculations suggest an increase of only 0.3-1.0 deg. 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 deg. 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 deg. 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 deg. 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

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