Submission to Hawdon's Club on Climate Change Policies

By Des Moore, Director, Institute for Private Enterprise 20 June 2017

Abstract

I summarise my assessment as follows. There are fundamental faults in the statistical and scientific analyses used to justify the need for early comprehensive mitigatory action by governments; claims of a consensus on the IPCC science have no credibility and account is not taken of the long history of faulty analyses by scientists; examination of the temperature and CO2 concentrations data indicate that any green house effect on temperatures to 2100 is likely to be very much less than predicted by the IPCC and other warmists; there is no satisfactory explanation of why temperatures did not increase during two lengthy periods when fossil fuel emissions did so; the increase from the late 1970s to the late 1990s mainly reflects natural causes; new research adds to existing evidence that the measurement of temperature increases in the last 100 years or so has considerably overstated the actual increase; new research also suggests that the extent of carbon dioxide in atmospheric concentration is much smaller than previously thought; there is no substantive evidence of threats from rising sea levels or melting of sea ice in the Arctic or Antarctic; there is no evidence of any significant change in average rainfall or that droughts and other severe weather events are likely to occur more frequently.

My assessment is that the best policy for governments, businesses and individuals is to adapt to changes in climate.

Overview

My thesis is that, despite the continued claims reported in the media, there is minimal risk that continued usage of fossil fuels will produce temperatures which become dangerously high. There is therefore no sound basis for governments to continue with expensive policies aimed at reducing usage of coal and other fossil fuels, which are by far the cheapest energy source. The so-called precautionary motive is not applicable now and is in fact less relevant than it was a few years ago.

Historically, there have been many examples of doom and gloom which did not eventuate. These include economist Jevons's 1865 book expressing concern that excessive usage of coal was threatening to exhaust coal supplies and stop economic growth. This followed the thesis promulgated by Malthus in 1800 that population growth must be stopped and was again utilized in 1968 by US ecologist and demographer Dr Paul Ehrlich. Then in 1972 a large number of eminent scientists, including five fellows of the Royal Society, supported Ehrlich. In the same year the Club of Rome group predicted that, without government intervention, growth would stop within 100 years and population and industry would fall. For some time we have also had the Intergovernmental Panel on Climate Change or IPCC predicting dangerous temperatures unless we stop using fossil fuels. A 2017 report by the Australian Chief Scientist simply assumed without examining the evidence that the government needed to take action to reduce emissions of CO2 into the atmosphere.

By contrast, the 2007 book *Scared to Death* by Christopher Booker and Richard North not only rejected the dangerous warming thesis but outlined numerous other projects proposed

by scientists and wrongly adopted by governments. Increasing numbers of organisations and individuals both here and overseas have also expressed sceptical global warming views in books and articles, including a petition by over 30,000 scientists in the US. I draw particularly on research and advice by physicist Tom Quirk and meteorologist Bill Kininmonth former head of Australia's National Climate Centre. There is no consensus that "science" justifies stopping the use of fossil fuels.

My own experience over the 28 years I worked in Federal Treasury is that professional scientists and economists often seek government action or funding to prevent wrongly perceived looming problems. When in 1972 I was temporarily researching at the Royal College of Defence Studies in London, I was given an "excellent" award for my analysis of the deficiencies in theses supporting *Limits on the Supply of Resources.* When in Treasury, I authored a publication on the serious deficiencies in proposals made through United Nations agencies for governments to establish a new international economic order to help low income countries. The NIEO is longer pursued.

However, almost all governments and United Nations agencies still accept the dangerous warming thesis and, through the IPCC, have tried for over 30 years to reach agreement on action to prevent temperatures increasing by more than 2C since the 19th century. Almost all countries reached an Accord in Paris in November 2015 to reduce emissions by 2030 (Figure 10), although the US has since stated it will withdraw from the Accord. Analyses of the voluntary undertakings by individual countries, which do not provide for reductions for China, India and (now) the US, suggest there would in fact be an increase of over 20 % in emissions to 2030. Since 1998 temperatures have also failed to increase despite the substantial increases in CO2 emissions. This has given sceptical views some recognition.

I want now to consider some deficiencies in the dangerous warming thesis. I do so not as a scientist but as an economist with experience in recognizing claims which exhibit many uncertainties. My degree is in fact a Bachelor of Science (Econ) degree at the London School of Economics.

The Theoretical Explanation Fails to Acknowledge Important Uncertainties

It is not disputed that a proportion of emissions of carbon dioxide from usage of fossil fuels remains in the atmosphere and that this has some warming effect. Nor is it denied that some of the heat radiated from the sun to the surface of the earth is radiated back up to the CO2 in the atmosphere. Some of this heat is, in turn, radiated back to the surface and increases the surface temperature as though in a greenhouse. These facts lead warmist believers to argue that the apparent increase in global average temperatures of about 0.8C over the past century is predominantly caused by this so-called greenhouse effect. This is argued to eventually raise temperatures to levels threatening human existence unless usage of fossil fuels stops.

One problem with this thesis is that the heat radiated back to earth from the CO2 in the atmosphere is offset by evaporation which absorbs heat and thus reduces the "greenhouse" effect. Expert opinions differ about the evaporation reduction effect but it is widely accepted as significant.

Another problem with the greenhouse theory is that it is based on research made many years ago suggesting that 55 per cent of emissions from fossil fuel usage stay in the atmosphere. But recent research suggests that only 16 per cent may be staying in the atmosphere. Much lower concentrations would of course have much smaller upwards effects on temperatures.

What Has Happened to Temperatures and Fossil Fuel Emissions

There is no doubt that atmospheric CO2 concentrations have been increasing strongly as world economies have increased emissions from fossil fuel usage. Data published on levels of concentrations show in Figure 1 an increase of over 30 per cent since 1920. But what has happened to global temperatures over this period? Figure 1 also shows that temperatures published by the Hadley Centre and used by the IPCC have increased by only about 6 per cent over this period on a global temperature baseline of 15 ^{0}C... There is a significant El Nino in 2016 which ended in 2017.

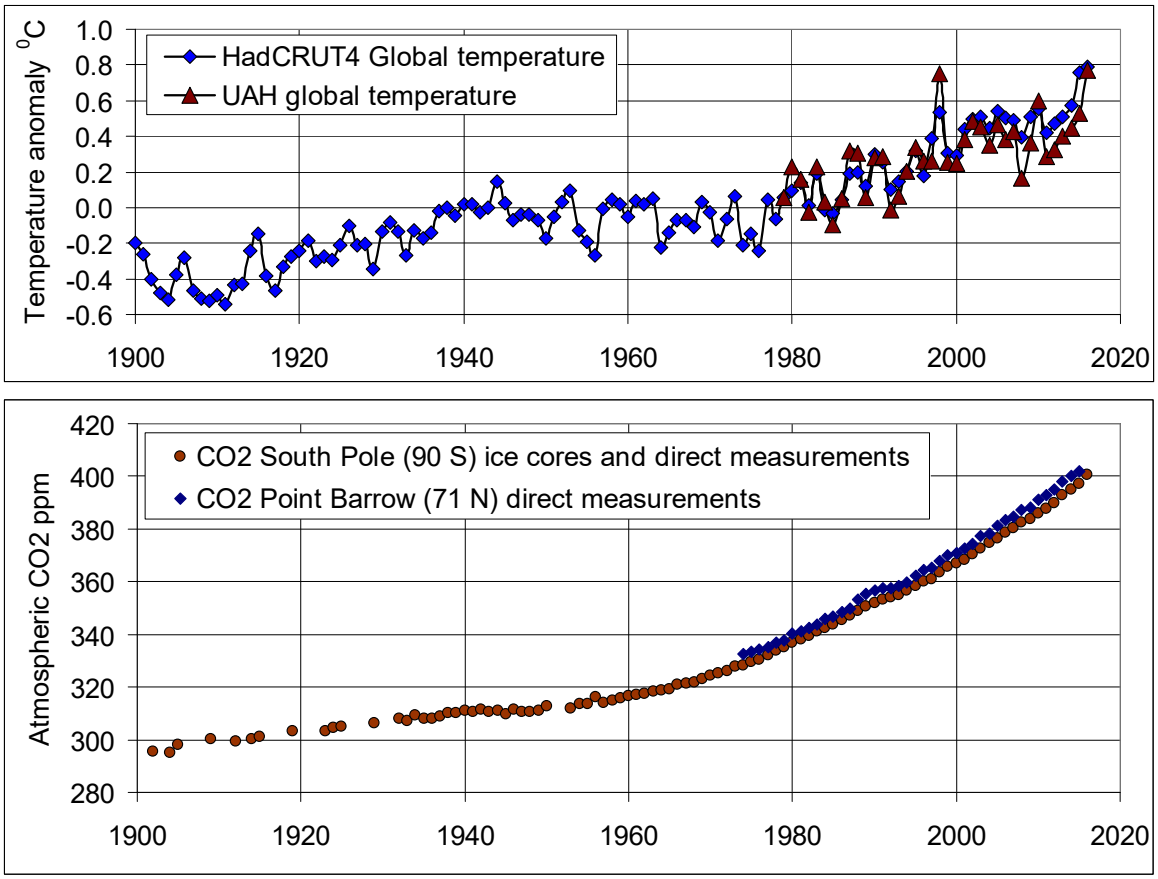

Figure 1: *Global temperature anomalies from surface and satellite. CO2 values at the South Pole (90 S) from ice cores and direct measurements Also CO2 from Point Barrow (71 N). Note the bump in 1990*

Of course, temperature levels don't necessarily increase by the same proportion as levels of CO2. But a comparison of the two time series clearly indicates that there is no correlation between changes in the two. This is summarised in the following table.

Table 1: Variations in temperature, atmospheric CO_2 and fossil fuel emissions

PERIOD	Global temperature 0C increase per 10 years		CO2 at the South Pole	Global fossil fuel emissions
	HadCRUT4	UAH (from 1979)	Annual increase in ppm	Annual average emissions in ppm
1922-1947	0.11 +/- 0.02		0.40 +/- 0.03	0.52
1948-1976	-0.02 +/- 0.03		0.85 +/- 0.03	1.38
1977-2000	0.16 +/- 0.03	0.14 +/- 0.03	1.49 +/- 0.01	2.73
2001-2016	0.14 +/- 0.04	0.09 +/- 0.04	1.97 +/- 0.02	4.00

What is revealed is that there were two periods, one from 1948 to 1976 and one from 2001 to the present, during which temperatures were relatively stable even though CO2 concentration levels increased quite strongly (except for the 1940-50 period).

The table also shows a period when both temperatures and CO2 concentration levels increased (from 1977 to 2000). But in that period *natural* influences caused apparently temporary changes in ocean temperatures. As an example, the Pacific Decadal Oscillation experienced a change from cool to warm water and this contributed to an increase in global temperatures. This PDO effect reflected *natural* causes arising from the replacement of cold water along the western Pacific coast of the North Americas. That had no causal connection with fossil fuel emissions. Figure 2 illustrates the change by fitting a straight line to the measured CO2 time series at Mauna Loa in Hawaii and showing the difference of the measurements from the straight line values, referred to as residual differences, year by year.

It is only in the period from 1922 to 1947 that changes in concentrations and temperatures appear to be correlated. But usage of fossil fuels would then have been relatively small.

My assessment is that this analysis makes it very difficult to justify the conclusion by the IPCC and others that a causal correlation exists between changes in temperatures and CO2 concentration levels.

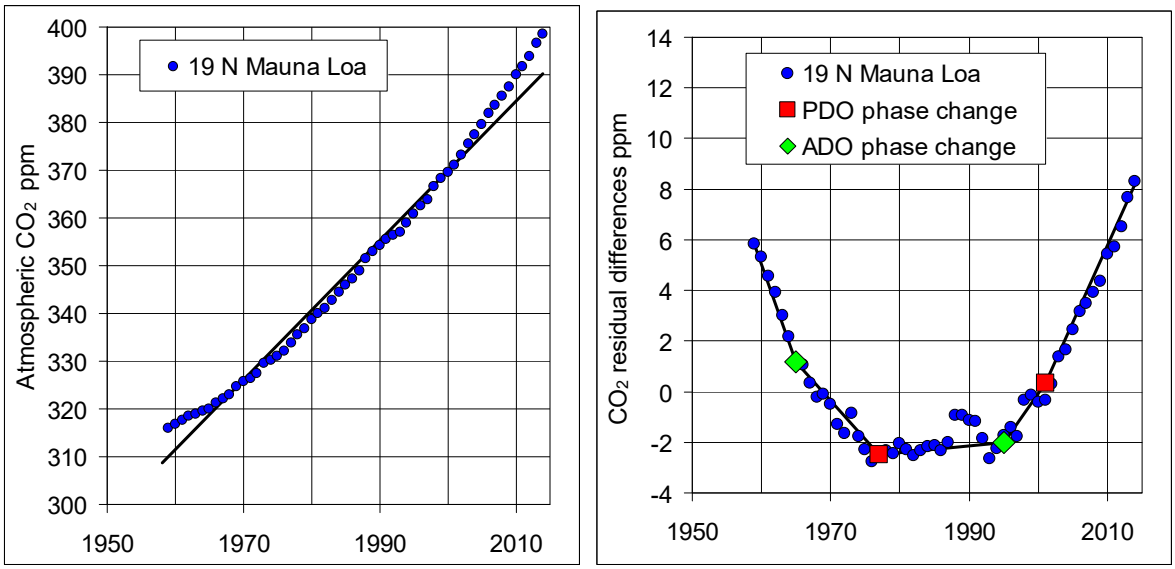

Figure 2: *The oceans change the rate of increase of CO2 in the atmosphere. This can be seen by showing the residuals from a straight line fit to the measured atmospheric CO2 at Mauna Loa. Changes occur when there are phase changes in the Pacific and Atlantic decadal Oscillations (PDO and ADO).*

Accuracy of Temperatures

There are also questions about the accuracy of the temperatures published by official agencies and used by the IPCC.

A comparison of mean temperature measurements from surface thermometers and satellites shows that there are systematic differences between land based surface temperature measurements and lower troposphere satellite measurements. This can be seen in Figure 3. No significant differences are found for the ocean measurements,

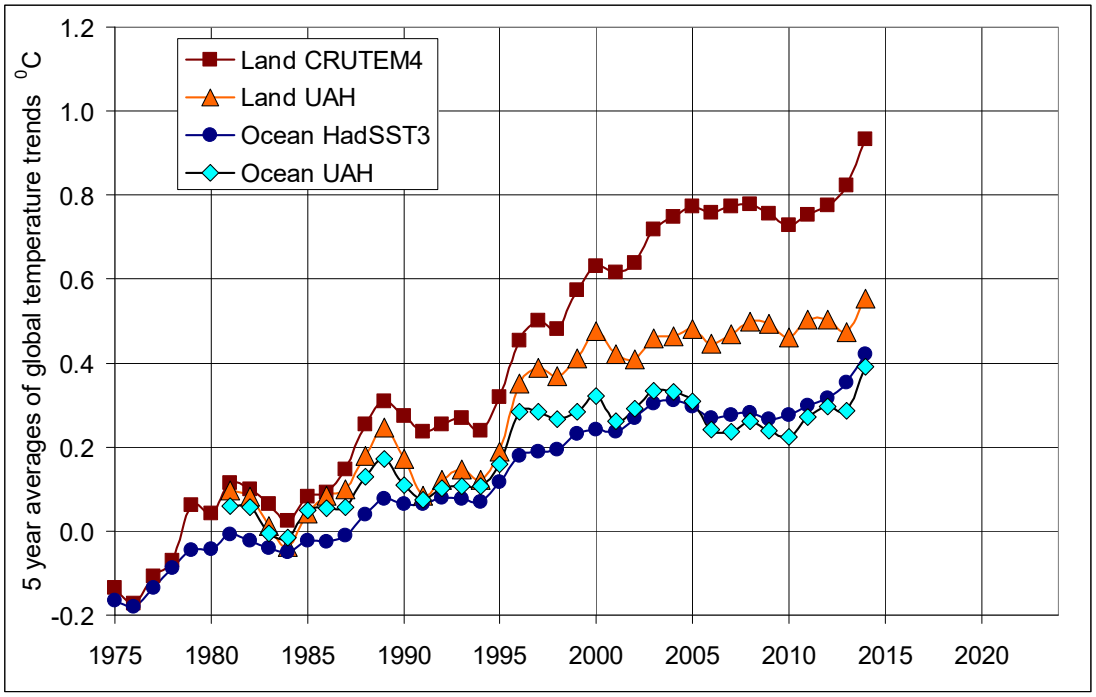

Figure 3: *5 year averages of lower troposphere global temperatures from UAH and from the UK Met Office for land and for the ocean. The yearly trend measurements are adjusted to cross zero in 1979 before the 5 year averaging.*

The land differences may be an artifact as a consequence of procedures used to turn single point measurements into wide area temperatures. It may also be in part a reflection of the Urban Heat island effect.

Two measurement problems are examined below

First, published daily temperatures are calculated only by averaging the minimum and maximum. However, what if Australia's average temperatures were calculated from temperatures recorded every 30 minutes?

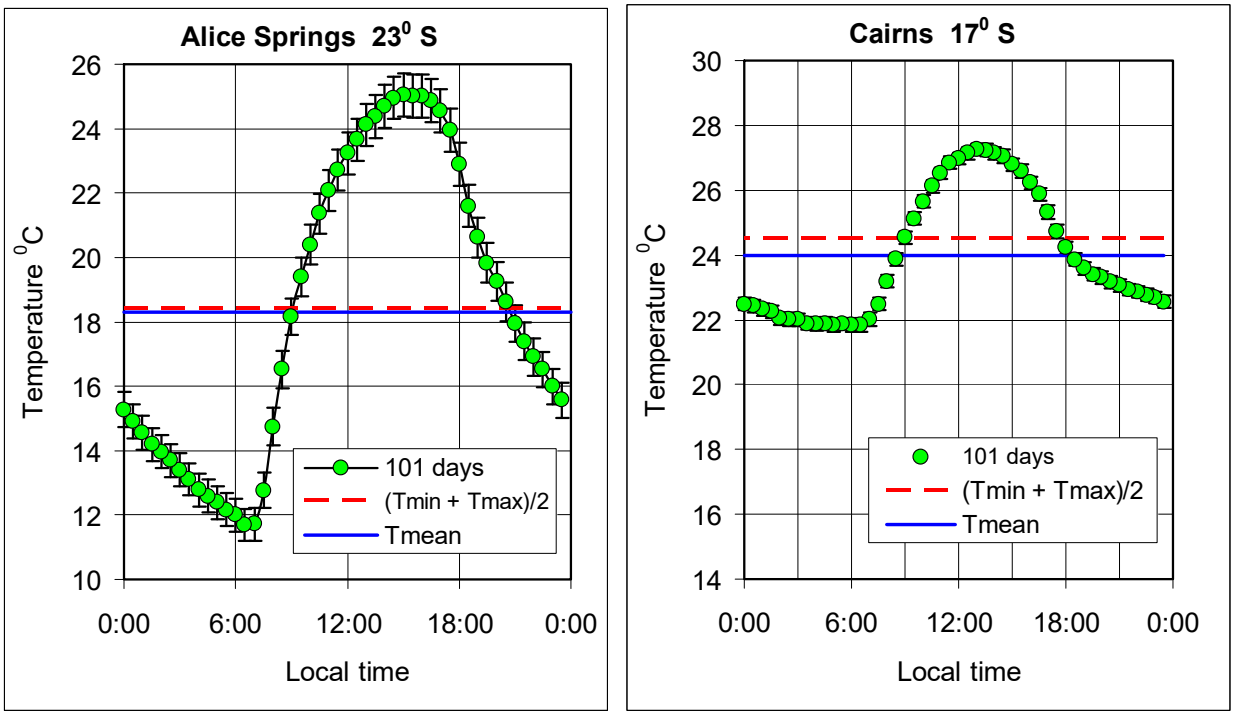

Figure 4: *Temperatures measured at 30 minute intervals through a 24 hour day. The solid* ***blue*** *line is the weighted average of readings every 30 minutes. The dashed* ***red*** *line is the average of the minimum and maximum temperatures*

Research by Tom Quirk shows that, in the central desert region (such as Alice Springs), the average over 30 minutes is about the same as with the averaging of minimum and maximum (Figure 4). But in coastal and inland areas (such as in Cairns) averaging of minimum and maximum produces temperatures about 0.6C higher than if the averaging is done on a 30 minute basis. This research suggests an overall upward bias in the published daily Australian temperatures of 0.3-0.4C.

Second, it appears that the Bureau of Meteorology calculation of Australian temperatures has not taken account of the heat island effect which keeps temperatures up when recorded in large built up urban areas.

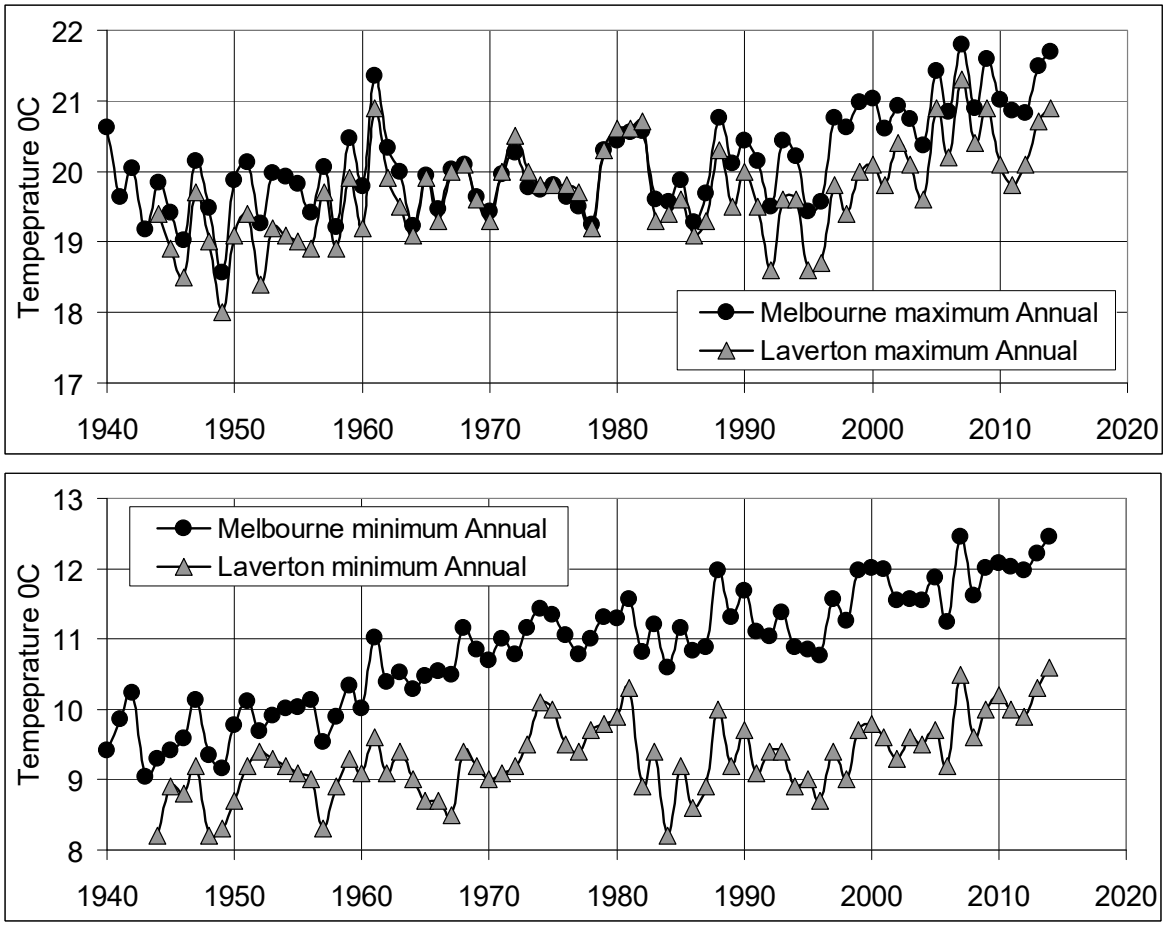

Figure 5: *BOM records of direct maximum and minimum temperatures at the BOM office in central Melbourne and at Laverton airport. The central Melbourne minimum would be much lower if account was taken of the urban heat effect*

Figure 5 comparing maximum and minimum temperatures at the BOM office in central Melbourne with those at Laverton shows similar maximum temperatures but much higher minimum for central Melbourne because more heat is retained in urban Melbourne.

Thirdly, although a 2015 review of temperature records of Australia's Bureau of Meteorology stated that it could not conclude whether there has been an upward or downward bias, it indicated that there was uncertainty about the adjustments made to "raw" temperatures by the BOM. Submissions by independent experts claimed the adjusted temperatures had an upward bias and further research since then have reinforced such conclusions.

What conclusion can be made about the accuracy of the temperature increase of about 0.8C of a degree since about 1900? One possibility is that about half is incorrectly calculated and the other half may well reflect natural causes. But even if the published data was accepted, it is relevant that temperatures *were* higher in the Medieval Warming Period (about 800 -1,100 AD and also in the Greco-Roman warm period (600 BC - 200 AD). Yet there were few fossil fuel emissions then. In fact, temperatures in those periods were likely higher than the scare temperature promulgated by warmists that they should not increase by more than 2C since industrialization.

Droughts and Rainfall

Much attention is given in the media and elsewhere to areas experiencing below average rainfalls and droughts and claims are made that these illustrate the effects of global warming. However, an examination of the variations in Murray Darling Basin's annual rainfall clearly shows no connection with levels or variations in Australia's average temperature. Indeed, there is no statistically significant change in MDB rainfall since 1900 (Figure 6).

Past Australian droughts occurred when global temperatures were lower than now and wetter years occurred when such temperatures were rising. There is no reason to expect that to change.

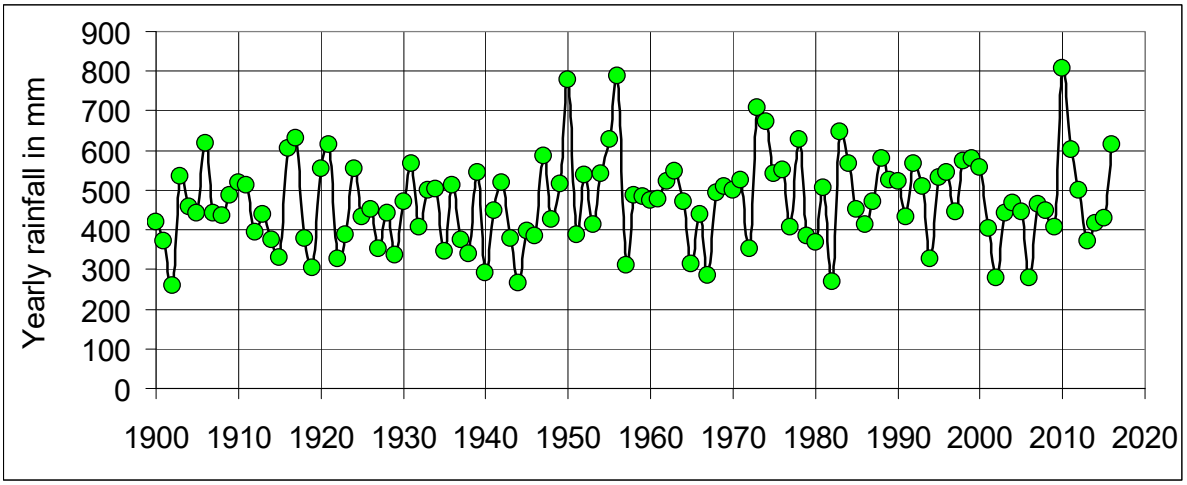

Figure 6: *Yearly rainfall in the Murray-Darling Basin. Average value is 471 mm. There is no significant trend in rainfall through this period but with large variability- standard deviation of 111 mm with rainfall extremes of a minimum 258 minimum in 1902 and a maximum of 809 mm in 2010*

Antarctic and Arctic Ice Sheets –Sea Levels and the Reef

Sea levels have been increasing over recent years and, if higher temperatures caused large ice sheets and glaciers to melt, sea levels would rise further and low-lying land would become more susceptible to flooding. In fact, owners of properties close to the ocean are already being stopped from development by measures that have been introduced by councils because of such alarmism (Figure 7).

However, IPCC reports have predicted much higher sea levels than actually occurred. Satellite measurements of sea levels from 1992 show an average rate of increase which, if continued, would result in levels about 30 centimetres higher by 2100. Most residences would readily be able to protect themselves against such an increase.

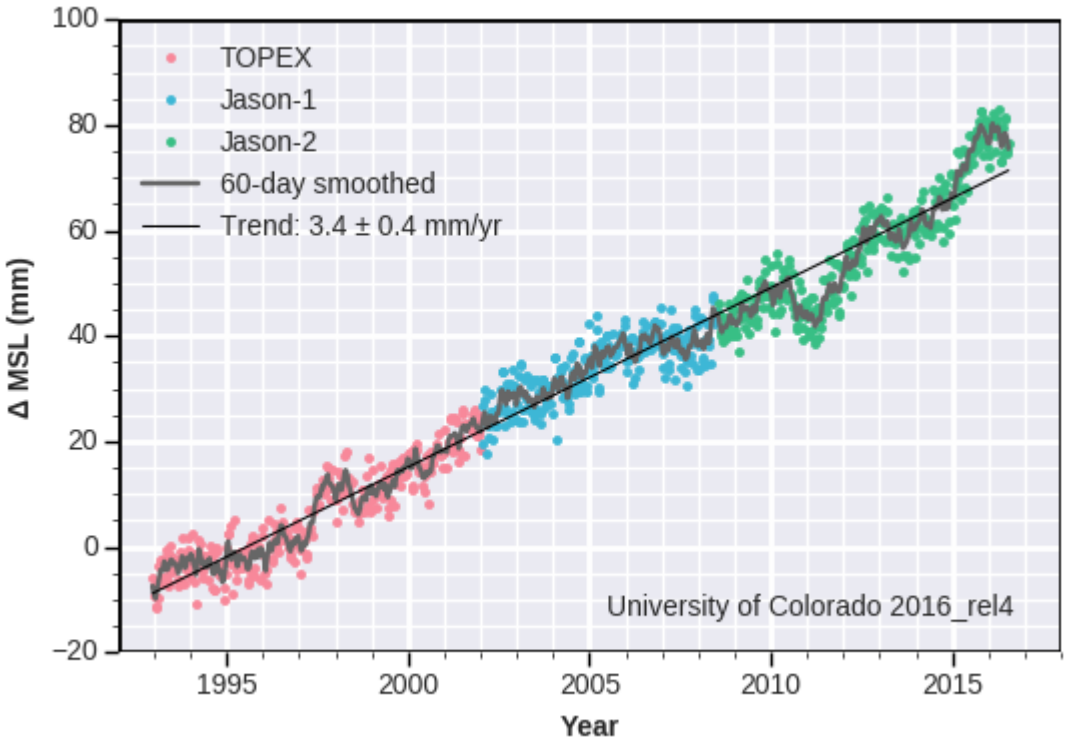

Figure 7: *The global mean sea level graph was made using satellite altimetry and processed by the University of Colorado at Boulder. Note that the rate of increase is 3.4 +/- 0.4 mm/year for1992 to 2016 If the rate of increase continues at about 3 mm a year, sea levels would reach about 30 cm in 2100. That is consistent with the IPCC's projection of 19-59 cm by 2100 and would not involve any significant flooding of low lying lands. . If the rate of increase continues at about 3mm a year, in 2100 average sea levels would be about 30cm higher than now/ Note the apparent influence of the 1997-98 El Nino.*

As to ice caps (Figure 8), the extent in the Arctic has been falling. However, melting ice in the Arctic has no effect on sea levels because the ice there is already floating in the sea. Canada's North West passage has in fact been navigated in earlier periods when fossil fuel usage was low.

In the Antarctic, the total ice area there has been increasing until very recently, when a large fall has occurred possibly reflecting a small rise in ocean temperatures (see Figure 3). Break offs of sections of the Antarctic ice sheet attract media attention but such break-offs are normal. Satellite data covering the past thirty years show a distinct cooling of the Antarctic region.

Changes in Northern and Southern Icecaps

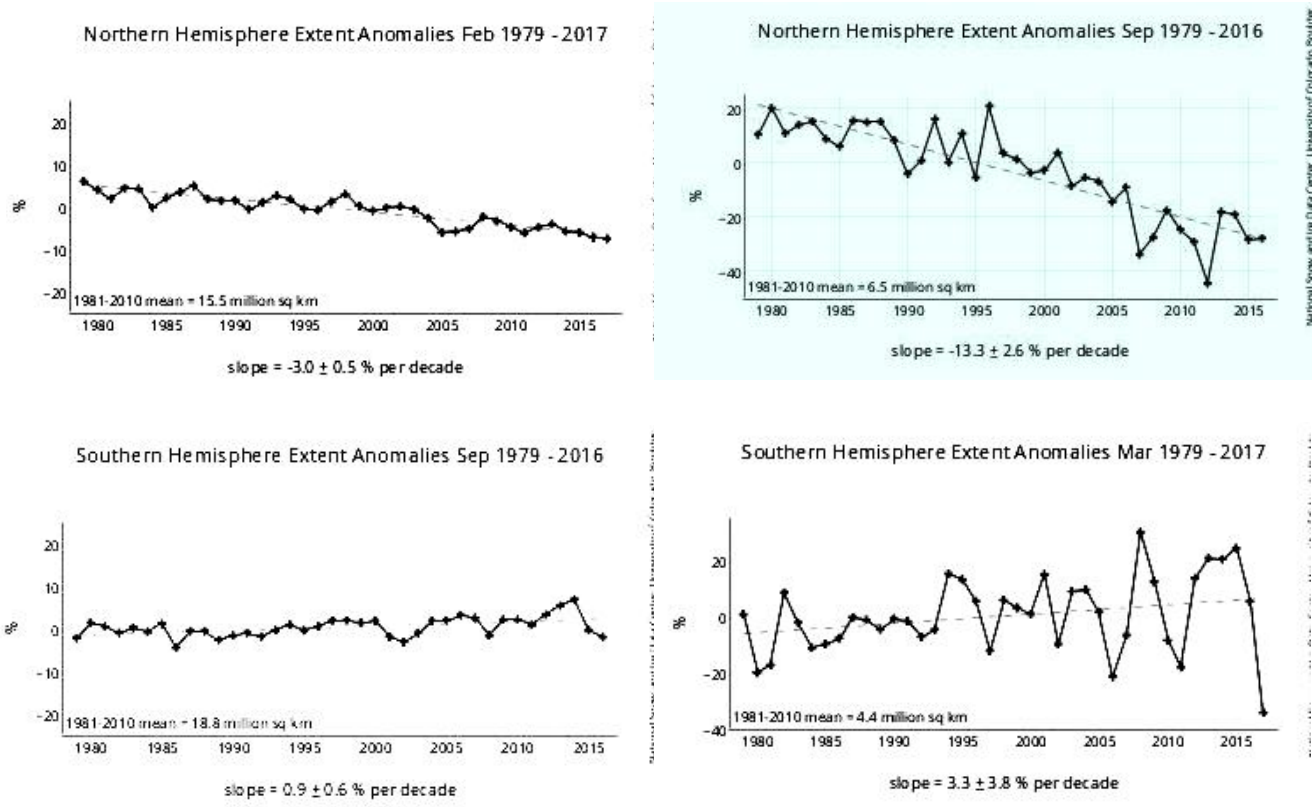

Figure 8: *Arctic and Antarctica ice extent. The maximum extent occurs in February in the Northern Hemisphere and in September in the Southern Hemisphere. Summer minima occur in September and March. The Northern Hemisphere ice extent is decreasing with reducing maximum and minimum extent. Note that the slopes for the fitted straight lines give the change per decade*

As to the Great Barrier Reef, alarmism by conservation bodies was shown to be unwarranted by the declaration of an international heritage agency that the reef was not in danger of destructive bleaching. However, while most of the reef recovered from the bleachings of 1998 and 2002 (which probably resulted from the temporary warming of sea water during the light winds which occur at the time of El Ninos and that limit the flow of cooler water across the reef), there has recently been further extensive bleaching and concern expressed by environmentalist. Some researchers suggest this may be due to changes in ocean circulation and Figure 3 shows only a small recent rise in ocean temperatures. Any action by Australia to reduce emissions would not help to protect the reef unless there is an effective international agreement by major emitters.

Temperature Measurements and Predictions

A key temperature test is to examine the predictions used by the IPCC which have been calculated by modelling. Figure 9 shows that none of the supposed expert modelling used by the IPCC as a basis for its predictions coincides with actual temperatures published and shown in the figure as observations. The published measured temperatures are much lower than the model predictions.

The marked difference shown between global temperature predictions and measurements published is said by some to be real. The difference for the years 2001 to the present is said to be missing heat that has gone into the ocean. But Figure 3 shows only a small increase in ocean temperatures has occurred recently and the missing heat has not been found. Most scientists do accept that, if atmospheric CO2

were to be doubled from the existing 400 ppm to 800 ppm, this would be likely to raise the global temperature by 1C. But models predicting rises of 2C to 4C to the end of the century do not take account of evaporation from the oceans, which reduce upwards radiation. .Bill Kininmonth has published estimates of the temperature increase taking into account evaporation. These predict global temperature increases of less than 1C and there is some satellite evidence to support this approach.

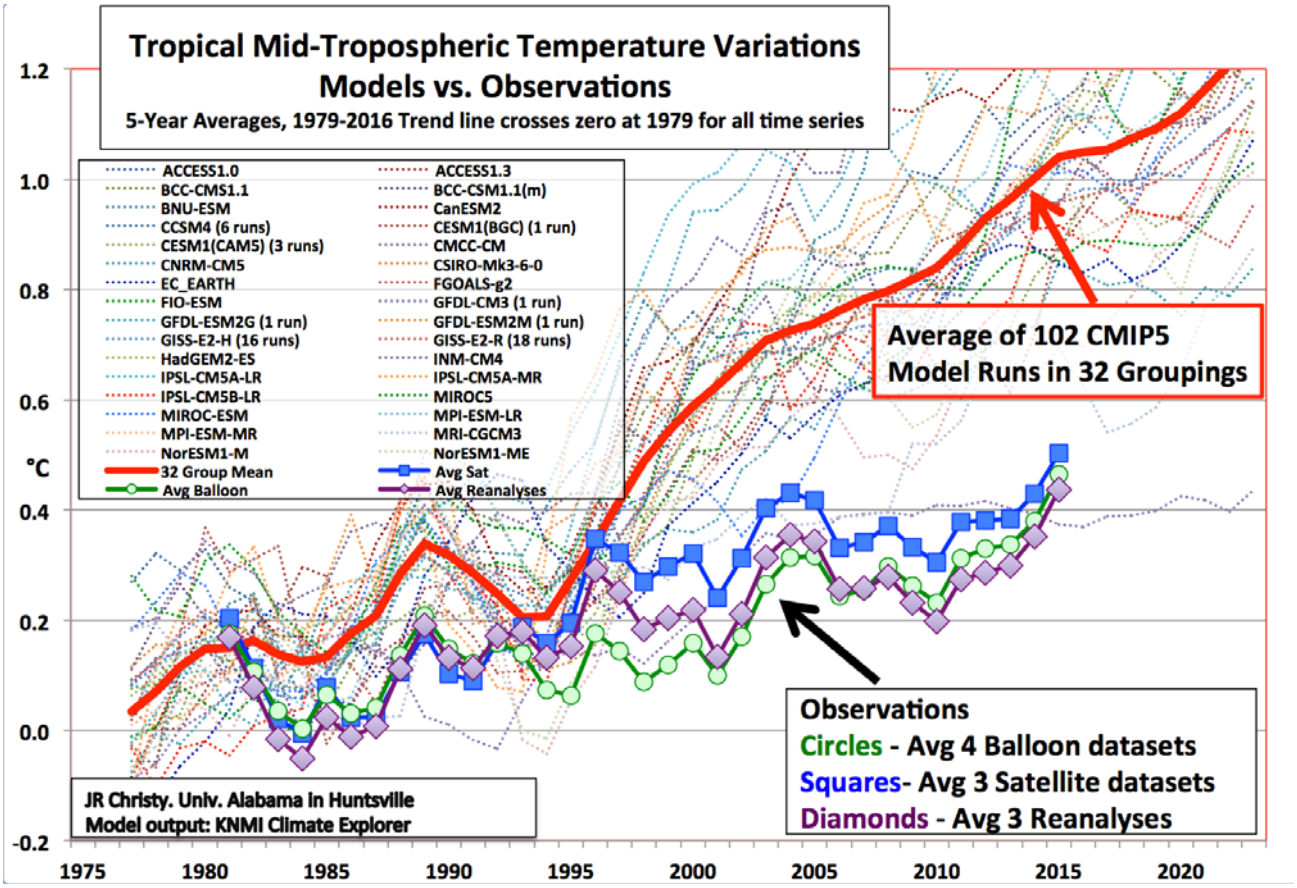

Figure 9: Tropical mid-troposphere temperature variations comparing models with measurements. 5 year averages for 1979 to 2016 trend lines cross zero in 1979 for all time series.. The published measured temperatures are much lower than the model predictions. John Christy testimony 9 March 2017 to the U.S. House Committee on Science, Space & Technology.

Further, although the effects of the phase changes in the Atlantic and Pacific oscillations are seen in the temperature and CO2 time series, the influence of the oceans on the atmosphere is not well accounted for in the computer modelling.

In fact, since the timing of these ocean changes is not well understood, their future effects cannot be projected by computer modelling.

Paris pledges to limit fossil fuel emissions

Almost all countries reached an Accord in Paris in November 2015 to reduce emissions by 2030 although the US has since stated it will withdraw from the Accord. The pledges for the reduction of fossil fuel emissions for the major contributors to greenhouse gases are shown in Figure 10.

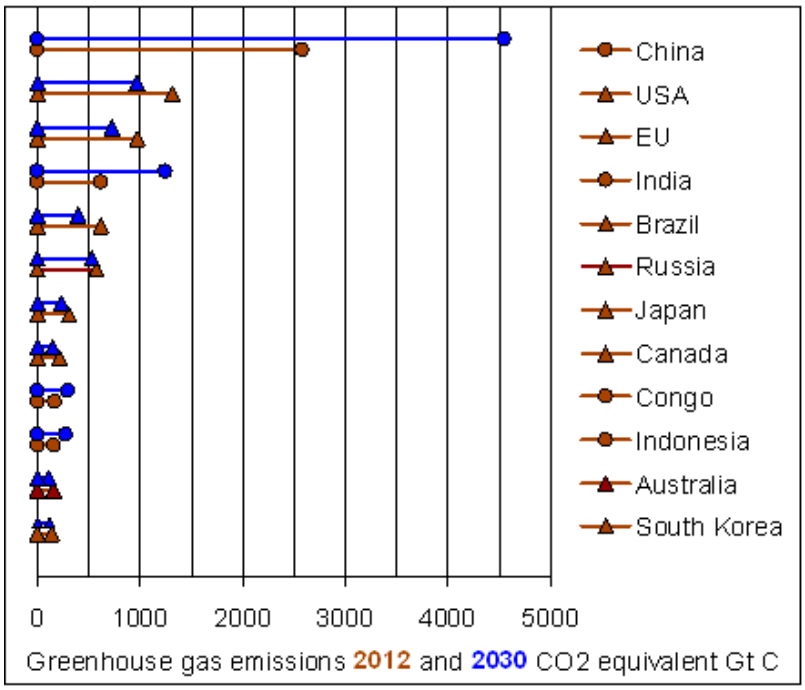

Figure 10: *Greenhouse gas emissions in 2012 and promises for 2030. There is a 23% increase from 7.83 Gt C to 9.59 Gt C for 72% of global emissions China is a major uncertainty*

Analyses of the voluntary undertakings by individual countries, which do not provide for reductions for China, India and (now) the US, suggest there would in fact be an increase of over 20 % in emissions to 2030.

Des Moore, a former Deputy Secretary of Treasury, is Director of the Institute for Private Enterprise. Tom Quirk trained as a nuclear physicist at the University of Melbourne where he took courses in meteorology. He has been a Fellow of three Oxford Colleges