

# CLIMATE CHANGE

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# THE FACTS

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# Introduction

John Roskam

**T**he Institute of Public of Affairs has been a leading sceptical voice about the science of global warming for more than a decade.

We don't believe 'the science is settled'. As a think tank committed to the ideals of free and open enquiry and debate we are not afraid to stand against the mainstream of prevailing elite opinion. Time and time again, the mainstream of elite opinion has been proved wrong.

Since its formation in 1943 the Institute of Public Affairs has a proud record of arguing for the principles of liberal democracy, personal responsibility, and limited government. Often our advocacy of these principles has been unpopular. For example, in the 1940s the IPA stood almost alone in its opposition to bank nationalisation and government control of the economy. In the 1980s the IPA argued passionately that empowerment for Aboriginal people was through education, employment, and individual property rights. The IPA's view on Aboriginal policy was contrary to the mainstream of elite opinion at the time, and the IPA was attacked for having such a position.

Today, there is the issue of global warming. The IPA is proud to be sceptical about the science of climate change. The IPA believes in free, and honest, and vigorous debate about public policy. That is why the IPA has produced this book *Climate Change: The Facts*.

Scepticism should be a hallmark of science. A 'sceptic' was once defined as someone who asked questions. Science should be about asking questions. Unfortunately when it comes to the 'science' of climate change, those who dare to ask questions are too often labelled 'deniers'.

(The use of the term 'denier' to describe those who question whether humans have in fact caused catastrophic climate change is a sad reflection on the condition of scientific debate in the twenty-first century.)

*Climate Change: The Facts* presents a range of analyses on climate change from some of the world's leading scientists and analysts. Although these perspectives could broadly be described as 'sceptical', some of the authors do accept that humans could be responsible for changing the earth's climate. But for them the issue is the extent of any human-induced climate change, and whether what is proposed by those such as the United Nations Intergovernmental Panel on Climate Change (IPCC) to stop global warming will be either ineffective or will produce outcomes worse than any of the problems that might be caused by any anticipated climate change.

The IPA has published this selection of 'sceptical' viewpoints in *Climate Change: The Facts* because there has been so little debate about the science of climate change. The public has been told by politicians that 'the science is settled'. In fact, as we know now, 'the science' is far from settled. And surely before something is 'settled' it should be the subject of rigorous argument, challenge, and debate. This has not happened.

Instead what has occurred is that a small clique of researchers have constructed a consensus and they have refused to consider the contributions of anyone who dares question that consensus. The recently revealed records of the Climatic Research Unit at East Anglia University, the so-called 'Climategate' demonstrate the extent to which some researchers have been willing to collude together to intimidate dissenters. Perhaps the most alarming revelation from Climategate is the revelation of the way in which the researchers on whom the IPCC has come to rely have refused to make public the evidence on which they have based their findings. To withhold or destroy evidence is a complete abrogation of the scientific method.

Those who read *Climate Change: The Facts* will quickly see that there is no such thing as a single or unified 'sceptical' position on climate change. Each contributor has a different perspective. From time to time the 'sceptics' disagree among themselves. And that is as it should be. The science of climate is complicated and uncertain and there are still many things we don't know.

Only politicians are arrogant enough to believe they have all the answers.

MELBOURNE, FEBRUARY 2010

**CLIMATEGATE**

# 1

## **Climategate: A failure of governance**

Sinclair Davidson

Sometime between 12 and 17 November 2009 a hacker gained access to the University of East Anglia's Climatic Research Unit (CRU) web server and obtained several thousand documents and email files. These documents were subsequently republished on the internet.<sup>1</sup> This incident and the subsequent fallout quickly become known as 'Climategate'.

There is more to this story than the 'ho hum, nothing to see here' attitude being displayed by those who believe in global warming.

### **THE EMAIL CONTROVERSY**

Early Climategate discussion centred on the contents of the emails. The authors of the emails have confirmed the emails are authentic and have attempted to explain what the emails 'really' meant. Some have argued that the emails are being taken out of context, and that the scientific jargon employed in the emails is different to the plain language meaning that laypersons might otherwise attribute to them. Yet it is difficult to explain away all the information that is contained in the emails by employing these arguments.

At face value, the emails suggest a sustained pattern of very poor behaviour; this includes attempts to subvert the peer-review process, refusal to make data available to journals, attempts to manipulate the editorial stance of journals, attempts to avoid releasing data following Freedom of Information requests, tax evasion, rejoicing at the deaths of opponents, manipulation of results, apparent misappropriation of grant money, and threats to physically assault rivals. Some of this behaviour may be illegal. To be sure, this behaviour does not automatically mean that the results of some of the authors' scientific work itself are wrong or have been fabricated. Nonetheless, it does suggest that greater caution



needs to be applied when translating the ‘scientific consensus’ to public policy.

**Table 1.1: Selected quotes from Climategate emails**

Quote	Author	Date
‘I’ve just completed Mike’s <i>Nature</i> trick of adding in the real temps to each series for the last 20 years (i.e. from 1981 onwards) and from 1961 for Keith’s to hide the decline.’	Phil Jones	November 16, 1999
‘I can’t see either of these papers being in the next IPCC report. Kevin and I will keep them out somehow—even if we have to redefine what the peer-review literature is!’	Phil Jones	July 8, 2004
‘If they ever hear there is a Freedom of Information Act now in the UK, I think I’ll delete the file rather than send to anyone.’	Phil Jones	February 2, 2005
‘The scientific community would come down on me in no uncertain terms if I said the world had cooled from 1998. OK it has but it is only seven years of data and it isn’t statistically significant ... As you know, I’m not political. If anything, I would like to see the climate change happen, so the science could be proved right, regardless of the consequences. This isn’t being political, it is being selfish.’	Phil Jones	July 5, 2005
‘I’ll maybe cut the last few points off the filtered curve before I give the talk again as that’s trending down as a result of the end effects and the recent cold-ish years.’	Mike Kelly	October 26, 2008
‘Next time I see Pat Michaels at a scientific meeting, I’ll be tempted to beat the crap out of him. Very tempted.’	Ben Santer	October 9, 2009
‘When the FOI requests began here, the FOI person said we had to abide by the requests ... Once they became aware of the types of people we were dealing with, everyone at UEA (in the registry and in the Environmental Sciences school—the head of school and a few others) became very supportive.’	Phil Jones	December 3, 2008

Source: All Climategate emails are available at <http://www.eastangliaemails.com/>

### ACADEMIC FREEDOM AND PEER-REVIEW

In a society characterised by the division of labour and specialisation, mechanisms must be developed or evolved that facilitate trade. This is the classic ‘lemons problem’ in economics; how does anyone know that the person they are trading with is any good? The same problem applies to academic research; how can anyone know that any piece of work is competent and high-quality research? The mechanism that has evolved in academic circles is the peer-review process. Academic freedom, combined with the peer-review process, is an evolved mechanism that ensures that research produces, over time, scientific results that are more likely to have eliminated error and falsehood.

George Stigler has described academic freedom as being the argument for ‘free speech and free inquiry’.<sup>2</sup> If an argument is trivially true, then having that argument challenged causes no harm.

Of course, the difficulty is that many arguments (and perhaps facts) are often uncertain. Stigler tells us that having the argument challenged helps to remove error, or helps to improve understanding of the initial argument. This is the common understanding of academic freedom and the peer-review process.

It is apparent, however, that the scientists involved in the Climategate scandal had a very different understanding of academic freedom and peer-review. When they did not agree with a particular author or work they would describe it as being ‘crap science’. An email between Tom Wigley and Timothy Carter (copied to Phil Jones and Mike Hulme) contained this extraordinary comment:

Hans von Storch is partly to blame—he encourages the publication of crap science ‘in order to stimulate debate’. One approach is to go direct to the publishers and point out the fact that their journal is perceived as being a medium for disseminating misinformation under the guise of refereed work ... Mike’s idea to get editorial board members to resign will probably not work—must get rid of von Storch too, otherwise holes will eventually fill up with people like Legates, Balling, Lindzen, Michaels, Singer, etc.<sup>3</sup>

But these are serious scientists. David Legates is an Associate Professor in climatology at the University of Delaware. Robert C. Balling is a Professor at Arizona State University. Richard Lindzen is a Professor of Meteorology at the Massachusetts Institute of Technology. Patrick J.

Michaels is a Distinguished Senior Fellow at George Mason University and a past president of the American Association of State Climatologists. Fred Singer is a Professor Emeritus of environment science at the University of Virginia.

Furthermore, stimulating debate is precisely what academic journals are meant to do. It is simply astonishing that a scientist could imagine that he was publishing the last word in any topic and that any disagreements were ‘crap science’ and that the editor needed to be removed and the editorial board be stacked with sympathetic voices—as opposed to unsympathetic voices. We see this in an email from Phil Jones:

I will be emailing the journal to tell them I’m having nothing more to do with it until they rid themselves of this troublesome editor. A CRU person is on the editorial board, but papers get dealt with by the editor assigned by Hans von Storch.<sup>4</sup>

Phil Jones is the head of the CRU; in other words he wants to have his own work and that of his colleagues refereed by one of his own subordinates.

It is a comment in an email between Phil Jones and Michael Mann that has generated much media coverage: ‘Kevin and I will keep them out somehow—even if we have to redefine what the peer-review literature is!’<sup>5</sup> This email refers to the corruption of the IPCC process. Those same academics who are attempting to undermine the position of journal editors and editorial boards are in turn involved in establishing what the peer-reviewed literature is for external consumption and they arbitrarily exclude some or other papers of which they do not approve.

### THE SCIENCE IS SETTLED

It is quite apparent from the emails that those lobbying for acceptance of the belief in human-induced global warming has worked very hard to create the appearance of a greater consensus than otherwise may have been the case. This has allowed the *political slogan* ‘the science is settled’ to gain substantial credence. Of course, it is very well-known that science itself is never settled. After all, if that were the case, the learned journals would all close down and scientists would cease their work and simply teach the history of science. Ludwig von Mises wrote on this very point.

There is no such thing as perfection in human knowledge, nor for that matter in any other human achievement. Omniscience is denied to man. The most elaborate theory that seems to satisfy completely our thirst for knowledge may one day be amended or supplanted by a new theory. Science does not give us absolute and final certainty. It only gives us assurance within the limits of our mental abilities and the prevailing state of scientific thought. A scientific system is but one station in an endlessly progressing search for knowledge. It is necessarily affected by the insufficiency inherent in every human effort.<sup>6</sup>

The global warming lobby was not omniscient; they were extraordinarily arrogant. Not content with subverting the peer-review process, they peddled the notion that their view of the world was ‘absolute’ with a ‘final certainty’. Now it is true that the scientists involved probably did not use the term ‘the science is settled’ themselves. More likely others used the term, perhaps even without permission; nonetheless, the scientists themselves never corrected the usage of the term and their behaviour is consistent with them holding this belief themselves.

We now know from the emails—as recently as 12 October 2009—that the global warming lobby scientists themselves did *not* believe the science to be settled.

The fact is that we can’t account for the lack of warming at the moment and it is a travesty that we can’t. The CERES data published in the August BAMS 09 supplement on 2008 shows there should be even more warming; but the data are surely wrong. Our observing system is inadequate.<sup>7</sup>

There has been some debate as to the meaning of this comment. It could be a complaint that funding constraints have led to a decline in the quality of observational data, or it could mean that the underlying scientific understanding is inadequate. Either of these explanations, however, is inconsistent with the idea that the ‘science is settled’. If the science were settled, scientists would be able to ‘account for the lack of warming’. The implicit bias in that statement (by Kevin Trenberth, a climate scientist at the American National Center for Atmospheric Research) is worth noting, when confronted by a divergence between the data and the computer modelling, he chooses the modelling. Of course, what makes this statement suspicious is a somewhat similar comment by Phil Jones in 2005.

The scientific community would come down on me in no uncertain terms if I said the world had cooled from 1998. OK it has but it is only seven years of data and it isn't statistically significant.<sup>8</sup>

Professor Tim Flannery, interviewed on the Australian Broadcasting Corporation's *Lateline* program in November 2009, made this comment after the Climategate scandal had broken.

These people work with models, computer modelling, when the computer modelling and the real world data disagrees you have a problem, that's when science gets engaged. What Kevin Trenberth, one of the most respected climate scientist in the world, is saying is, 'We have to get on our horses and find out what we don't know about the system, we have to understand why the cooling is occurring, because the current modelling doesn't reflect it'. And that's the way science progresses, we can't pretend to have perfect knowledge, we don't. We have to go forward and formulate policy on the basis of what we know now.<sup>9</sup>

Not only is this statement inconsistent with a 'the science is settled' argument, it is also inconsistent with Flannery's statement on the same program in June 2005.

Well, you can't predict the future; that's one of the things that you learn fairly early on, but if I could just say, the general patterns that we're seeing in the global circulation models—and these are very sophisticated computer tools, really, for looking at climate shift—are saying the same sort of thing that we're actually seeing on the ground. So when the models start confirming what you're observing on the ground, then there's some fairly strong basis for believing that we're understanding what's causing these weather shifts and these rainfall declines, and they do seem to be of a permanent nature. I don't think it's just a cycle.<sup>10</sup>

The emails do not contain a silver bullet that would kill off the global warming hypothesis. At the time of writing, computer programmers are in the process of examining the codes and data that were hacked at the same time as the emails. If it is shown that the data have been manipulated to show a warning trend, that would escalate what is already a scandal into a major scientific fraud.

## THE FALLOUT

In the first instance the integrity of the peer-review process has been challenged. *Herald Sun* columnist Andrew Bolt asked ‘Is that the truth, or were you peer-reviewed?’ after yet another study predicted the disappearance of the Arctic ice cap.<sup>11</sup> Mark Steyn had an entire column in the *Washington Times* on peer-review. It is worth quoting at length.

The more frantically they talked up ‘peer review’ as the only legitimate basis for criticism, the more assiduously they turned the process into what James Lewis calls the Chicago machine politics of international science. The headline in the *Wall Street Journal Europe* is unimprovable: ‘How To Forge A Consensus.’ Pressuring publishers, firing editors, blacklisting scientists: That’s ‘peer review,’ climate-style.

The more their echo chamber shriveled, the more Mr. Mann and Mr. Jones insisted they and only they represent the ‘peer-reviewed’ ‘consensus’ ... ‘Quis custodiet ipsos custodes?’ wondered Juvenal: Who watches the watchmen? But the beauty of the climate-change tree-ring circus is that you never need to ask ‘Who peer reviews the peer reviewers?’ Mr. Mann peer reviewed Mr. Jones, and Mr. Jones peer reviewed Mr. Mann, and anyone who questioned their theories got exiled to the unwarmed wastes of Siberia.<sup>12</sup>

James Delingpole, writing in the *Telegraph*, is far more expansive:

It’s perhaps the single most important fact to emerge from the Climategate scandal. Peer-review is dead. Meaningless. Utterly void of credibility. More irredeemably defunct than a Norwegian Blue...

What the CRU’s hacked emails convincingly demonstrate is that climate scientists in the AGW camp have corrupted the peer-review process. In true Gramscian style they marched on the institutions—capturing the magazines (*Science*, *Scientific American*, *Nature*, etc), the seats of learning (Climate Research Institute; Hadley Centre), the NGO’s (Greenpeace, WWF, etc), the political bases (especially the EU), the newspapers (pretty much the whole of the MSM I’m ashamed, as a print journalist, to say)—and made sure that the only point of view deemed academically and intellectually acceptable was their one.<sup>13</sup>

Both Delingpole and Steyn suggest there are fundamental problems with climate science and the peer-review process. Both of these individuals, however, are well-known to be climate change sceptics. George Monbiot, however, is decidedly not a climate change sceptic. Rather he is an global warming activist and columnist for *The Guardian*. In a column on 23 November 2009 he wrote,

It's no use pretending that this isn't a major blow. The emails extracted by a hacker from the climatic research unit at the University of East Anglia could scarcely be more damaging. I am now convinced that they are genuine, and I'm dismayed and deeply shaken by them... I believe that the head of the unit, Phil Jones, should now resign. Some of the data discussed in the emails should be re-analysed.<sup>14</sup>

Monbiot does not believe that the emails undermine the totality of evidence in support of the global warming hypothesis, but does believe that the emails are evidence of inappropriate behaviour. Indeed, he went on to apologise to his readers.

I apologise. I was too trusting of some of those who provided the evidence I championed. I would have been a better journalist if I had investigated their claims more closely.<sup>15</sup>

Writing in his *The Guardian* blog on 25 November, Monbiot again calls for the resignation of Phil Jones and expands on his earlier argument.

Some people say that I am romanticising science, that it is never as open and honest as the Popperian ideal. Perhaps. But I know that opaqueness and secrecy are the enemies of science. There is a word for the apparent repeated attempts to prevent disclosure revealed in these emails: unscientific.<sup>16</sup>

This is, of course, the core problem identified by the Climategate leaks. The global warming lobby research is tainted by allegations that it is unscientific. This is precisely the charge the global warming lobby has been making for years against its own opponents.

The University of East Anglia, host of the Climatic Research Unit, has announced an inquiry into the whole affair. Similarly, Penn State University has announced an investigation into Professor Michael Mann—an employee who features very prominently in the emails.<sup>17</sup> (Unfortunately, the university press release begins by praising his work on the now notorious hockey stick. Quite possibly this will not be a

serious investigation.) Senator James Inhofe, the ranking Republican on the US Senate Committee on Environment and Public Works, has begun an investigation into the affair.<sup>18</sup> While this is an American body, it will still have some jurisdiction in the matter—the CRU has accepted substantial funding from American government agencies. Senator Inhofe has written to the American academics and American government agencies that have been named in the emails and advised them that he will be conducting an investigation into the affair and that they will need to retain all records. This inquiry is likely to have greater impact than will the internal university investigations.

Donald Kennedy, emeritus president of Stanford University, has written a book entitled *Academic Duty*; one such duty he identifies is ‘to tell the truth’. He writes:

... the most interesting fact about research misconduct is that it tends to occur in places where the pace of activity, the size of the group, and the scope of work make personal accountability difficult. A terse but perhaps not terribly useful conclusion would be that fraud occurs when the right people aren’t paying enough attention.<sup>19</sup>

In his 1966 classic, *The Organization of Inquiry*, Gordon Tullock made much the same point: ‘It is not that scientists are more honest than other men; it is that they are more carefully watched.’<sup>20</sup> It is clear that there is a governance failure at the heart of Climategate.

In the first instance, the publishers of the academic journals should have asked harder questions. Is it appropriate that individual academics can blackmail academic publishers into sacking editors and editorial boards? The publishers should have made a full and frank disclosure at the time these events occurred. We know that the CRU was able to avoid, delay or obfuscate on Freedom of Information requests with the full cooperation of those individuals at the University of East Anglia whose jobs it was to ensure compliance. Furthermore, we know that journalists did not investigate global warming claims as carefully as they should have.

### CONCLUSION

Irrespective of whether Climategate develops into an even greater scandal than it already is, we know that the mechanisms to ensure that research results are more likely to be accurate and correct have been tainted.



But we can have no confidence in the observations that temperature has increased due to human activity because the mechanisms of science have been subverted. This is not rare in academia. As George Stigler has noted, in a different context:

It has gradually become evident that this community imposes sharp limits on the range of respectable opinion within its ranks.<sup>21</sup>

None of this would matter much, but for the politicisation of climate science. Poor scientific behaviour has become the basis of economic policy making that is likely to have very large repercussions on the world economy and the Australian economy in particular. It is important that economic policy is formulated on a sound empirical basis. Climategate has damaged and perhaps undermined the claims of the global warming lobby.

The great economics writer, Adam Smith, believed that cartels and conspiracies against the public were unstable and would ultimately fall apart. Without the actions of an anonymous hacker (perhaps an internal whistleblower) we might never have discovered the full extent of the machinations of the scientists involved in Climategate.

## 2

### **Climategate's Australian connection**

Alan Moran

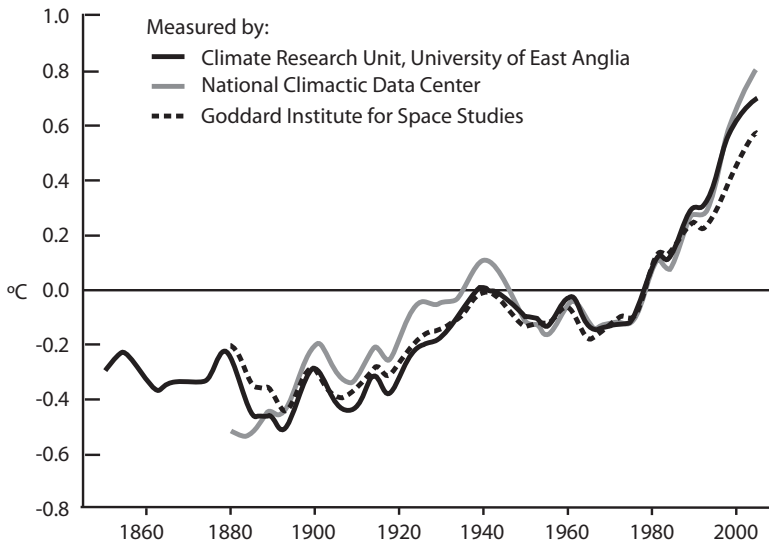
**T**he leaking of emails from the University of East Anglia's Climatic Research Unit (CRU) in November 2009, dubbed 'Climategate', occurred while this book was being prepared. The emails comprise correspondence between the CRU and researchers and their associates, including journalists, throughout the world.

Headed by Phil Jones, the CRU is one of three interlinked global research centres, the others being the New York-based Goddard Institute for Space Studies (GISS) directed by James Hansen and the National Climatic Data Center (NCDC) in North Carolina directed by Thomas Karl. These three centres led the examination of the science and data collection on global temperature trends that has underpinned the credibility of reports by the United Nations Intergovernmental Panel on Climate Change (IPCC). The IPCC reports assembled scientific and empirical evidence that has led to the conclusion of the 2007 Fourth Assessment Report: 'Warming of the climate system is unequivocal, as is now evident from observations of increases in global average air and ocean temperatures, widespread melting of snow and ice and rising global average sea level.'<sup>1</sup>

Figure 2.1 shows the temperature reconstructions of the three premier research agencies used in the IPCC report. This visually-appealing uptick seems to demonstrate support for a significant warming.

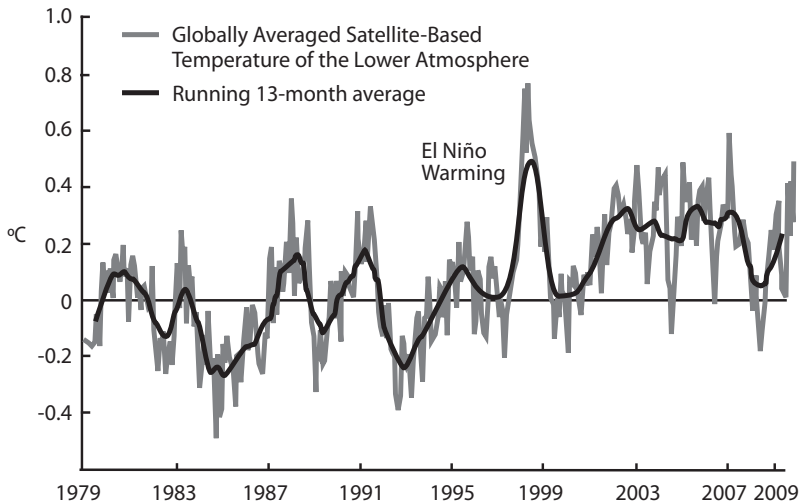
Yet the recent history presents a far less convincing picture of the case for a human impact on global climate when examined using the satellite data (as shown in Figure 2.2) which is available only since 1978.

**Figure 2.1: Global land-surface air temperature (°C), 1850–2005**  
(historical anomaly from 1961–1990 average)



Source: Intergovernmental Panel on Climate Change, *Fourth Assessment Report* (2007)

**Figure 2.2: Global satellite-based temperature (°C), 1979–1998**  
(historical anomaly from 1979–1998 average)



Source: Roy Spencer, *Latest Global Temperatures* (accessed January 2010); available from <http://www.drroyspencer.com/latest-global-temperatures/>

The Climategate emails reveal:

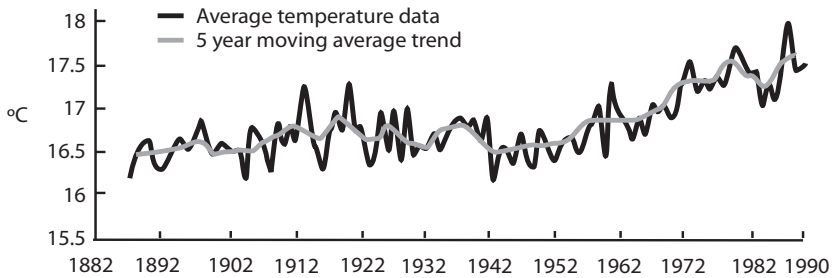
- the orchestrated vilification of ‘sceptic’ scientists;
- deliberate attempts to exclude any such work being published (including organising the dismissal of editors who allowed its publication); and
- insights into how data had been manipulated to ‘prove’ a warming effect to coincide with industrialisation, while preventing the raw data from being made available to those outside the inner circle.

While the ethics of the scientists concerned are indefensible, what is now coming under scrutiny is the accuracy of their data. The unraveling of Climategate and the refusal of the scientists concerned to allow independent scrutiny of their data first became apparent with the famous ‘hockey stick’ examination.

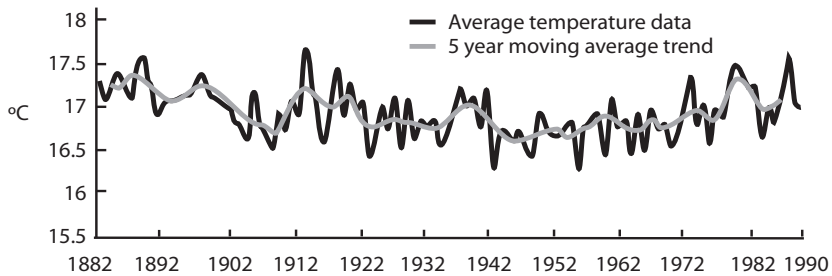
The case in support of climate change resulting from human activity is strengthened if it could be shown that current temperatures are higher than those experienced in recent history. This was seemingly demonstrated with the hockey stick graph, which was a central feature of the IPCC 2001 Third Assessment Report and its popularisations by Al Gore and others.<sup>2</sup>

In spite of strenuous efforts to prevent the hockey stick data being scrutinised, Steve McIntyre and Ross McKittrick demonstrated that the ‘hockey stick’ was a fictitious depiction of the climate trends over the past millennium—they showed the apparent anomalously rising temperature during the twentieth century was the outcome of the hockey stick model itself and that the same result emerged even when random data were fed into the model.<sup>3</sup>

The secretive nature in which the CRU data was held first became apparent almost four years ago when an Australian scientist, Warwick Hughes, could not understand what the adjustments were that the CRU had made to arrive at their conclusions that warming occurred in the twentieth century. The response of Phil Jones was, ‘Why should I make the data available to you, when your aim is to try and find something wrong with it.’<sup>4</sup> Of course, this is inimical to the whole notion of scientific discovery whereby findings are subject to constant review.

**Figure 2.3: Average temperature for Australian capital cities**

Source: Warwick Hughes, 'The Australian Record on Global Warming'  
(Tasman Institute, December 1991)

**Figure 2.4: Average of 25 Australian regional and remote stations**

Source: Warwick Hughes, 'The Australian Record on Global Warming'  
(Tasman Institute, December 1991)

Warwick Hughes himself has a record of temperature reviewing going back to 1991. He was critical of the original Phil Jones choice of sites for Australia as being likely to be contaminated by local heat island effects. Phil Jones used thirteen long-term sites, all of which were official Bureau of Meteorology sites, and five of which were capital cities. Hughes noted that the official data for the state capitals showed an upward trend, while data for twenty-five remote stations he identified as not having had an urbanisation overlay showed no trend. These two data sets are graphed in figures 2.3 and 2.4.

A later paper by Hughes wrote with Robert Balling and Sherwood Idso was published in December 1992 in *Geophysical Research Letters* (GRL).<sup>5</sup> It examined temperature trends in Australia in the eight decades to 1991 using forty-three stations with continuous records. It showed a net cooling in the years to 1978 and a warming in the years 1979–90.

These findings were originally contested by the Bureau of Meteorology (BOM) and three researchers led by Dr Neville Nicholls, (who became a lead author of the IPCC 2007 Fourth Assessment Report) who sought to have GRL publish a 'comment' attacking the data adjustments that had been made. Eventually the BOM acknowledged that their attempted rebuttal had only marginal merit and GRL declined to publish it.<sup>6</sup>

At the time, William Kininmonth was the head of the National Climate Centre at the BOM. He has since written:

In the late 80s and early 90s there was an effort to establish a reasonable temperature record for Australia. Many problems were found!

The urban heat island is one problem and I do not know of any way to correct for it. But the instruments and methods of observation are another. We established the Reference Climate Network, which was a set of stations with long observing records, away from urban effects and with unchanged instruments and observing methodologies. Many stations were lighthouses, agricultural research stations and small town post offices. But shortly after we had identified and designated the network, the Commonwealth began closing lighthouses and giving the sites back to the States; also the Post Office was corporatized and did not see taking meteorological observations as part of the duties of staff unless the Bureau of Meteorology was prepared to recompense them, so there was a shift to automatic weather stations at regional aerodromes. In addition State Governments closed or downgraded staffing at the agricultural research stations.

All this severely impaired the reference climate network especially from the late 80s and early 90s.

The Jones site selection aggravated this potential inaccuracy problem. To get updated information he is restricted to sites that BOM exchanges monthly across the international network. He only includes Bureau staffed stations, mostly at major aerodromes. This throws up particular problems including Melbourne being moved initially from its city site.<sup>7</sup>

The Climategate emails and their related files puncture any myths about the integrity of the Australian data. In the working notes of the CRU's climate model programmer, we read: 'Confidence in the fidelity of the

Australian station[s] in the database drastically reduced. Likelihood of invalid merging of Australian stations high.' The programmer's frustration was summarised in the statement, 'getting seriously fed up with the state of the Australian data. so many new stations have been introduced, so many false references ... so many changes that aren't documented.'<sup>8</sup>

The empirical data on temperature increases has been the key supportive feature of the theory that global warming is both serious and attributable largely to human activities. The Climategate emails may suggest that, in addition to inappropriate statistical analysis, the data itself may have been manipulated or subjected to highly dubious assumptions.

# THE SCIENCE OF CLIMATE CHANGE



# 3

## History of global climate change

Ian Plimer

Climate always changes. That's what climate does. This is no surprise, as planet Earth is dynamic and evolving. Without looking into the past, it is impossible to predict climate changes or to understand modern climate. History shows us that climate rules our lives. For example, the subsistence crises in the northern hemisphere in the seventeenth and eighteenth centuries resulted from the Little Ice Age. The wet weather and resultant bad harvests in 1697 brought disaster to the farming communities. In Finland in 1697, the famine killed one-third of the population.<sup>1</sup> We are currently enjoying an 'interglacial' period (a period of warmer average global temperature between two colder periods) that has already lasted tens of millions of years.<sup>2</sup>

We can acquire factual hard data on past climate from ice. However, we need not rely solely on this because there is a wealth of information in sea floor and lake sediments, tree rings, bogs, peat, pollen, and historical records that show there were very significant rapid climate changes in the past.

Previous warming trends occurred well before industrialisation which cannot be related to human emissions of carbon dioxide (CO<sub>2</sub>) and must be natural. Knowledge of these previous warmings is validated from science and history. If human emissions of CO<sub>2</sub> have forced warming in the late twentieth century, then those making such a claim need to show that this warming is above and beyond natural warming.

### THE LAST GREAT WARMING

The last interglacial period, about 125,000 years ago, was a short warm period between two longer colder periods.<sup>3</sup> On a more detailed scale,

the last glaciation ended with sudden warming about 14,700 years ago, after which it suddenly became cold again some 13,000 years ago after which the modern interglacial period started at about 11,700 years ago.<sup>4</sup> During the last interglacial period, the climate was warmer than today.<sup>5</sup> The temperature was up to 6°C warmer at the poles and 2°C warmer at the equator.<sup>6</sup> This interglacial spanned from 130,000 to 116,000 years ago with the peak 125,000 years ago.<sup>7</sup> Global ice volume was low and sea level was four to six metres higher than now.<sup>8</sup> Tree lines followed the glacier retreats and expanded to high latitude areas and to mountains.<sup>9</sup> Much low-lying land became covered by warm shallow seas. Indeed, many flat coastal plains were directly caused by the deposition of suspended clay and silt in a shallow marine setting.

Sea surface temperature rose and this correlates with a time of raised coral reefs.<sup>10</sup> It also correlates with polar temperature calculated from ice cores.<sup>11</sup> This warm interglacial was worldwide. During the interglacial period, land that was once covered by thick ice sheets started to rebound and rise, only to be covered by ice and depressed again a few thousand years later by ice sheets.<sup>12</sup>

During the interglacial period, high latitude tundra was replaced with trees, and thick forests again covered continental Europe, Britain and elsewhere in the northern hemisphere.<sup>13</sup> Not only was it warmer in northern Europe, Greece was also warm and warmer than at present, showing that the warming was not just restricted to high latitudes.<sup>14</sup> This warming was global, sea level in Western Australia was at least three metres higher than at present and coral reefs thrived between 128,000 and 121,000 years ago in areas where water temperature is now far too cool for coral.<sup>15</sup> During this time modern man, *Homo sapiens*, evolved in east Africa.

### THE LAST BIG FREEZE

The last glaciations started 116,000 years ago.<sup>16</sup> Over the last 100,000 years we have had both climate change and climate variability. Evidence suggests that the shift from interglacial to glacial conditions occurred in only 400 years. Snowlines throughout the world were 900 metres lower than today.<sup>17</sup> Air temperature at the glaciers was some 5°C cooler than today and the tropical sea surface temperature was 3°C cooler.<sup>18</sup> Open vegetation replaced thick forests. The forests retreated to lower

latitude areas, ice sheets expanded to lower altitudes and latitudes, and forest lands such as the Amazon gave way to grasslands. Forests in Europe disappeared abruptly 107,000 years ago and cold water invaded the central North Atlantic ocean.<sup>19</sup> Evaporated water fell as snow, accumulated in ice sheets, and was not recycled back to the oceans, resulting in a lowering of sea level. The ice sheets waxed and waned, as did alpine valley glaciers. With less water falling as rain on vegetation, forest lands retreated to lower latitudes. Dune sands and sea spray were deposited over large areas of Africa, Australia, Asia, and the Americas. The climate was not only cold, it was windier and drier. As the glaciation commenced, sea level dropped and extended rivers cut new ravines at least ten metres deep into previously submerged coastal plains.<sup>20</sup>

During a glaciation, there are great variations in air and sea surface temperature, ice volume, and sea level. Temperature reconstructions from the shells of floating animals provide a sea surface temperature proxy. Some 74,000 years ago it became intensely cold after the Indonesian volcano of Toba filled the atmosphere of both hemispheres with dust and sulphuric acid aerosols. This dust reflected heat and light.<sup>21</sup> There was a brief respite between 60,000 and 55,000 years ago when it became slightly warmer and glaciers started to retreat.<sup>22</sup> Then it cooled again to the zenith of the last ice age at 21,000 to 17,000 years ago. Areas not covered by ice were windy cold deserts. Sea level was at least 130 metres lower than now. During the peak of the last glaciation some 20,000 years ago, lake sediments in Africa show that there was aridity, lake levels were low and the winds were stronger.<sup>23</sup>

During this glaciation, humans existed at the edge of ice sheets, in mountain terrains, on the coastal plains and next to water. Although there were at least three hominid species at the start of the last ice age, by the end of the ice age, only one species had survived.

That was us, *Homo sapiens*, and we almost didn't make it.

## THE END OF THE FREEZE

The Earth is normally free of ice. After the last glaciation, planet Earth did not just steadily warm. Climate fluctuated wildly and cyclically.<sup>24</sup> The deglaciation that followed this glaciation was dramatically interrupted by cooling a number of times, the most intense episode of

which was the Younger Dryas, a very intense cold period from 12,900 to 11,500 years ago. It was a brief bitterly cold period that lasted for about 1,300 years that saw a return to the glaciation from which the Northern Hemisphere had just escaped. Parts of Greenland were 15°C colder than now. In England fossil beetles show that the temperature dropped to -5°C and ice fields and glaciers formed. Lake sediments in Germany show that in the Younger Dryas the wind strength increased due to an abrupt change in the North Atlantic westerlies.<sup>25</sup> Glaciers surged, ice broke off to form icebergs and armadas of ice that drifted south to lower latitudes. During the Younger Dryas, changing ocean currents resulted in changes to the distribution of heat.<sup>26</sup>

The change from warmth to the bitter cold of the Younger Dryas took less than 100 years and maybe only a decade. No climate change of this size, rapidity, and extent has occurred since the Younger Dryas. Changing climates change ecosystems. This is well documented in the scientific literature. For example, over the last 6,000 years, lake sediment studies show that the Sahara changed from a green warm wet environment to a desert about 2,700 years ago.<sup>27</sup> This is in accord with the evidence from archaeology, geology, fossil pollen, and deposition of Saharan dust in the Atlantic Ocean sea floor sediments.<sup>28</sup> This was not the end of the world, but simply meant that one drier ecosystem replaced another wetter one.

### **THE ROMAN WARMING (250 BC-450 AD)**

Warming started about 250 BC and was enjoyed by the Greeks and Romans. The Romans had it easy. Although the Empire started in a cool period, grapes were grown in Rome in 150 BC. By the first century BC, Roman scribes record little snow and ice and that vineyards and olive groves extended northwards in Italy.<sup>29</sup> At the peak of the Roman warming, olive trees grew in the Rhine Valley of Germany. The location of vineyards is a good climate proxy. Citrus trees and grapes were grown in England as far north as Hadrian's Wall and most of Europe enjoyed a Mediterranean climate. This suggests a very rapid warming. It was also wetter.

Temperatures in the Roman warming were 2°C to 6°C warmer than today. Sea level was slightly lower than today despite the fact that times were warmer suggesting that land movements associated with

the collision of Africa with Europe influenced local sea level.<sup>30</sup> Roman clothing also shows it was warmer than today.

The good weather during the Roman warming meant that crop failures and famine became a rarity. There was an excess of food, population increased and the great Roman construction projects were undertaken using the excess labour and wealth. England had at least 5.5 million people, all of whom could be fed. It was not until the Medieval warming (900 to 1280 AD) and the late sixteenth century that England again had a population exceeding 5.5 million. The Dark Ages quickly depopulated areas that had thrived in the Roman warming.

### THE DARK AGES (535-900 AD)

The Dark Ages were a terrible time to be alive. Sudden cooling took place in 535 and 536 AD and the Earth plunged into the dark ages until about 900 AD.<sup>31</sup> It was cold, there were famine, war, change of empires, and the stressed humans succumbed to the plague.

Around 540 AD, trees almost stopped growing.<sup>32</sup> Flooded bog oaks and timber from this time have very narrow growth rings. This was a global event because it is also recorded in tree rings from Ireland, England, Siberia, North America and South America. Snow fell in Mediterranean Europe and coastal China and there were savage storms in Scandinavia and South America. The sky was dim, there were meteor and comet swarms, flooding was common and, after the famines of the late 530s, the plague attacked Europe between 542 AD and 545 AD.

The Black Sea froze in 800, 801 and 829 AD. Ice formed on the Nile River. Such freezing has not happened since then. It was very cold. Long bitter droughts in Europe between 300 AD and 800 AD led to population displacement (the *Viilkenvanderungen* or migrating wandering people), social tensions and famine.<sup>33</sup> Weakened populations and new groups of *Viilkenvanderungen* with no resistance fell prey to the bubonic plague.<sup>34</sup> Plague pandemics did not take place again until the fourteenth century which was, not coincidentally, another time of global cooling, famine and social disruption.

The Dark Ages was a global cold period. For example, coastal sediments in Venezuela show that there was very little runoff water at that time, suggesting a prolonged drought. This is the same drought that caused the collapse of Mayan cities in Central America.<sup>35</sup>

### THE MEDIEVAL WARMING (900-1300 AD)

The Medieval Warming from 900 to 1280 AD was followed by two decades of very changeable weather as the Medieval Warming changed to the ensuing Little Ice Age. In the Medieval Warming, it was far warmer than the present and warming was widespread.<sup>36</sup> The Medieval Warming was not all beer and skittles, because there was a cold period from 1040 to 1080 AD when the sun was very inactive.

However, on balance, summers were longer and warmer, crops were plentiful and there were few serious famines. Europe was warm, rainfall was higher, the climate was stable and agricultural productivity was very high. There was excess food, excess labour and excess wealth. There was prosperity and there were funds to fight the Crusades. Cultivation was higher in the mountains than it had ever been, and tree ring studies in California suggest that North America was also enjoying the warm times.<sup>37</sup> Excess food in Europe led to a 50 per cent increase in population.

The *Doomsday Book* of England shows where grapes were grown, in places where no grapes could now be cultivated for wine production. England, now a cool damp place, was warmer and drier in the Medieval Warming. England thrived and its population grew from 1.4 million to 5.5 million. France's population tripled to 18 million.

Vineyards in Germany were up to 780 metres above sea level, whereas today the maximum altitude is 560 metres above sea level. Temperature usually decreases by 0.6°C to 0.7°C per 100 metres of altitude gained, so the average mean temperature must have been 1.0 to 1.4°C warmer than now.<sup>38</sup> Settlements, land clearing and farming in valleys and slopes spread 100 to 200 metres higher in altitude in Norway, again suggesting that summer temperatures were 1°C higher than now.<sup>39</sup> Tree lines moved upslope in the Medieval Warming and the stumps and roots are still preserved above the current tree line in many alpine areas. Stumps and logs of *Larix sibirica* 30 metres above the current tree line in the Polar Urals have been dated and show that at 1000 AD the tree line was higher than now.<sup>40</sup>

In the northern hemisphere, borehole data shows the Medieval Warming, and a cooling of about 2°C from the Medieval Warming to the Little Ice Age.<sup>41</sup> A study of 6000 boreholes on all continents has shown that temperature in the Medieval Warming was warmer than

today and that the temperature fell 0.2°C to 0.7°C during the Little Ice Age.<sup>42</sup>

An analysis of the physical evidence from 112 studies of the Medieval Warming in Greenland, Europe, Russia, USA, China, Japan, Africa, Chile, Argentina, Peru, Australia, and Antarctica showed that the Medieval Warming was recorded.<sup>43</sup>

### **THE LITTLE ICE AGE (1280-1850 AD)**

The Little Ice Age started in 1303 AD. This major climate change took only 23 years. It led to famine, depopulation, war and disease.<sup>44</sup> The Little Ice Age started when the sun again became lazy. The Wolf Minimum (1280 to 1340 AD) was a time when there were few sunspots, and the lack of solar activity resulted in increased cloudiness. The planet became cold. The Little Ice Age had a number of intense periods when the sun emitted less energy. These were the Sporer Minimum (1450-1540 AD), the Maunder Minimum (1645-1715 AD) and the Dalton Minimum (1795-1825 AD).<sup>45</sup> The Maunder Minimum was the most bitterly cold time of the Little Ice Age. Times of feast suddenly changed to times of famine.<sup>46</sup>

The Little Ice Age was not really an ice age. In reality, it was a cool interval within the current interglacial period. What made the Little Ice Age particularly difficult was that there had been hundreds of years of warmth in the Medieval Warming and the increased population was supported by subsistence farming. Subsistence farming was later replaced in Britain by specialist farming to support city populations. The northern hemisphere had adapted to warm times and was not prepared for the sudden onset of cold times. This created an environmental catastrophe. There was massive depopulation. This catastrophe was global. Pacific island populations were greatly reduced at the beginning of the Little Ice Age.<sup>47</sup> Other parts of the world were cold and dry.<sup>48</sup> Not only was it cold during the Little Ice Age, but there were rapid fluctuations in temperature and precipitation. During the Maunder Minimum, a year of record cold temperatures (1683-1684) was followed by a year of record heat (1685-1686). An ice age climate change is characterised by drastic changes in temperature, storminess and precipitation without warming. These changes were local, global and rapid. They had a profound effect on human society.<sup>49</sup>

We have a reliable picture of the extremely cold periods during the Little Ice Age from the weather records. Private diaries, ships' logs, accounts of military campaigns and similar sources give descriptions of the wind directions, wind speed, cloud formations and other weather indicators. Precisely dated annals, chronicles, audited accounts, agricultural records, and tax ledgers provide indirect information, particularly on extreme weather events. Records of wine grape harvests, salt harvest from evaporation pans and grain prices are a good proxy for temperature, rainfall and wind. For example, the price of grain was higher in periods of weak solar activity when Europe was extraordinarily cold. Additional evidence from debris left behind by glaciers, lake and ocean muds, pollen and insects in mud, tree rings, coral growth structures, ice core analysis, boreholes, archaeological site investigations and historical records can all be used to reconstruct the conditions during the Little Ice Age.<sup>50</sup>

The cold climate and glacier expansion in the Little Ice Age are documented from all continents and on major islands from New Zealand in the South Pacific Ocean to Svalbard in the Arctic Sea.<sup>51</sup> The Little Ice Age was not a single, uniformly cold episode. There were warm and exceptionally cold periods and distinct variations in climate and glacier activity took place on a regional basis. In Europe and North America, at least six phases of glacier expansion occurred.<sup>52</sup> These were separated by warm periods.<sup>53</sup>

In the second half of the seventeenth century, the French army used frozen rivers as thoroughfares to invade the Netherlands, while New Yorkers walked from Manhattan to Staten Island. Sea ice surrounded Iceland, trapping the population and causing famine.

The Little Ice Age had two cold phases and included four intense cold periods at times of reduced sunspot activity. Glaciers advanced and retreated in the Little Ice Age. During glacial advance, European alpine villages were destroyed and forests were flattened. The northeast Pacific region of Alaska shows evidence of two major glacial advances that destroyed forests. Glaciers stabilised after advancing, some retreated slightly and the glacial fluctuations were on a decadal scale.<sup>54</sup> This also shows that the Little Ice Age was not restricted to Europe.

During the first phase (1280-1550 AD) of the Little Ice Age, the climate was far more variable than in the Medieval Warming or the second phase. The extreme variability brought warm and very dry



summers in some years and very cold wet summers in other years. Storm frequency in the North Sea and the English Channel increased.<sup>55</sup> There were Arctic winters, stinking hot summers, major droughts, torrential rains and floods, long winters and long summers. In high latitudes, the Little Ice Age was heralded by the growth of the ice sheets in Greenland in the early thirteenth century. Ice then covered much of Iceland, Scandinavia and northern Europe, and landslides, avalanches and floods were far more common.<sup>56</sup>

The second phase of the Little Ice Age (1550-1850 AD) was even colder and more variable. In the middle of the sixteenth century a very rapid change occurred. An upland blanket of peat in southern Scotland provides a vegetation and climate record over the last 5,500 years and shows 210-year cycles of alternating wet-cool and warm climate with the coldest wettest time in the Little Ice Age during the Sporer Minimum (1450-1540 AD).<sup>57</sup> This coincides with a solar cycle of 210 years in length.

The first half of the sixteenth century in Europe appears to have been much warmer than the previous 150 years, which had seen a steady decline in temperatures after the Medieval warm period. During this early sixteenth century warmth, people were able to bathe in the Rhine River in January. A brief warm period in the 1500s allowed the return of ships to Greenland, only to find that the stranded Viking population had starved and frozen to death.

However, this early sixteenth century warmth was not to last and a rapid cooling occurred. The winter of 1564-1565 was long and bitter. It heralded many similar winters which brought hardship and social unrest throughout Europe. The next 150 to 200 years was the zenith of the Little Ice Age and temperatures were lower than any other period since the last major ice age.<sup>58</sup> Violent storms created havoc, flooding and loss of life with some areas along the Danish, German and Dutch coasts lost permanently to the sea.

Over the last 1,000 years in Europe, there is a correlation between violent conflict, cold weather and precipitation.<sup>59</sup>

## THE WARMING OF THE LATE 20TH CENTURY

The Earth is recovering from the Little Ice Age. The late twentieth century warming has just finished. An analysis of 102 scientific studies

of the late twentieth century warming showed that 78 per cent of the studies found that earlier periods lasting at least 50 years were warmer than any period in the twentieth century. Three studies stated that the twentieth century was the warmest century and four studies rated the early part of the twentieth century, before humans released much CO<sub>2</sub> into the air, as the warmest part of the twentieth century. The late 20th century warming was nothing unusual.

As with previous climate changes, the late 20th century warming has not been a period of steady warming. There was warming from 1850-1940, cooling from 1940-1976, warming from 1976-1998 and cooling since 1998.

Climates far warmer than the late twentieth century warming existed before industrialisation and human emissions of CO<sub>2</sub>. The notion that climate change is tied only to human activity with known atmospheric and ocean feedbacks is a simple and erroneous explanation of modern and ancient climates. To argue that modern climate is driven by slight changes in a trace gas in the atmosphere (CO<sub>2</sub>) requires many non-scientific leaps of faith.

The modern media barrage has conditioned us to think that we are approaching an unprecedented catastrophic warming and that we humans can actually change climate.

Declarations that a particular year was the warmest ever are nothing more than calculating an average value of temperatures recorded at measuring stations. Such calculations can be misleading since the distribution of observation points over land and ocean is uneven and there are large areas of the Earth that have few measurements.

Data from the 3,000 scientific robots in the world's oceans shows that there has been a slight cooling over the past five years. While we are getting hot and bothered about a possible global warming, we are ignoring the announcements by nature of the next inevitable global cooling.<sup>60</sup> It has happened before, it will happen again. Quickly. And all we can do is to adapt, as we have done in the past.

## 4

### **Is carbon dioxide dangerous?**

William Kininmonth

**T**he hypothesis that global warming and climate change are being caused by industrial emissions of carbon dioxide (CO<sub>2</sub>) is propagated within sections of the climate science community and promulgated widely in the media. The hypothesis suggests that increasing concentrations of CO<sub>2</sub>, a so-called greenhouse gas, are trapping heat within the climate system and continuing to warm the Earth. It is even claimed that if humanity does not restrict emissions of CO<sub>2</sub>, then runaway global warming will make Earth uninhabitable. The view is so pervasive that governments, through the United Nations, have negotiated a Climate Change Convention through which countries have agreed that action should be taken to reduce emissions of CO<sub>2</sub> and so prevent dangerous climate change.

What constitutes 'dangerous climate change' has not been defined. However, the Kyoto Protocol is an international regime designed to reduce energy production from fossil fuels in developed countries, including Australia. Negotiations are currently under way to extend the life of the Protocol beyond 2012, to increase further the emission reduction requirements, and to impose emission reduction requirements on developing countries.

Australia, with the United States, did not initially ratify the Kyoto Protocol, although it has set in place a number of actions designed to limit our CO<sub>2</sub> emissions within the target specified by the Kyoto Protocol. Most industrialised countries are having difficulties meeting their initial CO<sub>2</sub> reduction obligations. The Rudd Government ratified the Kyoto Protocol in 2007. New targets are being proposed that beyond 2012 will require cuts of up to 80 per cent below the 1990 emission levels. Such targets will be exceedingly difficult to achieve while maintaining current technological efficiency and standards of living. It should be noted that developing countries,

including the industrialising countries of Asia and Latin America, do not have CO<sub>2</sub> containment requirements under the current 2012 targets. Much of the continuing intergovernmental negotiations relate to the future responsibilities of developing countries, such as China, India, and Brazil, for participating in emission reduction schemes.

### THE ALLEGED THREAT FROM GREENHOUSE GASES

For more than two decades there have been media reports alleging that our climate is deteriorating, Earth has warmed to unprecedented levels, the environment is degrading, we are facing catastrophic and possibly irreversible climate change, and that human activities are to blame. The former Chief Scientist in the United Kingdom, Sir David King, claims that global warming is a greater threat than terrorism and that by the end of the twenty-first century the only habitable continent will be Antarctica.<sup>1</sup> Such a claim is extraordinary given that Antarctica is now an icy wasteland with winter temperatures colder than -80°C.

Australian of the Year Tim Flannery, in his book *The Weather Makers*, promotes human caused climate change as a scientific fact. He elaborates on dangerous impacts that he predicts the continuing burning of fossil fuels and climate change will have on the environment and on humankind.<sup>2</sup>

Former US Vice-President and Nobel laureate Al Gore launched his Academy Award-winning documentary film *An Inconvenient Truth* to an adoring and largely uncritical media reception. Gore's prophecies of melting ice caps, rising sea levels, more hurricanes and the widespread loss of species, including iconic polar bears and emperor penguins, has helped to sway public opinion on the need for drastic action to address climate change. We are told that, because of rising CO<sub>2</sub> concentrations:

- The Earth is warming rapidly and about to pass a 'tipping point' leading to runaway global warming.
- The polar ice sheets are melting at an alarming rate and sea level will rise by tens of metres as first the Greenland ice cap and then the Western Antarctic ice cap melts.
- Australia will have more droughts and floods and there will be more tropical cyclones that are of greater intensity.

- Tropical diseases such as malaria will spread into middle and high latitudes as the Earth warms up.

And the list goes on. Two essential claims underpin these stories:

1. Climate was unvarying prior to industrialisation and consequently recent global warming is abnormal and unprecedented. That is, climate was stable and equable before man-made emissions of CO<sub>2</sub> to the atmosphere began to increase.
2. The hypothesis linking atmospheric carbon dioxide concentrations with global temperature levels is soundly based, such that as human-caused CO<sub>2</sub> concentration increases so too global temperatures will escalate.

The claims are incorporated in assessments of the United Nations' Intergovernmental Panel on Climate Change (IPCC). The IPCC assessments are reputed to have broad consensus based on the number of experts making input to the reports. The assessments have also been accepted by all governments that are party to the IPCC process.

In February 2007 the IPCC released its Fourth Assessment Report.<sup>3</sup> The IPCC concluded, on the basis of computer simulations, that it is very likely that most of the global warming of the last half of the twentieth century was caused by human activities. Moreover, the report endorsed computer-based predictions that Earth will warm between 1.4°C and 5.8°C during the twenty-first century and sea levels will rise up to a half a metre. From the well-orchestrated media hype associated with the release of the IPCC 2007 Fourth Assessment Report, the public would be excused for concluding that industrialisation and modern technologies are driving the world to an apocalyptic future.

The media hype neglects to mention that the cleanest air, the purest drinking water, the most productive lands, the most pristine nature reserves, and the societies most resilient to natural hazards are those of developed countries, such as Australia, utilising the methods and technologies of industrialisation.

So, it is a fair question to ask, is the prospect of human-caused dangerous climate change a reality?

Or is the danger being oversold? Three indisputable facts point to the latter:

1. Recent climate characteristics have been neither unusual nor unprecedented.
2. Increasing CO<sub>2</sub> concentration in the atmosphere will have little additional impact on the Earth's radiation characteristics (the so-called radiative forcing of climate).
3. There are fundamental deficiencies in how computer models represent the climate system and these exaggerate the temperature predictions.

### CLIMATE IS HIGHLY VARIABLE

Evidence of past climates comes from a variety of sources. As climate has changed there are telltale signs left in many places.

Over polar regions the annual accumulation of snow has compacted into layers that build up with time. Each layer embeds physical and chemical characteristics of the prevailing climate. Over Greenland and Antarctica the compacted annual layers of snowfall now reach to depths of several kilometres. Deep cores drilled from the ice and analysed provide information that records variations of climate over the past several hundred thousand years.

On the ocean floor the physical, chemical and organic structure of sediment layers also reflect changing climate. Cores drilled from the ocean floor provide information of changing climate back through millions of years.

Deep ice cores from Antarctica and Greenland confirm that Earth has mostly been in glacial conditions for at least the past 500,000 years. Earth has emerged from the icy conditions for relatively brief warmer periods, such as the current interglacial period, approximately every 100,000 years. Only 20,000 years ago Earth was in the grip of glacial conditions.

- Great ice sheets covered North America and northern Europe, much as Greenland and Antarctica are still covered in ice today.
- The southern boundary of the North America ice sheet extended from Vancouver through St Louis to New York. Chicago was under more than a kilometre of ice.

- London was at the southern extent of the European ice sheet.

The extensive ice sheets of the last glacial epoch caused sea level to be about 130 metres lower than it now is. Tasmania and New Guinea were connected to Australia by land bridges, and the separation from Asia was a waterway only about 150 kilometres wide.

The now pristine coral atolls making up the Great Barrier Reef were, at that time, high limestone cliffs.

Australia's climate was colder than now and very dry. Permanent ice formed over the higher elevations of south-eastern Australia and Tasmania. Inland was arid, and wind-blown sand formed extensive dunes that still characterise the central Australian landscape.

There is evidence of sudden and significant climate fluctuations during the last glacial epoch that began about 100,000 years ago and abruptly ceased about 19,000 years ago.

Ocean sediment cores from the North Atlantic Ocean identify sudden increases in the rate of iceberg formation during the last glacial epoch. These developments (termed Heinrich events) are characterised by sediment layers with an increase in granular soil material, or ice rafting debris, in the structure. The granular material comes from melting of icebergs whose origins can be traced to the land bounding the Hudson Strait and from eastern Greenland.

During the glacial periods, climate was very different from now, but even then there were frequent periods when the climate changed very quickly, and for reasons that we do not understand.

### **THE CURRENT INTERGLACIAL PERIOD**

A great global warming event commenced about 19,000 years ago and this caused much of the North American and European ice sheets to melt and be replaced by forests. Sea level rose about 130 metres over the next 8,000 years to reach near present elevations. Tasmania and New Guinea were isolated from the Australian mainland and coral growth followed sea level rise.

During much of the present Holocene period—the last 10,000 years—temperatures were generally slightly warmer than now and tropical lands were wetter. The now semi-arid and desert lands of North Africa, the Middle East and central Australia were, until relatively recently, grassy savanna. This is the period in which human civilisation evolved.

The advocates of human-caused global warming claim that the Earth's climate had been continually mild and equable over the past 10,000 years before the onset of industrialisation. The widespread evidence for variability of climate even during this period challenges their proposition.

The Greco-Roman civilisations declined during the cooling from the first century AD to the middle of the first millenium. There is strong evidence of advancing glaciers over the Rocky Mountains of North America and the European Alps. In England, the number of settlements continued to decline for more than a century after the withdrawal of the Romans in the early fifth century.

The Norse settled Iceland and coastal parts of Greenland during the warmer Medieval Period that extended from about 800 to 1200. This was also a period of generally increased food supplies across Europe that enabled major construction activities, including the many cathedrals that survive from the period.

The onset of cooler conditions commenced in the late 1200s. There is evidence that many European settlements were in decline in the half-century before the onset of the Black Death that killed up to a third of the population in Europe in 1348. The last Greenland settlement perished in about 1550.

It was not constantly cold during the centuries of the Little Ice Age. Cold was at its worst in the seventeenth century. Winter Frost Fairs were common as many rivers of Europe periodically froze during the Little Ice Age. This is not the description of some Arcadian climate that we are led to believe existed in pre-industrial times. It is certainly not a climate state that we should voluntarily attempt to achieve by way of CO<sub>2</sub> reduction.

### RECENT WARMING

There is no convincing evidence that the climate of the late twentieth century is unusual or unprecedented. Global mean temperature since the late 1800s, as measured by instruments, suggests a rise of about 0.6°C. The warming was mainly over two periods, 1910–1940 and 1975–1998, with declining temperatures between. Unfortunately, the historical temperature records tend to be sparse prior to 1950 and averages may not be globally representative.





A summertime view of the Alps behind Chamonix, France, shows how glaciers have retreated up the valleys. There are historical accounts of how the glaciers extended to the valley floor during the Little Ice Age of the sixteenth and seventeenth centuries. Archaeological evidence supports the view that the glaciers have advanced and retreated many times over the past several millenia. Source: William Kininmonth

For example, the temperature records from Upsalla and Stockholm that are continuous from the middle 1700s identify the 1780s, the 1930s and the recent decade as equally warm periods. In the United States, where records go back to the middle 1800s, the 1930s were as warm as the recent decade.

For Adelaide, Melbourne, and Sydney, where temperature records also began in the middle 1800s, extreme daily maximum temperatures were recorded during a prolonged heat wave over south-eastern Australia in January 1939. New extreme maximum temperatures over parts of Victoria were set on 'Black Saturday' in 2009.

Many of the Medieval Norse settlements of Greenland remain icebound. This suggests that in that region temperatures were generally warmer during the Medieval Period than they are today.

Some high mountain passes of the European Alps have recently become accessible as permanent snow and ice have melted. Archaeological studies,

based on the dating of items discarded by travellers, suggest that these passes have previously been used as transport routes. The passes have opened and closed in the past as temperature and precipitation have varied.

The evidence does not support the proposition that the current warmth of the Earth is unprecedented. Nor does it support the view that climate over the past 10,000 years was steady. Rather, the evidence is that the current interglacial period was at it warmest between 8,000 and 5,000 years ago and that temperatures have been slowly declining since in a series of irregular fluctuations.

The concept of a stable climate prior to human industrialisation is one that has little relationship to historical and proxy climate records. Also, from the evidence, a warmer and wetter climate would seem to be preferable to a colder and drier one—if we had the choice.

### **THE MELTING OF THE GREENLAND ICE CAP AND SEA LEVEL RISE**

One of the scare scenarios promulgated by Al Gore and his fellow advocates is that human-caused global warming is likely to melt Greenland and the Antarctic ice caps. Such melting will lead to dangerous sea level rise and the drowning of low-lying islands and coastal margins. It is claimed that only the reduction in fossil fuel burning will prevent such calamity. However:

- 120,000 years ago during the previous interglacial, unrelated to industrialisation and burning of fossil fuel, the world was slightly warmer than it is today. A large part of the Greenland ice cap did melt and sea level was several metres higher than now. We have to be prepared for such an event recurring irrespective of CO<sub>2</sub> concentration, although the evidence suggests that Earth is now in a gradual temperature decline.
- Today the Greenland ice cap is melting around the periphery and coastal regions are again being settled, just as during the Medieval Warm Period. However, many of the locations of settlements from the Medieval Period remain icebound.
- There is no evidence that the Greenland and the Antarctic ice masses are contracting. Ice continues to accumulate inland over the high cold plateaux.

## THE SCIENCE OF CLIMATE CHANGE

The climate system is very complex, and explanations of human caused global warming have been simplified for public discussion according to two different approaches.

The first approach suggests that greenhouse gases warm the atmosphere. Tim Flannery uses this explanation in his book, *The Weather Makers*.

CO<sub>2</sub> acts as a trigger for the potent greenhouse gas, water vapour. It does this by heating the atmosphere just a little, allowing it to take up and retain more moisture, which then warms the atmosphere further. So a positive feedback loop is created, forcing our planet's temperature to ever-higher levels.<sup>4</sup>

It is this suggestion of positive feedback that leads to the illusion of runaway global warming, but it is nonsense. In the atmosphere, greenhouse gases emit more radiation than they absorb. Overall, the direct effect of greenhouse gases on the Earth's radiation is to cool the atmosphere, not to warm it. The energy flow from the sun follows a well-understood pathway through the climate system.

- Over the tropics, and elsewhere during summer, solar radiation heats the Earth's surface.
- Conduction and evaporation are the dominant processes for transfer of energy from the Earth's surface to the atmosphere. It is convection and air currents that distribute the heat through the atmosphere and offset net radiation loss.
- The greenhouse gases (that is, water vapour and CO<sub>2</sub>) and clouds radiate energy outward.

The primary role of the greenhouse gases is to dissipate the Earth's energy by cooling the atmosphere. *Greenhouse gases do not directly warm the atmosphere.*

The second approach, as used in IPCC assessment reports, is based on the proposition that increasing CO<sub>2</sub> concentration reduces radiation to space. This proposition, and the assumption that Earth was in radiation balance (or constant climate) prior to industrialisation, underpin the IPCC hypothesis for anthropogenic global warming. The theory is that, as atmospheric CO<sub>2</sub> concentration increases, the radiation to space emanates from a higher colder altitude in the

atmosphere. As a consequence, there is less radiation to space, heat is retained in the Earth system, and warming takes place. The IPCC claims, based on computer model simulations, that there is a linear relationship between the reduction in radiation to space and global surface temperature increase.

At current concentrations, an increase in CO<sub>2</sub> will only marginally reduce infrared radiation to space.<sup>1</sup>

### INTERACTIONS OF THE OCEANS AND ATMOSPHERE

The IPCC global warming hypothesis is based on a one-dimensional construct of the climate system. It ignores the fact that most solar radiation is absorbed over the tropics; that over middle and high latitudes there is net loss of radiation energy to space. In order to achieve a global radiation balance it is necessary to transport energy constantly from the tropics to the polar regions by the atmospheric and ocean circulations.

The atmosphere and the oceans, however, are dynamic and interacting fluids.

- The oceans are the inertial and thermal flywheels of the climate system. The total energy of the atmosphere is contained within the top three metres of the ocean and it is the oceans and the patterns of surface temperature that regulate climate variations.
- Surface winds drive the ocean currents and induce regions of upwelling and downwelling that vary the ocean surface temperature patterns.
- Changing sea surface temperature patterns, such as those associated with El Niño events, have profound impacts on climate.

The interactions between the atmosphere and oceans lead to climatic variations with interannual, decadal, and longer timescales. Only the shorter period events, the El Niño that often are associated with intense drought over Australia, have been studied in any detail. There is a range of climate cycles with decadal to centennial timescales that are poorly understood.

There is much more research to be done to understand the ocean circulations and their variations before we can be confident of being able to predict the natural cycles of climate variability. The observation programs to produce the necessary ocean data were only commenced

in the last decade. These programs will take many more decades to reach fruition.

### LIMITATIONS OF COMPUTER MODELS

The predictions of future global temperatures are based on computer models that are claimed to simulate the climate system. As a forcing mechanism, the computer models incorporate increasing concentrations of atmospheric CO<sub>2</sub> triggering an expected rise in Earth's temperature. However, the simulated temperature response of computer models is exaggerated.

The computer models are rudimentary in their construction and in the representation of important physical processes.

- The computer models do not adequately represent a range of energy exchange processes, including those associated with clouds, with transfer of heat and moisture between the Earth's surface and atmosphere, and with the growth and decay of ice sheets.
- There are only limited observations of sub-surface ocean circulations and their variability.

Understanding the ocean circulations is crucial to modelling the natural variability of the climate system.

In essence, computer models represent a highly constrained version of the complex non-linear and chaotic climate system. Computer models cannot predict major and important short-term climate events, such as El Niño; they are certainly not able to predict the next Little Ice Age.

Without a forcing mechanism the global temperature of computer models remains essentially constant—the stable climate scenario. However, a stable and unvarying climate is not what we observe.

In an example of convoluted logic, the IPCC claims that because computer models only have limited internal variability, then the climate system must also have only limited natural internal variability! There is no acceptance that perhaps it is the constraints of the computer models that prevent them from reproducing the observed variability of the climate system. The computer model predictions of global warming are the basis for quantifying the Earth's temperature response to increasing

man-made CO<sub>2</sub> concentration in the atmosphere. The direction of the response is predetermined and it is only the magnitude of response that can vary, depending on assumptions and formulations of physical processes specified in each model.

Evaporation is a natural constraint to surface temperature increase because variations of evaporation and the exchange of latent energy between the Earth's surface and the atmosphere follow the Clausius-Clapeyron relationship. The rates of increase of evaporation and exchange of latent heat increase nearly exponentially as temperature increases. Evaporation is a powerful constraining factor because the oceans cover about 70 per cent of the Earth's surface. Proxy records indicate that a natural upper limit to the surface temperature of tropical oceans is about 30°C, as is currently observed.

Recent analyses of the computer models used in the IPCC 2007 Fourth Assessment Report, as published in peer-reviewed journals, identify that the rate of increase of evaporation (and latent energy exchange) with temperature increase is grossly underestimated. On average, the rate of increase of evaporation in the models is only about one-third of the observed value.

The primary reason for the exaggerated sensitivity of the model temperature response to CO<sub>2</sub> forcing is the under-specification of the rate of increase of evaporation and latent energy exchange with surface temperature increase. The exaggerated sensitivity is not real and is a consequence of errors in the specification of evaporation processes.

A simple mathematical analysis of the role of evaporation suggests that underestimation of evaporation in some computer models is so severe that those models border on instability.

The direct effect of radiation forcing from increasing CO<sub>2</sub> concentration is to warm the surface and atmosphere. The warmer atmospheric temperature and corresponding higher water vapour concentration will cause an increase in back radiation to the surface. The increased back radiation tends to raise further the surface temperature, thus again raising the atmospheric temperature and water vapour and amplifying the initial CO<sub>2</sub> forcing.

This potential for instability is misinterpreted as runaway global warming. Runaway global warming is an implausible concept because a more realistic representation of evaporation would strongly constrain surface temperature response to CO<sub>2</sub> forcing.

## SUMMARY

In the past, Earth's climate has undergone constant change. There have been cyclic glacial periods when large parts of the high latitude Northern Hemisphere lands have been covered in deep layers of ice. We are presently enjoying one of the brief interludes of warmth and are near the upper limit of the feasible global temperature range. However, even during the past 10,000 years there have been regular fluctuations between slightly warmer and significantly colder conditions.

There are neither sound theoretical grounds nor observational evidence to support the argument that changing concentrations of atmospheric CO<sub>2</sub> will have any significant impact on future climate or global temperatures. In particular, there is no reason to believe that there is a mystical tipping point beyond which runaway global warming will lead to dangerous climate change. To the contrary, because of the damping effect of evaporation, the Earth's temperature is bounded at a value not too much warmer than current values.

There is, therefore, no reason that levels of CO<sub>2</sub> in the atmosphere should influence either international protocols or national policies. The paramount consideration should be that fossil fuels are a non-renewable resource and are to be used judiciously.

Environmental propagandists, such as Al Gore and Tim Flannery, insist that laws should be passed to regulate behaviour and limit fossil fuel usage to ensure climate returns to what it was in pre-industrial times. In the musical *Camelot*, King Arthur mandates:

It's true! It's true! The crown has made it clear!

The climate must be perfect all the year.<sup>5</sup>

We do not live in Camelot. We can neither control nor predict future climate and we certainly do not want to return intentionally to a pre-industrial climate as characterised by the Little Ice Age.

Finally, it should be noted that the magnitude of energy flowing through the climate system has the potential to meet all future needs, if it can be economically harnessed. This should be a guiding principle as non-renewable fuels that are now widely in use are steadily depleted.

## 5

# Doomed Planet

Richard S. Lindzen

**T**he notion of a static, unchanging climate is foreign to the history of the Earth or any other planet with a fluid envelope. The fact that the developed world went into hysterics over changes in a global mean temperature anomaly of a few tenths of a degree will astound future generations.

Such hysteria simply represents the scientific illiteracy of much of the public, the susceptibility of the public to the substitution of repetition for truth, and the exploitation of these weaknesses by politicians, environmental promoters, and, after twenty years of media drum-beating, many others as well.

Climate is always changing. We have had ice ages and warmer periods when alligators were found in Spitzbergen. Ice ages have occurred in a hundred thousand year cycle for the last 700,000 years, and there have been previous periods that appear to have been warmer than the present despite carbon dioxide (CO<sub>2</sub>) levels being lower than they are now.

More recently, we have had the Medieval Warm Period, and the Little Ice Age. During the latter, alpine glaciers advanced to the chagrin of overrun villages. Since the beginning of the nineteenth century these glaciers have been retreating. Frankly, we do not fully understand either the advance or the retreat.

For small changes in climate associated with tenths of a degree, there is no need for any external cause. The Earth is never exactly in equilibrium. The motions of the massive oceans where heat is moved between deep layers and the surface provides variability on time scales from years to centuries. Recent work suggests that this variability is enough to account for all climate change since the nineteenth century.<sup>1</sup>

Supporting the notion that man has not been the cause of this unexceptional change in temperature is the fact that there is a



distinct signature to greenhouse warming: surface warming should be accompanied by warming in the tropics around an altitude of about nine kilometres that is about 2.5 times greater than at the surface. Measurements show that warming at these levels is only about three-quarters of what is seen at the surface, implying that only about a third of the surface warming is associated with the greenhouse effect, and, quite possibly, not all of even this really small warming is due to man.<sup>2</sup> This further implies that all models predicting significant warming are greatly overestimating warming. This should not be surprising, though inevitably in climate science, when data conflicts with models, a small coterie of scientists can be counted upon to modify the data. Thus stretching uncertainties in observations and models might marginally eliminate the inconsistency.<sup>3</sup>

That the data should always need correcting to agree with models is totally implausible and indicative of a certain corruption within the climate science community.

It turns out that there is a much more fundamental and unambiguous check of the role of feedbacks in enhancing greenhouse warming that also shows that all models are greatly exaggerating climate sensitivity. Here, it must be noted that the greenhouse effect operates by inhibiting the cooling of the climate by reducing net outgoing radiation.

However, the contribution of increasing CO<sub>2</sub> alone does not, in fact, lead to much warming (approximately 1°C for a doubling of CO<sub>2</sub>). The larger predictions from climate models are due to the fact that, within these models, the more important greenhouse substances, water vapor and clouds, act to amplify greatly whatever CO<sub>2</sub> does. This is referred to as a positive feedback. It means that increases in surface temperature are accompanied by reductions in the net outgoing radiation—thus enhancing the greenhouse warming.

All climate models show such changes when forced by observed surface temperatures. Satellite observations of the Earth's radiation budget allow us to determine whether such a reduction does, in fact, accompany increases in surface temperature in nature. As it turns out, the satellite data show that the feedback in nature is strongly negative—strongly reducing the direct effect of CO<sub>2</sub> in profound contrast to the model behavior.<sup>4</sup> This analysis makes clear that even when all models agree, they can all be wrong, and that this is the situation for the all-important question of climate sensitivity.

According to the United Nation's Intergovernmental Panel on Climate Change (IPCC), the greenhouse forcing from man-made greenhouse gases is already about 86 per cent of what one expects from a doubling of CO<sub>2</sub> (with about half coming from methane, nitrous oxide, freons, and ozone), and alarming predictions depend on models for which the sensitivity to a doubling for CO<sub>2</sub> is greater than 2°C, which implies that we should already have seen much more warming than we have seen thus far, even if all the warming we have seen so far were due to man.

This contradiction is rendered more acute by the fact that there has been no statistically significant net global warming for the last fourteen years. Modellers defend this situation by arguing that aerosols have cancelled much of the warming, and that models adequately account for natural unforced internal variability. However, a recent paper points out that aerosols can warm as well as cool, while scientists at the UK's Hadley Centre for Climate Research recently noted that their model did not appropriately deal with natural internal variability, thus demolishing the basis for the IPCC's iconic attribution.<sup>5</sup>

Interestingly (though not unexpectedly), the Hadley Centre research paper did not stress this. Rather, its authors speculated that natural internal variability might step aside in 2009, allowing warming to resume. The fact that warming has ceased for the past fourteen years is acknowledged. It should be noted that, more recently, German modellers have moved the date for 'resumption' up to 2015.<sup>6</sup>

Climate alarmists respond that some of the hottest years on record have occurred during the past decade. As we are in a relatively warm period, this is not surprising, but it says nothing about trends.

Given that the evidence (and I have noted only a few of many pieces of evidence) strongly implies that anthropogenic global warming has been greatly exaggerated, the basis for alarm due to such warming is similarly diminished. However, a really important point is that the case for alarm would still be weak even if anthropogenic global warming were significant. Polar bears, arctic summer sea ice, regional droughts and floods, coral bleaching, hurricanes, alpine glaciers, malaria, etc. all depend not on some global average of surface temperature anomaly, but on a huge number of regional variables including temperature, humidity, cloud cover, precipitation, and direction and magnitude of wind. The state of the ocean is also often crucial.

Our ability to forecast any of these over periods beyond a few days is minimal. Yet, each catastrophic forecast depends on each of these being in a specific range. The odds of any specific catastrophe actually occurring are almost zero. This was equally true for earlier forecasts of famine for the 1980s, global cooling in the 1970s, Y2K and other panics.

Regionally, year-to-year fluctuations in temperature are over four times larger than fluctuations in the global mean. Much of this variation has to be independent of the global mean; otherwise the global mean would vary much more.

This is simply to note that factors other than global warming are more important to any specific situation. This is not to say that disasters will not occur; they always have occurred and this will not change in the future. Fighting global warming with symbolic gestures will certainly not change this. However, history tells us that greater wealth and development can profoundly increase our resilience.

In view of the above, one may reasonably ask why there is the current alarm, and, in particular, why the astounding upsurge in alarmism of the past four years.

When an issue like global warming is around for over twenty years, numerous agendas are developed to exploit the issue. The interests of the environmental movement in acquiring more power, influence, and donations are reasonably clear. So too are the interests of bureaucrats for whom control of CO<sub>2</sub> is a dream-come-true. After all, CO<sub>2</sub> is a product of breathing itself. Politicians can see the possibility of taxation that will be cheerfully accepted because it is necessary for 'saving' the Earth. Nations have seen how to exploit this issue in order to gain competitive advantages.

The sale of indulgences is already in full swing with organisations selling offsets to one's carbon footprint while sometimes acknowledging that the offsets are irrelevant. The possibilities for corruption are immense.

And finally, there are the numerous well-meaning individuals who have allowed propagandists to convince them that in accepting the alarmist view of anthropogenic global warming, they are displaying intelligence and virtue. For them, their psychological welfare is at stake.

With all this at stake, one can readily suspect that there might be

a sense of urgency provoked by the possibility that warming may have ceased and that the case for such warming as was seen being due in significant measure to humans, disintegrating. For those committed to the more venal agendas, the need to act soon, before the public appreciates the situation, is real indeed.

However, for more serious leaders, the need to resist hysteria courageously is clear. Wasting resources on symbolically fighting ever-present climate change is no substitute for prudence. Nor is the assumption that the Earth's climate reached a point of perfection in the middle of the twentieth century a sign of intelligence.

## 6

### **Carbon Myopia Three dangerous fallacies about man-made carbon dioxide**

Willie Soon and David R. Legates

**I**n December 2009, lawmakers and representatives from nations around the world, scientists, actors, and numerous journalists flocked to Copenhagen to promote a strange scheme aimed at controlling human carbon emissions by declaring the element a tradable commodity and establishing laws and regulations to govern that trade.<sup>1</sup>

Control of carbon emissions is rooted in claims that increasing atmospheric carbon dioxide (CO<sub>2</sub>) concentrations will cause multiple disastrous climatic, ecological, and economic impacts. The report issued by the United Nations Intergovernmental Panel on Climate Change (IPCC) is the primary government-sanctioned source of this claim of dangerous man-made global warming. However, IPCC reports and the science behind them have come under increasing scrutiny and criticism, especially in the wake of leaked or ‘hacked’ email exchanges among leading IPCC scientists who may have used their positions to control the scientific debate, alter temperature data and computer model output, and promote their belief that the Earth faces a man-made climate crisis.<sup>2</sup>

Moreover, the hypothesised *dangerous* consequences of rising atmospheric CO<sub>2</sub> are merely speculations without scientific support. Three critical fallacies of the hypothesis lead us to the conclusion that blindly continuing down the path of carbon emission control, as advocated by many public policy activists and lawmakers, will impose large costs on everyone and will benefit only a small cadre of rent-seekers—‘climate entrepreneurs’ or ‘profiteers,’ if you will—in exchange for no measurable benefits for the Earth’s climate or environment.

Claims that increasing concentrations of atmospheric CO<sub>2</sub> will

have serious adverse effects not only on local, regional and global temperatures, but also on rainfall, animal and plant life, and sea levels have been examined by hundreds of studies. None of the claims stand up under close scrutiny. Herein, then, lies **the first fallacy about man-made carbon dioxide**: that rising atmospheric CO<sub>2</sub> will produce adverse weather and climate changes beyond what would occur due to natural variation.

Claims of future harm from rising atmospheric CO<sub>2</sub> are contradicted by the evidence. For example, the latest global temperature and ocean heat content data are both at odds with the claims of disastrous consequences.<sup>3</sup> While some researchers have tended to select time periods that support their dangerous-warming hypothesis, it is now apparent that forecasts of continued surface and atmospheric warming, and oceanic heat accumulation, have been at odds with the observations for the last decade.<sup>4</sup> It must be rather uncomfortable for the computer modellers and their supporters to try to explain away the large discrepancies between the increases in ocean heat content *predicted* on the basis of the dangerous CO<sub>2</sub> hypothesis, and the *observed* ocean heat content data.<sup>5</sup>

Arctic temperature data from coastal stations in Greenland and averages over the Arctic Pacific, North Atlantic, Greenland-Iceland, and the entire circum-Arctic are also at odds with this dangerous man-made warming hypothesis. These data show abrupt warming and cooling every few decades. The temperature changes fit well with abrupt fluctuations in solar activity, ocean currents, and jet streams. By contrast, the steady rise in atmospheric CO<sub>2</sub> concentrations over the past century, including especially the last fifty years, does not explain the variability in surface temperatures in and around the Arctic.<sup>6</sup>

Neither is it possible to find support for the dangerous-warming hypothesis in the audited station data from across the United States, when the well-known, and localised, urban heat island effect is removed. The evidence shows that warming and hydrological changes result directly from urbanisation and changing landscape cover.<sup>7</sup> The warming prior to 1940, which represents half of the warming of the twentieth century, cannot be attributed to changing CO<sub>2</sub> concentrations.

Failure to find a CO<sub>2</sub> greenhouse-warming signal in an extensive and objective search of climate records all over the globe in the last century or more leads to a very simple conclusion: atmospheric CO<sub>2</sub>

is not a dominant driver of weather and climate.<sup>8</sup> This stands in very sharp contrast to the speculations from computer climate models, which are predicated on a strong relationship between atmospheric CO<sub>2</sub> and air temperature.<sup>9</sup>

An examination of the predicted adverse chemical and biological influences of rising atmospheric CO<sub>2</sub> reveals the **second fallacy about man-made carbon dioxide**: that an increase in atmospheric CO<sub>2</sub> would have only negative effects on ecosystems and biodiversity.

Despite the 2007 US Supreme Court opinion that ‘greenhouse gases fit well within the *Clean Air Act*’s capacious definition of air pollutant,’ atmospheric CO<sub>2</sub> is a vital nutrient for all photosynthetic organisms, green plants, fresh and ocean water algae, and photosynthetic bacteria.<sup>10</sup> It is therefore necessary as the base of most food chains. It is highly inappropriate to assert that CO<sub>2</sub> is an ‘air pollutant’.

Today’s level of atmospheric CO<sub>2</sub>—about 390 parts per million (0.039 per cent or the equivalent of about four cents out of \$100)—is not ‘dangerously high’ from the perspective of photosynthetic organisms. In fact, 390 ppm is far below the nutrient saturation level for these organisms and below the optimal level for growth.<sup>11</sup> And yet few scientists, politicians or climate entrepreneurs consider the positive benefits to plants under elevated CO<sub>2</sub> levels.<sup>12</sup> Furthermore, some marine organisms may actually grow better and be more productive as a result of ocean acidification.<sup>13</sup> This is caused by dissolving CO<sub>2</sub> in seawater.<sup>14</sup>

This is why some of the fast biological responses—most likely involving the positive synergistic interactions among changes in temperature, solar radiation and bicarbonate—are likely to stimulate marine life and food production in the world’s oceans. Biologist and oceanographer, Dr. Debora Iglesias-Rodriguez, summarised her findings on the topic this way:

Increased CO<sub>2</sub> in the Earth’s atmosphere is causing some microscopic ocean plants to produce greater amounts of calcium carbonate—with potentially wide-ranging implications for predicting the cycling of carbon in the oceans and global climate modeling ... Our research has also revealed that, over the past 220 years, [single-celled algae and phytoplankton] have increased the mass of calcium carbonate they each produce by around 40 per cent. These results are in agreement with previous observations that [single-celled algae and phytoplankton] are abundant throughout

past periods of ocean acidification, such as that which occurred roughly 55 million years ago.<sup>15</sup>

An examination of the procedures used in studies that come to contrary findings reveals that they have inappropriately claimed to examine the ocean acidification issue by *adding hydrochloric acid* to seawater, rather than taking the trouble to bubble CO<sub>2</sub> through the water to simulate more faithfully natural conditions with carbonic acid.<sup>16</sup>

Recently, some ecologists and geologists have cautioned about the dangers of ‘carbon myopia’—of seeing and examining only the alleged dangers of rising CO<sub>2</sub> levels in the atmosphere, while ignoring the benefits of this plant- and shellfish-enhancing nutrient. Francis Putz and Kent H. Redford, for example, cautioned that carbon-based conservation can be bad for biodiversity and harmful to both plants and animals. They note that carbon-based discrimination will adversely affect non-arboreal plants, result in shorter tree species, and put non-forested ecosystems at risk. They observe:

Given that tropical savannas and other open-canopied ecosystems are in as much jeopardy as closed-canopy forests, the enthusiasm for tree planting among carbon investors could create perverse incentives, leading to major biodiversity losses from areas that fall on the wrong side of the forest/not-forest dichotomy.<sup>17</sup>

Apart from a few species required for pollination and seed dispersal, ‘most vertebrates and invertebrates are superfluous, if not nuisances, in forests managed for carbon,’ Putz and Redford conclude. That means that incentives to sustain and preserve those species will bring only limited benefits, if they do not actually prove to be detrimental.

Another large team of scientists, led by the distinguished ecologist and conservationist Professor Daniel Botkin, made another important point about prediction of species extinction by the IPCC and others:

Current forecasting methods suggest that global warming will cause many extinctions, but the fossil record indicates that, in most regions, surprisingly few species went extinct [over the last 2.5 million year... [I]n North America, for example, only one tree species is known to have gone extinct. Large extinctions were reported mainly for tree species in northern Europe (68 per cent loss of tree genera) and for large mammals (> 44 kg) in the Northern Hemisphere.<sup>18</sup>



Professor Kathy Willis and colleagues from Long-term Ecology Laboratory at Oxford University added more doubt and uncertainty:

[C]autions may be required in interpreting [extinction] results from these models, not least because their coarse spatial scales fail to capture topography or ‘microclimatic buffering’ and they often do not consider full acclimation capacity of plants and animals.<sup>19</sup>

In the *Journal of Biogeography*, Dr. Sergio Avila and ten co-authors noted that extinction caused by extreme cold (i.e., global cooling) cannot be confirmed either:

Not a single endemic Azorean species of mollusc that is present in the Pleistocene fossil record has since become extinct, and we found no signs of ‘mass extinction’ in the littoral marine molluscs of the Azores ... Thus, our results do not support Briggs’ ‘Pleistocene temperature theory,’ which argued that a (supposed) lack of endemism indicates that the older (Azorean endemic) fauna was wiped out by a severe drop in sea surface temperatures during the Pleistocene. Nearly all of the molluscs now present in the Azores were there prior to the last glaciation.<sup>20</sup>

In no uncertain terms, Professor Tom van Loon, a geologist and former president of the European Association of Science Editors, concluded:

There are no convincing data either that the Stone Age societies (including people such as American Indians, Aborigines, and Maoris in the past centuries) that possibly contributed to the disappearance of several large mammals did more harm to nature than other species did in the geological past. It seems therefore essential that insight into biodiversity and its fluctuations be deepened... [I]t must be admitted that activities in this framework [have received] little attention thus far, most probably because the role of natural evolution is largely ignored—if recognized at all—by decision makers in the field of nature conservation.<sup>21</sup>

Van Loon further pointed out that we do not have any clear evidence that humans and their activities have caused past extinctions beyond the ‘natural’ (without man) background rate of change today.<sup>22</sup> For humans to be the principal culprit in species extinction, Professor van Loon estimated, the current rate of species extinction would have to be well over 20–100 species per year—far below what is observed today.<sup>23</sup>

Finally, the **third fallacy about man-made carbon dioxide** is that carbon trading will lead directly to a reduction in atmospheric CO<sub>2</sub>.

Recent failures of carbon emission trading, both in the Chicago Climate Exchange and in the European Union Emission Trading Market, confirm a simple but harsh reality: carbon trading is an artificial and unworkable system that will cause more harm than good, since there are simply too many potential cheaters, too many opportunities to cheat and get away with it, and too many opportunities to make big profits by cheating. Professor Roger Pielke Jr. has critically remarked that 'very complex policies full of accounting tricks, political pork and policy misdirection' were being devised to create the false promise of an international climate-solution deal at Copenhagen.<sup>24</sup> Even *Science* magazine reluctantly agreed on 23 October 2009 that:

The accounting now used for assessing compliance with carbon limits in the Kyoto Protocol and in climate legislation contains a far-reaching but fixable flaw that will severely undermine greenhouse reduction goals ... For example, the clearing of long-established forests to burn wood or to grow energy crops is counted as 100 per cent reduction in energy emissions, despite causing large releases of carbon.<sup>25</sup>

There is a dangerous paralysis creeping into our modern era as a consequence of unscientific carbon myopia. This paralysis is illustrated by the nightmare of complex and misleading carbon budget accounting, where the:

... [o]ffset of carbon dioxide emissions can be achieved through additional storage and protection of carbon pools located in human settlements. Human settlements store carbon in natural pools such as vegetation and soil, as well as in anthropogenic pools. Anthropogenic carbon pools encompass buildings, printed materials, landfills, clothing and living organisms.<sup>26</sup>

Those who have not followed the trading price of carbon emissions at the Chicago Climate Exchange will be intrigued to learn that carbon began trading at the modest price of \$US1 per metric tonne in January 2004. Prices then fluctuated wildly, reaching a peak value of \$US7 per metric tonne in May/June 2008.<sup>27</sup> However, as public interest waned (due in part to economic conditions, in part to a lack of correlation between the extreme scenarios that have been posited and observations

in the real world), the trading price of carbon emissions fell to a low of \$0.10 per metric tonne by November 2009.<sup>28</sup>

An initial investor in carbon emissions back in January 2004 has now lost 90 per cent of his or her original investment on what has amounted to a tax on a gaseous atmospheric component that is essential for all life—and on the hydrocarbon energy that powers 85 per cent of the United States economy. Speculators who unfortunately entered the carbon market on 30 May 2008 have lost 98.6 per cent of their investments.

At the European Union Emission Trading Market, trading has similarly collapsed. Trading peaked around €30 per metric tonne in April 2006, dropped to less than €1 in February 2007, and eventually reached €0.03 in December 2007—a fall to 0.1 per cent of its peak value.<sup>29</sup> Ironically, at least part of the reason for the fall was that too many carbon emission credits were allocated relative to actual emissions. Moreover, EU emissions have actually *increased* over the same time period—by 10–54 per cent in some countries—during this first phase of the EU carbon trading experiment. For example, emissions as of the end of 2007 for both Greece and Ireland were twenty-five per cent *above* their 1990 levels; Portugal's emissions were 38 per cent above and Spain's were 54 per cent above.<sup>30</sup> These, of course, are the very outcomes that carbon trading was supposed to *prevent*.

The second phase of EU trading also is not promising, as new hurdles and questions have arisen. This is exemplified by the September 2009 decision of the European Court ruling against the European Commission's plan to cut emission quotas for Poland and Estonia. The court held that the two countries could not be compelled against their will to abide by lower emission quotas imposed by the subsequent to the acceptance of the Kyoto Protocol.<sup>31</sup>

Media coverage of the man-made global warming alarm makes it clear that activist scientists have subverted science, to disguise these three carbon fallacies.<sup>32</sup> Humanity cannot afford a future based on the grievous misunderstanding engendered by carbon myopia and the real harm that would be caused by adhering to these fallacies about carbon.

## 7

### **Imprecision, uncertainty and bias in scientific research**

Garth W. Paltridge

**I**n one limited sense the members of the ‘do something about global warming’ lobby are correct. If humans insist on giving the atmosphere an extra dose of carbon dioxide, then indeed one can expect Earth’s surface temperature to rise. To be strictly accurate, we should say that its temperature will be higher than it would have been otherwise. Either way, it doesn’t take a lot of physical knowledge and insight to accept the statement. It is rather the equivalent of saying that if one hits something with a bat, then that something will respond. So it is true, as the lobby delights in telling us at every opportunity, that there is no longer much argument among scientists about the existence of the greenhouse global warming phenomenon. There never was.

The consensus goes no further down the chain of political correctness than this. It is rather naughty of the greenhouse lobby either to say outright, or to imply by judicious omission, that it does.

It has not been solidly established, and it is certainly not accepted by the majority of scientists as proven fact, that global warming from increased atmospheric carbon dioxide will be large enough to be seriously noticeable—let alone large enough to be disastrous. Imagine the response of a well-bedded concrete post when belted by a relatively small bat. In a situation where the post has been around a long time and has in the past survived the beatings of lots of much bigger bats, the chances are that it will not move much.

More than thirty years of well-funded international research directed specifically at the climate change problem have brought us no nearer to an estimate of future temperature rise than to say, rather feebly when one thinks about it, that the global-average temperature

increase over the next century may be somewhere between one and several degrees celsius. Thus say the various computer models, whose simulations even of present climate fall into the 'reasonable' range only by dint of forced tuning of many of the pieces of input information. There are no means of experimentally checking the overall predictions of future climate change—basically because our knowledge of past climate is not precise enough. Furthermore, it should be remembered that the 'one to several degrees' range covers only a limited set of the results obtained from all possible variants of climate model. The choice of that particular set derives from what might be called seat-of-the-pants statistics—the sort of statistics practiced by members of a committee dedicated to producing figures which, on the one hand, are interesting and on the other, are not so over-the-top as to be rejected by their peers. Suffice it to say that there are more than enough pitfalls associated with the application of statistics to actual measurement. The pitfalls are multiplied enormously when applied to various manifestations of pure theory.

Even accepting for the sake of argument that some significant degree of global warming may be observed in the future, it is certainly not the consensus of the majority of scientists that the actual impact on humans will be significant—or indeed that it will be detrimental. The bottom line here is that computer models have no provable skill at forecasting the change of regional and local climate even if we accept that they may say something sensible about global averages. In particular it may be that things like the continental, regional, and local averages of rainfall are *inherently* unpredictable. Therefore the models are in no position to tell us anything of the impact of climate change on any particular aspect of human endeavour. Instead, one must resort to all sorts of 'what if' scenarios, virtually all of which have no justification other than that they are easy enough to sell as doomsday forecasts to politicians and to the public. 'Where it is dry we will get more droughts. Where it is wet we will get more floods. Where there is disease, it will spread. Where there are people the sky will fall in.' Such predictions are tailor-made for the mournful tones of the politically correct reformers of mankind. They are now accepted without a murmur of dissent by a large fraction of western society.

The trouble is that the uncertainty inevitably associated with the

chaotic behaviour of climate works both ways. It may be impossible even in principle to substantiate a doomsday forecast, but it is also impossible to prove anything to the contrary. So the winning side of any argument about the matter will inevitably be the side with the loudest collective voice. In any event, should the doomsday scenario indeed fail to inspire fear and trepidation because it cannot be substantiated, one can always fall back on its unspoken basis—namely that ‘all change is bad’.

### DAMAGING SCIENCE

Why is it that the scientific community has become so one-eyed in its public support for the disaster theory of climate change? Why is the scientific community taking such an enormous risk with its reputation?

In fact, the short-term risk to the profession is probably not all that great. In view of all the uncertainty inevitably associated with argument on either side of the fence, it is not likely that anyone will be able in the near future to prove absolutely that any particular forecast of climate change is nonsense. It has taken the United Nations Intergovernmental Panel on Climate Change (IPCC) more than twenty years to develop a story which, though replete with uncertainty at just about every level, is coherent enough to be sold to the public at large. Perhaps more to the point, the story is complex enough to be virtually unarguable by anyone or anything other than a fully-fledged research institution specifically assigned to make that argument. Thus it is unlikely—not impossible, but unlikely—that an individual somewhere will produce a single scientific result powerful enough to blow the idea of disastrous global warming out of the water. It is even less likely that a national government would risk the anger of its scientific establishment by creating a research institution—it would have to be a very large research institution—designed solely to perform a large-scale critical audit of the scientific bases of the forecasts of climatic doom. While the suggestion along these lines by Michael Crichton was sensible enough, one has to suspect he did not really hold out much hope that such an institution would ever come to pass.

On the face of it, the long-term risk to the profession is much greater. In fifty or a hundred years the forecasts of doom will have been

tested and, with any luck, proved wrong. But by then the leading role of the scientific community in upsetting the global economic system will probably have been forgotten. The scientist of that time will be able to dig into the archives and find various quotes to the effect that 'on such and such an occasion, this or that scientist spoke publicly about the uncertainty of the climate forecasts'. He will therefore be able to maintain with his hand on his heart that it was not the fault of scientists that society went overboard on the matter. Rather, it will have been the fault of the environmentalists and politicians who misinterpreted the scientific results for their own nefarious purposes. Sufficient repetition of statements along these lines should effectively obscure the existence in the past (that is, in the 'now') of a carefully calculated campaign to trade scientific reputation for political action.

By then as well, there will be enough 'wobble room' to evade serious enquiry as to why scientists rarely bothered to refute, in public, the more fantastic of the scenarios for climatic disaster. 'It was not our job to protect the public from misinformation' they will say in the year 2110. Die-hard global warming scientists make that comment even today. Strangely enough, they are not nearly so coy when it comes to refuting ideas to the effect that things might not be as bad as they are painted.

## THE BUSINESS CONNECTION

As to the 'why' of the business, there are a fair number of very strong forces at work to encourage the interpreters of climate science to overstate their case. To a large extent, the forces are at work also on the scientists themselves. As with all religions, woe betide those demented souls, scientists or not, who are so deluded as to question the beliefs of the politically correct.

It is worth remembering that among the interpreters are the scientific administrators—in particular the managers of research institutions who, by virtue of their office, are the official spokesmen for the views of their organisations. Their words carry tremendous authority with the public because it is assumed that they have a deep understanding of the science for which they are responsible. Sadly, in the modern era of management, that assumption can be way off the mark. They may have little real knowledge of science, and are as

subject to the necessities of political correctness as the rest of us. Indeed, perhaps rather more than the rest of us. Many of them have been appointed to their position precisely because of their 'feel' for the views and needs of the community rather than their 'feel' for science.

There are a number of pragmatic reasons for a sub-conscious bias by the ordinary bench scientist towards the politically correct. Basically, they boil down to the need to eat. Fame and fortune in the research profession depend largely on artificial measures of success related to the quantity rather than the quality of research publications and of funding grants. Undoubtedly the system rewards conformity to the popular view when outcomes are determined by consensus rather than proof.

There are also a number of less pragmatic reasons for bias. But perhaps the saddest and most deeply hidden is related to the fact that much modern research can be intensely debilitating to the scientist concerned. The reward system of his profession forces scientists to spend a great deal of their time researching safe topics whose importance in the grand scheme of things is virtually nil. Scientists can be reasonably certain that work of this type, when published, will probably never be read by anyone. Persuading themselves that it is nevertheless significant and worth doing requires a tortuous and painful exercise of self-delusion. In such circumstances it is an immense relief to be associated with an international programme which, whatever one might think of its aims and politics, at least has high and popular moral purpose. It restores their pride.

Bias in the global warming story is overwhelmingly toward the politically correct. If for no other reason, the money lies on that side of the fence. Perhaps the most interesting, and probably unanswerable, remaining question about it all is how a belief in climatic doom became politically correct in the first place. Conspiracy theorists would probably favour the idea that it was all planned thirty years ago by some small, shadowy, secret organisation bent on destruction of the world's social order. But, given the human addiction to tales of collective guilt, there is no need to invoke conspiracy as part of the explanation. The path to the final outcome was inevitable from the start.



## POLITICS AND GLOBAL WARMING

Finally it is worth making the point that a situation has emerged wherein the politicians who must make decisions on the matter of climate change are being deprived of a basic tool of their profession—namely, access to a diversity of advice from the ‘scientific-technological elite’. President Eisenhower was extraordinarily prescient on the matter, and it is worth quoting the relevant part from his farewell address to the nation. Remember that this was a speech made nearly half a century ago.

Today, the solitary inventor, tinkering in his shop, has been overshadowed by task forces of scientists in laboratories and testing fields. In the same fashion, the free university, historically the fountainhead of free ideas and scientific discovery, has experienced a revolution in the conduct of research. Partly because of the huge costs involved, a government contract becomes virtually a substitute for intellectual curiosity. For every old blackboard there are now hundreds of new electronic computers.

The prospect of domination of the nation’s scholars by Federal employment, project allocations, and the power of money is ever present—and is gravely to be regarded.

Yet, in holding scientific research and discovery in respect, as we should, we must also be alert to the equal and opposite danger that public policy could itself become the captive of a scientific-technological elite.<sup>1</sup>

## 8

### **Carbon mitigation: the crippling costs**

Christopher Monckton

**W**e are all environmentalists, but some of us are more sensible than others, and we do not want to waste time, resources, and money on non-problems, when real problems in the environment and elsewhere so urgently need to be addressed.

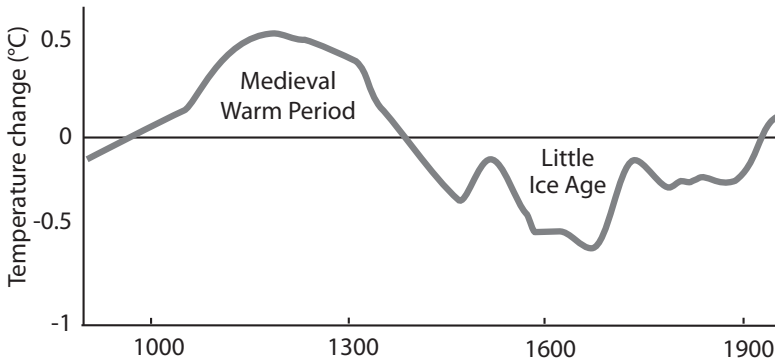
We all see images of doom and gloom, such as scenes of the British Houses of Parliament under thirty feet of water as depicted in the 2007 film *Flood*. They are the kinds of images being put around by the United Nations Intergovernment Panel on Climate Change (IPCC) and its supporters, to try to suggest that unless you are prepared to give up large amounts of your freedom and your cash, and to shut down a large proportion of your economies, the world is doomed.

#### **CLIMATE SCIENCE**

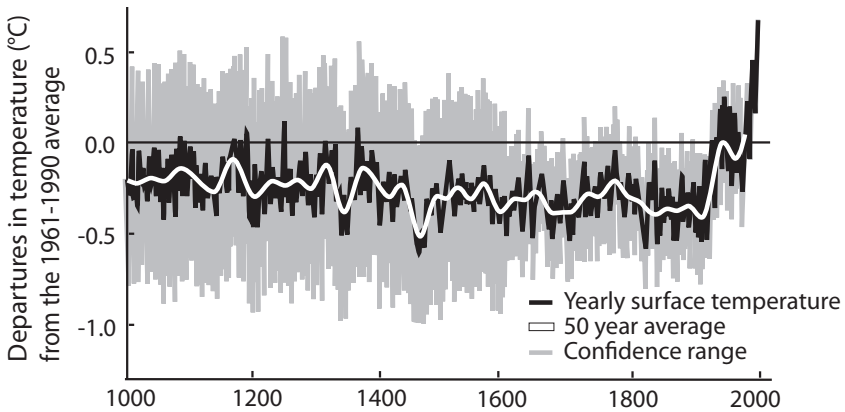
The Intergovernmental Panel on Climate Change (IPCC) 2001 Third Assessment Report conveniently ignored the Medieval Warm Period. Instead, it flagrantly exaggerated the record of twentieth century temperature by only using Northern Hemisphere temperatures. With the Southern Hemisphere temperatures included, there would have been far less temperature rise in the twentieth century.

What should have been a 'bathtub' graph (see Figure 8.1) became a 'hockey stick' graph, with the last 1,000 years being the shank, and the hundred years most recently being the blade (see Figure 8.2).

This was largely achieved by giving 390 times as much weighting to proxy temperature data. Such a reconstruction of pre-instrumental temperature gave a 'hockey stick' shape with a great upward tick during the twentieth century.

**Figure 8.1: IPCC's 1990 report clearly shows Medieval Warm Period**

Source: Intergovernmental Panel on Climate Change,  
*First Assessment Report (1990)*

**Figure 8.2: IPCC's 2001 report 'hides' Medieval Warm Period**

Source: Intergovernmental Panel on Climate Change,  
*Third Assessment Report (2001)*

The algorithm used in processing the proxy data automatically generated the sudden apparently dangerous uptick in the twentieth century. But that outcome is achieved even if random data are inserted into the algorithm.

This was further modified by removing the real data for the Middle Ages, and replacing them with alternative estimates. In fact, the Medieval Warm Period was real. It was global, and it was warmer

than the present. We know this because more than 740 scientists in 400 institutions, in more than forty countries over the past twenty years have contributed to papers establishing this to be the case. The original 2007 IPCC report showed various contributions to sea level rise over the past fifty years that had been inserted by the bureaucrats after their receipt of the report, as signed off by the scientists. This embellishment had serious errors, including a multiplication by ten of the observed Greenland and Antarctic ice sheet on sea level rise. They removed the table, relabelled it, moved the decimal points back to where they belonged, made other corrections, and reposted it quietly on their website.

Misleadingly, the IPCC claims that '2,500 scientists' have contributed to a supposed consensus. The entire documentation of the IPCC boils down to one question only: how much warming will we get if we double the CO<sub>2</sub> in the atmosphere as we are expecting to do in the next hundred years?

On that central question on which everything else depends, there were only four papers cited by the IPCC in support of the values which it chooses for the three parameters which, when multiplied together, provide the final climate sensitivity. Those four papers involve perhaps a dozen scientists in all, not 2,500. The remainder for various reasons have been willing to go along with those four papers, which does not mean those papers are right, and it does not mean that 2,500 scientists contributed to that central conclusion.

It is untrue that there is warming in the pipeline, even after we stop allowing CO<sub>2</sub> to increase. In fact, the warming in the pipeline over the whole of the twentieth century, if we do not mitigate any of our CO<sub>2</sub> emissions and we then stop CO<sub>2</sub> rising in 2100, is only 0.5°C which would occur over several thousand years.

### CLIMATE ECONOMICS

The atmospheric CO<sub>2</sub> concentration in 2009 was 388 parts per million per volume. We are adding just two parts per million per year. Using the IPCC's central estimate formula, this would cause warming of 0.025°C, about one fortieth of a Celsius degree. Even on the IPCC's own figures, to prevent just 1°C of the warming that the IPCC predicts will happen would take 40 years of shutting down the entire world economy, and

not emitting any CO<sub>2</sub> whatsoever throughout that time.

The West is actually no longer the problem—it is therefore not solely the solution. China's emissions have recently overtaken those of the United States, and they are intending to continue opening one or two coal-fired power stations a week, and they will not have the technology for cleaning up the emissions for the foreseeable future.

By the same token, achieving Kyoto targets would be costly and futile. On the business-as-usual scenario compared with the Kyoto scenario, by 2100, there is barely 0.2°C of temperature difference, even if everybody had complied with Kyoto—which they have not.

There is a heavy cost of mitigation compared with adaptation. It is much cheaper, on any estimates, to adapt to any climate changes rather than trying to produce less warming by reducing the CO<sub>2</sub> emissions.

We also have to be wary of pious alternatives. Many people argue that all we have to do is build a few windmills or solar panels. However, gesture politics of that kind are costly and futile. Even if wind and solar could be reliably provided, their costs are many times those of conventional power. Wind turbines only give one sixth of their rated capacity because the wind is not blowing most of the time.

Often overlooked is that CO<sub>2</sub> also is economically and socially beneficial. Not only is it plant food but its use is heavily associated with longer and healthier lives. This is because of the services—heat, cooling, and improved productivity—brought about as a result of burning CO<sub>2</sub>.

CO<sub>2</sub> is therefore highly beneficial to humanity. Yet we offer to Africa, as the alternative energy source, timber carried on the backs of the people, and used in smoky rooms where children often die of smoke-related diseases. Such outcomes are inflicted on Africans if they are prevented from having access to fossil fuels, which are still and will long remain the cheapest forms of electricity generation.

The population paradox is that it is the poorer countries that have the largest population growth. If poor countries are allowed to become rich, this causes their population to stabilise. That facilitates a better environmental balance and a reduced human footprint on every kind of environmental feature. Ironically, what is being recommended by

the Greens and by others who are trying to peddle this now discredited global warming scare would lead to an increase in world population. That would simply defeat any of the carbon emission reduction measures. There are grievous consequences if we get the policy wrong.

And finally we have the Copenhagen Treaty. This envisages a scheme for new institutional arrangement based on three basic pillars. The first of these is government with enormous powers. It has a structure with 300 separate new bureaucracies, and a facilitative mechanism to carry out public policies as the prevailing instrument to which market rules, and related dynamics should be subordinate. The Copenhagen Treaty would shut capitalism down. There would be no such thing as free markets under the present draft of the Treaty.

The economic provisions also envisage a wealthy-nations tax of two per cent of gross domestic product. That is the equivalent of half the US Defence budget. There will also be a two per cent tax on all financial transactions—a similar idea applied to banks was recently rejected by the G20 when the British Prime Minister proposed it, but here it is reappearing. The treaty also has a worldwide cap-and-trade regime, which means progressive rationing of electricity and the tradeable rights to carbon emissions, and unlimited fines are to be imposed by this new tyranny for those governments that do not comply.

Thirdly, the provisions of the treaty say nothing about ‘elections’, ‘votes’, ‘ballots’, ‘democracy’ with those words not even occurring in the text.

These on-going attempts to implement this profoundly undemocratic and economically harmful institutional framework that would have had serious repercussions on liberty.

# THE POLITICS AND ECONOMICS OF CLIMATE CHANGE POLICY

## 9

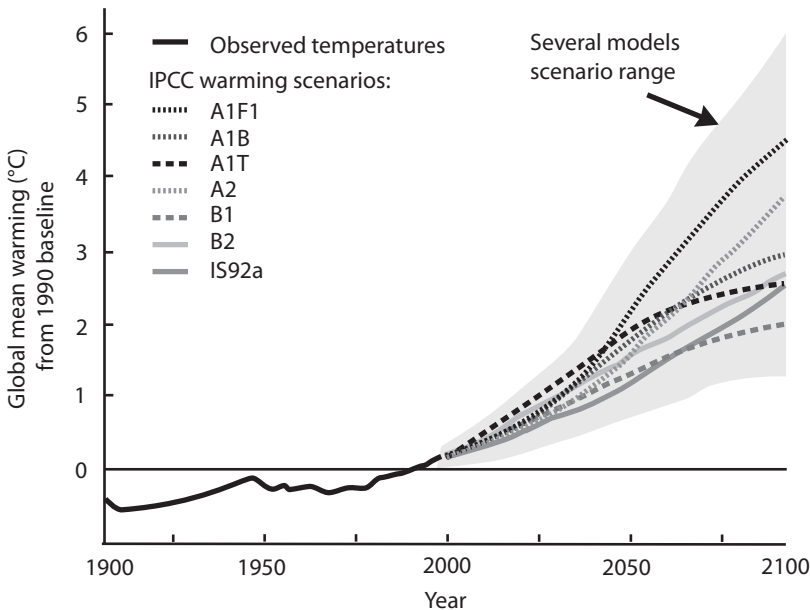
# The impact of climate change and its policy implications

Richard Tol

The impact of climate change on humans is less certain than often depicted, both in terms of the risks it might impose and the costs (and benefits) of those risks.

Figure 9.1 shows range of possible future warming scenarios as estimated by the Intergovernmental Panel on Climate Change. The lines depict alternative realisations of how the future may unfold.

**Figure 9.1: Range of Future Warming Estimates**



Source: Intergovernmental Panel on Climate Change, Third Assessment Report (2001); Special Report on Emissions Scenarios (SRES)<sup>1</sup>



The uncertainties are many; we do not know how many people there will be in the future. We do not know how rich they will be, how much energy they will use, and what sort of energy will be available. These uncertainties mean that the graph illustrates just six alternative realisations of how the future may unfold. On top of this, adding the further uncertainty about the workings of the climate system, one sees the grey areas within the graph which suggests that by the end of this century, the world may have warmed by 1°C or perhaps by 6°C. We do not know where in this range we will be, and moreover, there is good reason to assume that experts overestimate their ability to predict the true uncertainties, which are probably much larger than the range depicted.

We typically experience warming of greater than 6°C between six in the morning and midday. But the warming means all the extremes are shifting as well—rainfall patterns and storm patterns will shift. That said, how much one cares about climate change really depends on how one looks at life.

If one is the sort of person who worries about coral reefs and butterflies, then climate change is actually a very big problem. There have already been documented extinctions of certain butterfly species because of warming. The reason for that is that butterflies tend to live in very specific ecological niches. If anything changes, that niche will simply disappear from under them—they have no place to go. Even though they can fly, butterflies cannot travel very far.

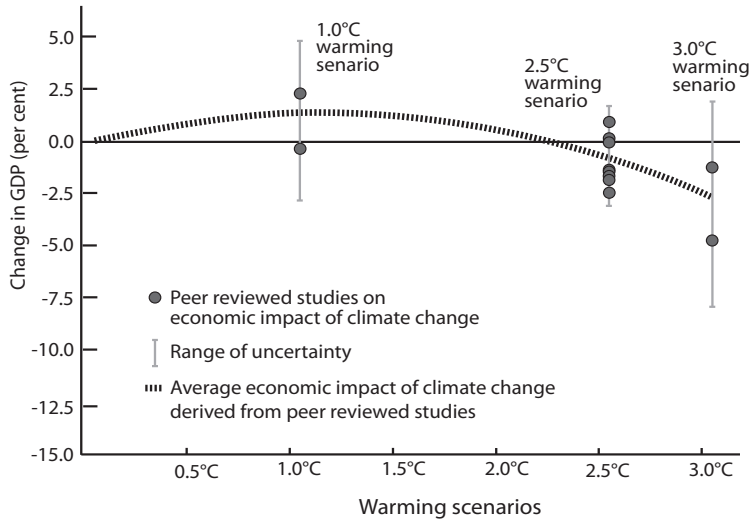
If, on the other hand, one only worries about what happens at a macro scale to the planet, then climate change is perhaps less of a concern. These macro threats of the consequences of climate change include occurrences such as a shutdown of thermohaline circulation or a collapse of the West Antarctic ice sheet.

The thermohaline circulation and other ocean currents are actually fairly robust and we simply do not understand the effect of our current CO<sub>2</sub> emissions for such things as the West Antarctic ice sheet. It may be that emission increases will speed up the disintegration of the West Antarctic ice sheet. It may be that it will become more stable because of climate change. We simply do not know. But most of the models and most of the scenarios suggest that if these sorts of things happen, they will not happen this century, and probably not even next century. We therefore have time to act. Our emissions over the next twenty years or so will hardly affect those probabilities.

We must then ask ourselves: (1) What would happen to the economy as a whole, and to the welfare of the people; and (2) How would those impacts be distributed between countries and between groups of people?

Figure 9.2 depicts the economic impacts of climate change. The horizontal axis represents changes to global temperatures in degrees centigrade (°C)—this is the global warming scenario that various studies have considered. The vertical axis represents percentage change of GDP equivalence. The top dot at 1°C indicates a study which said that for a 1°C increase in global warming, we would feel better off, with a positive impact to the tune of about 2.5 per cent of income. In this case, climate change would do as much good to us as a 2.5 per cent increase in our income would.

**Figure 9.2: The economic impact of climate change**



Source: Tol, derived from UN data

In total, there are fourteen dots in Figure 9.2. Each dot presents an estimate of the total impact of climate change on human welfare that has been published in the peer-reviewed literature. This is the total population of such studies. It is being claimed that climate change is the biggest problem in the world, and definitely the biggest environmental problem in the world. But there is actually very little empirical evidence

to back up such statements. Only fourteen studies have been published, far fewer than might be expected in view of the political noise.

At the 2.5°C warming scenario (towards the right hand side of Figure 9.2), ten studies have been published with the estimated impacts ranging from a positive 1 per cent to a negative 2.5 per cent. So the experts cannot even agree on the sign.

Two point five degrees is the sort of warming that we can expect perhaps over seventy or eighty years, whereas a change of income of +1 per cent to -2.5 per cent is the type of change that you can expect over a year. This puts climate change firmly into perspective.

As Figure 9.2 illustrates, climate change can have positive impacts. This is not surprising. Two of the biggest positive impacts of climate change are a reduction in winter heating costs and a reduction in cold-related deaths. Since the world economy—not the world population—is concentrated in the temperate zone, and most of the people that would have their death postponed because of warming, that is, would not die of cold-related (seasonal) influenza, are actually pretty wealthy people, this means that there are positive impacts in those parts of the world where the economy is biggest. So there are net positive impacts of climate change.

There is another central message that comes out of Figure 9.2, and for this we need to focus on the central line. What this line shows is that a little bit of warming would probably be good for economic welfare, but if we warm further and further, things start turning negative.

Some might misinterpret this graph and say that initial warming is good and therefore we can forget about climate policy, but this would be an incorrect interpretation. What matters is, of course, not total change but incremental change. The central curve shows that things start turning negative at around 2.3°C, and we will actually have to work very hard to keep temperatures below that. And this would be required not just by people in the developed world, but also the Indians and Chinese will have to cooperate if we want to stop warming at 2.5°C.

The real concern is not where the curve goes negative, but where it starts to turn down. This is where the curve reaches its peak and that is around 1°C above today's temperature. This means that no matter what we do, we are going to get to the suggested climate optimum anyway, and we are most likely going to overshoot it. We are going to get these benefits no matter what we do. They are irrelevant for policy—what is

relevant of course are the things that we can avoid, and that is where the curve starts turning negative.

There are further messages to take from Figure 9.3. One of them is the range of uncertainty. Even though the mean impact may only be a few per cent of GDP, the maximum impact may actually be a lot larger than that. This suggests that we are really talking about managing uncertainty rather than worrying about the central tendency of the distribution. The range of uncertainty also suggests asymmetry. That is, the probability of negative surprises is larger than the probability of a positive surprise of the same magnitude.

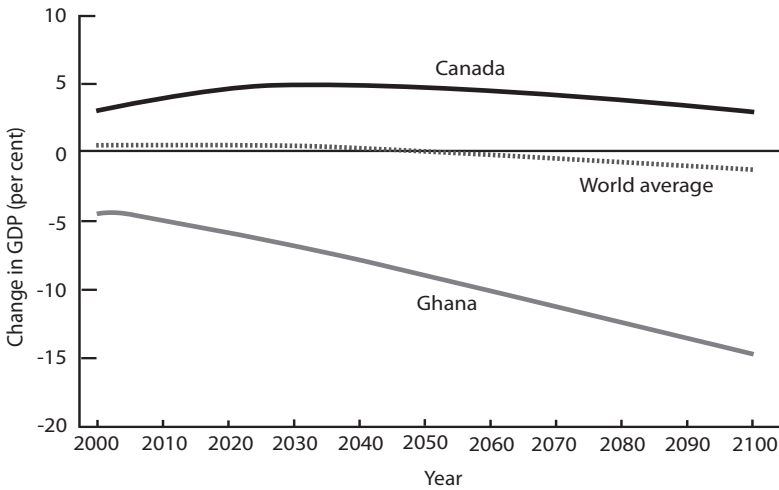
The fourteen studies are the only ones that have been published—there is no other literature out there. If you look at the 3°C scenario, there are negative impacts, and these impacts are getting worse. More importantly, it is not just that things are getting more negative, but they are actually accelerating and at that 3°C point our knowledge stops. Everything beyond this is extrapolation and speculation. We basically stop researching at the point where things appear to be most dreadful.

While Figure 9.2 shows that climate change is real and is a real problem, nothing in this graph suggests that climate change is the end of the world. The British Stern Review on the Economics of Climate Change in 2006 and the Australian Garnaut Climate Change Review in 2008 were not peer-reviewed and, especially the Stern Review, are outliers in the literature. The Stern Review, which showed GDP losses of 12.5 per cent plus, was essentially a political manifesto, and has very little academic content.

Figure 9.3 shows the monetised impact of climate change. The shape of the centre curve is roughly the same as that of the centre curve in Figure 9.2, with roughly the same interpretation—it is the welfare equivalent income loss. The difference is that Figure 9.3 shows changes in percentage change in GDP as a function of time. The centre line is the total economic impact on the world average, but as usual, the average hides a lot of distributional issues.

The top curve shows the country that is best off due to climate change. That country is Canada. This is not surprising and, indeed for the century as a whole, Canada probably enjoys a positive impact, but by about 2035 or so, Canada gets beyond its optimum and, from a marginal perspective, it would be even in Canada's interest to slow down warming.

**Figure 9.3: Economic impact of climate change**



Source: Author's calculations

The bottom curve is Ghana, where climate change would already be having a significant negative effect. The reason that Ghana is so vulnerable is because it is very poor, it is low lying, it is ineptly governed, it has all sorts of disease problems, and warming is simply bad in an environment like this. While Figure 9.3 shows that total world impact of climate change was actually still positive by around 2050, most countries have a negative impact. This is simply because most countries are poor and the world economy is dominated by a handful of wealthy economies. If we consider population numbers, then an even more dramatic picture would emerge with an even greater negative impact.

By and large, poorer countries are more vulnerable to climate change than richer countries. There are a few exceptions. Bhutan is poor and cold, as is Mongolia. Because they are so cold, warming will probably bring a positive impact to these countries. Singapore on the other hand is also an exception. Singapore is a rich nation, but it is very hard to imagine that additional warming would do Singapore any good, or any rise in sea level would do Singapore any good. These exceptions aside, poorer countries are more vulnerable to anything, and definitely more vulnerable to climate change.

There are three reasons why this is so.

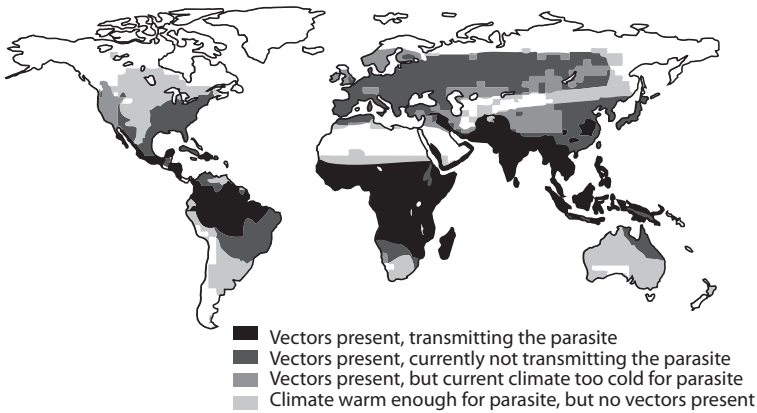
1. Poorer countries tend to be in hotter places, and if you are in

- a hotter situation already, then additional warming is probably bad because more systems and plants will be closer to their biophysical limits. Also, people who live in a relatively poor place can look at how people in hotter places live their lives and adopt their technologies and their behaviour. But if one lives in the hottest place on the planet, there are no such analogies and one must essentially invent everything from scratch.
2. Poorer countries simply have a bigger share of their economic activity and agriculture in the most exposed sectors to climate and weather change.
  3. Poorer countries tend to be less well organised, use inferior technology and simply cannot afford a lot of things that the richer countries use to protect themselves from the vagaries of the weather.

While these arguments are well accepted in the literature, what is a bit more controversial is the corollary that if we have a world that is growing economically, this would also mean that the future would be less vulnerable to climate change since richer people in the future would be better able to adapt to climate change. The other corollary is then that sacrificing economic growth in poor countries to reduce greenhouse gas emissions is not necessarily a smart idea.

Figure 9.4 is a map of malaria from 1995. Countries in dark grey are those places where there is malaria, while countries in light grey are where all the natural conditions are mapped for the disease to propagate and thrive, but for some reason there is no malaria. This is almost like a map of the rich and poor—it is almost as if the rich are immune to the disease. In places like Europe and the US, we have malaria under control through several mechanisms. The first is environmental management, essentially draining of wetlands and making hard surfaces in our cities and taking away the small puddles of warm water that mosquitoes need to breed. The second thing that richer countries have done is large scale spraying of mosquitoes. The third thing is the ‘breaking of the cycle’ with medicine. Malaria is the type of disease that has a life cycle that goes through the mosquito to the human, to the mosquito and then back the human. If the parasite is in the human and the human takes medicine, then he or she cannot infect other people, and the cycle is broken, then we create herd immunity. Malaria is now concentrated in the poorer parts of the world.

**Figure 9.4: Malaria is a disease of poverty and climate**



Source: World Health Organization: World Health Report, 1995

As soon as a country has an income above, say \$US3,000 per person per year, then malaria is as good as gone from that country.

In Figure 9.5, the frozen baseline condition shows the number of people who would die of malaria and other diseases if climate is the only thing that is changing. What we actually find is that out of the 500,000 people or so that die each year of malaria, about 70,000 currently die because of the climate change enhancement of malaria. If we see a further warming into the future, this number would increase to about 250,000 or so by the end of the century, due to warming alone.

In the population growth condition, where we are adding population growth, the number actually goes up to 700,000 or 800,000, and this line is the sort of number that the Intergovernmental Panel on Climate Change likes to trumpet, and is the basis for the claim that millions of people would die because of vector borne diseases.

These are annual numbers, so if we add up over this line we will indeed end up with millions of people. But there are other factors.

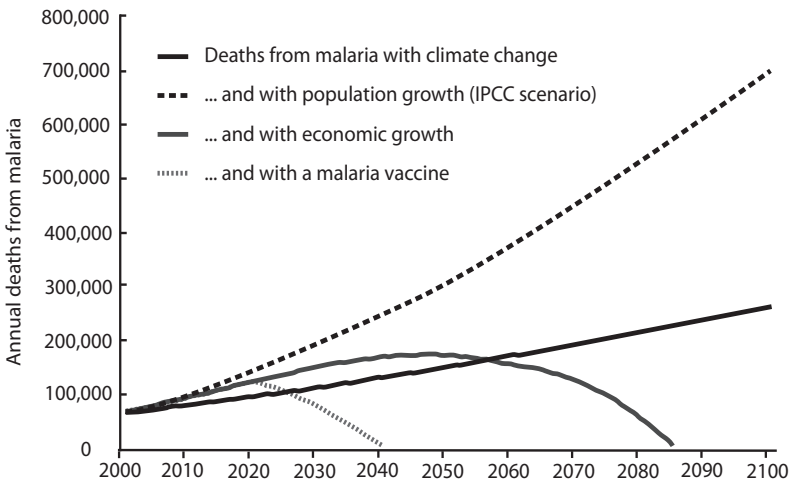
Most interestingly, the vaccine condition shows what would happen if a vaccine for malaria was rolled out. Let us assume that Bill Gates will this time deliver on time, and that the Bill Gates Foundation will have

developed a malaria vaccine by 2020. It took twenty years to roll out the polio vaccine across the world. If both of these conditions are met, the disease will simply be gone by 2040 and that would not just be the climate part of malaria, but it would actually be all of malaria.

If climate change primarily affects poor people and it is a problem of the future, then emission reduction is not something we do for ourselves, it also not something we do for our children or grandchildren, we do it for the children and grandchildren of the currently poor people in developing countries. Why do we care about the children and the grandchildren of the Bangladeshis when obviously we do not care much about the Bangladeshis? Why do we care about the children of people we do not seem to care about? This is a question every climate activist has to ask themselves.

A question that immediately follows is that if we worry about malaria in West Africa, is emission reduction really the best way for reducing that? Would we not rather spend our money on mosquito nets or developing a vaccine? Or if we go to Bangladesh, would we not rather build dykes there than reduce our emissions? Would that not be cheaper?

**Figure 9.5: Climate change-induced vector-borne mortality**



Source: Tol, Climate Framework for Uncertainty, Negotiation and Distribution (FUND2.8n)



If greenhouse gas emission reduction comes at the expense of development, we are actually making the situation worse than it is and we are likely to increase adverse impacts.

Climate is a global problem, and a real problem, but there is simply no support for the current end-of-the-world-is-nigh type of hysteria.

## 10

### Lower Emission Levels and Australian Energy Impacts

Alan Moran

**T**he Stern Review on the Economics of Climate Change, written for the British Government in 2006, sought reductions in rich countries' emissions of carbon dioxide to 20 per cent of 1990 levels by 2050. Stern argued that the economic cost will be one per cent of world gross domestic product, 'which poses little threat to standards of living given that the economic output in wealthy countries is likely to rise by over 200 per cent and in developing countries by more than 400 per cent' during this period.<sup>1</sup>

The *American Clean Energy and Security Act 2009* (Waxman-Markey Bill) requires a 20 per cent reduction in US emissions by 2020 and an 83 per cent reduction by 2050. Such a level of reduction would bring US emissions to the present world average and is consistent with stabilising global CO<sub>2</sub> equivalent (CO<sub>2</sub>-e) emissions which are currently 390 parts per million at somewhere between 450 and 550 ppm.

Unsurprisingly, given the volume of international meetings and consultations involved, Australia's trajectory plans for CO<sub>2</sub>-e are similar to those of other countries.

All developed countries have incurred considerable costs in subsidising and regulating in favour of high-cost energy sources with low CO<sub>2</sub> emissions. In spite of this, and the fact that the early gains are likely to be the easiest because they tap into the fabled 'low-hanging fruit', few major signatories will meet their Kyoto obligations.

Some individual European Union countries will achieve their targets—Germany because of unification, and the United Kingdom because of the shift from coal powered electricity generation to gas.

**Table 10.1: Target comparisons in CO<sub>2</sub>-e levels**

Country	2020 targets	2020 per capita reduction	2050 targets
<b>Australia</b>	5–15 per cent below 2000 levels (4–14 per cent below 1990 levels)	27–34 per cent below 2000 levels (34–41 per cent below 1990 levels)	60 per cent below 2000 levels (60 per cent below 1990 levels)
<b>EU</b>	20–30 per cent below 1900 levels	24–34 per cent below 1990 levels	60–80 per cent below 1990 levels
<b>UK</b>	26–32 per cent below 1990 levels	33–39 per cent below 1990 levels	80 per cent below 1990 levels
<b>US</b>	Return to 1990 levels	25 per cent below 1990 levels	80 per cent below 1990 levels

Source: Australian Department of Climate Change

**Table 10.2: Kyoto commitments and achievements over 1990 baselines**

Country	2008–12 target	2005 actual (including clearing)	2005 actual (excluding clearing)
<b>Australia</b>	8%	4.5%	25.6%
<b>Canada</b>	-6%	54.2%	25.3%
<b>EU</b>	-8%	-4.0%	-1.5%
<b>Japan</b>	-6%	7.1%	6.9%
<b>NZ</b>	0%	22.7%	24.7%
<b>Norway</b>	1%	-23.1%	8.8%
<b>US</b>	-7%	16.3%	16.3%

Source: United Nations Framework Convention on Climate Change, National greenhouse gas inventory data for the period 1990–2005, 24 October 2007

The Australian Government has involved itself in some aggressive chest thumping in arguing that its per capita reductions in 2020, as shown in Table 10.1, are greater than those of its fellow carbon cutters. Australia claims to be meeting its (generous) Kyoto 2008–12 target of 108 per cent of 1990 levels but would be 30 per cent above 1990 levels were it not to measure its emissions on the basis of the creative ‘Australia clause’ in Article 3.7 of the Kyoto Convention. That clause permits countries to count changes to land-use and forestry as part of their measures of net emissions. (Australia’s reductions were achieved by preventing, without compensation, land owners using their land productively.)

Table 10.2, drawn from the United Nations Framework Convention report, indicates levels of achievement compared to the 2008–12 targets expressed as the emissions in excess of, or below, the 1990 base level. The data for 2005 levels are expressed on two bases: with and without counting land use changes as a result of policy towards clearing land for cultivation. Only the European Union taken as a whole is close to the targets in the form they were originally agreed.

### THE GLOBAL TASK

In 2004, global greenhouse gas emissions (in CO<sub>2</sub> equivalents) were 28,790 million tonnes. Just over 10 per cent of these were from the former Soviet bloc with the rest split fairly evenly between the OECD countries and the developing world.

By 2008, developing countries' emissions exceeded those of the OECD countries. The faster growth in emissions within developing countries will increasingly dilute any actions taken by the developed OECD nations, the only group seriously considering abatement measures at the present. The dilution is further amplified if abatement in the OECD is achieved by smelting and other energy intensive activities being re-located to developing countries.

The IPCC report tended to downplay this leakage issue arguing: 'Estimates of carbon leakage rates for action under Kyoto range from 5 to 20 per cent as a result of a loss of price competitiveness, but they remain very uncertain.'<sup>2</sup> Given the globalised nature of production and the incentives and necessities of businesses to relocate to venues where even modest cost savings are available, the IPCC's carbon leakage estimates may be too modest. To combat leakage, the EU is discussing countervailing duties on non-cooperating trade partners, a measure that would surely unravel the world trade regime.

It would take unparalleled technology advances and energy-saving developments to achieve emission stabilisation at 2004 levels of 28,790 million tonnes. For global stabilisation by 2030 with OECD countries reducing their emission levels by 20 per cent and the former Soviet bloc holding their emissions constant, developing countries would need to limit their increases in emissions to 15,000 million tonnes (by 22 per cent). The contrast of this and business-as-usual is illustrated in Table 10.3.

**Table 10.3: Emission stabilisation scenario  
(million tonnes of CO<sub>2</sub> equivalent)**

	2004	2030	2030 (Business as usual)
OECD	13,319	10,655	18,350
Former Soviet bloc	3,168	3,168	3,168
Developing countries	12,303	14,967	36,671
<b>Total</b>	<b>28,790</b>	<b>28,790</b>	<b>58,188</b>

Source: Derived from United Nations Development Programme,  
*Human Development Report 2007/2008*

While superficially generous to the developing countries, the 22 per cent increase is a massive reduction compared with business-as-usual growth levels. Compared with the 15 billion tonnes of carbon dioxide equivalent projected under this scenario, business-as-usual levels—based on previous growth rates—would see developing countries emitting nearly 37 billion tonnes in 2030.

Moreover, because of their population growth, limiting developing countries' emission levels to 15 billion tonnes of carbon dioxide equivalent would result in their emissions per head actually *falling*. Developing countries in 2030 are estimated to have a population at 7.2 billion, and under this scenario their per capita emissions would fall from 2.4 tonnes to 2.3 tonnes. This is one fifth of the OECD 2004 per capita average of 11.5 tonnes and only a quarter of the OECD average in 2030 (7.9 tonnes) once a 20 per cent reduction and population growth are incorporated.

The surreal nature of this feature of the debate was illustrated by the main agreement negotiated at G8 Summit in L'Aquila in July 2009. The L'Aquila agreement required the developed countries to reduce their emissions in 2050 by 80 per cent and the developing countries by 50 per cent. Present per capita emission levels of carbon dioxide are 11.5 tonnes and 2.4 tonnes for the developed world and the developing world respectively. Using simple arithmetic, by 2050 the 80 per cent cut would leave the developed world with 2.9 tonnes of carbon dioxide per capita and the developing world with less than half of this at 1.2 tonnes per capita. And this is based on the unlikely event of population growth in the developing countries slowing to the level of that in the developed world.

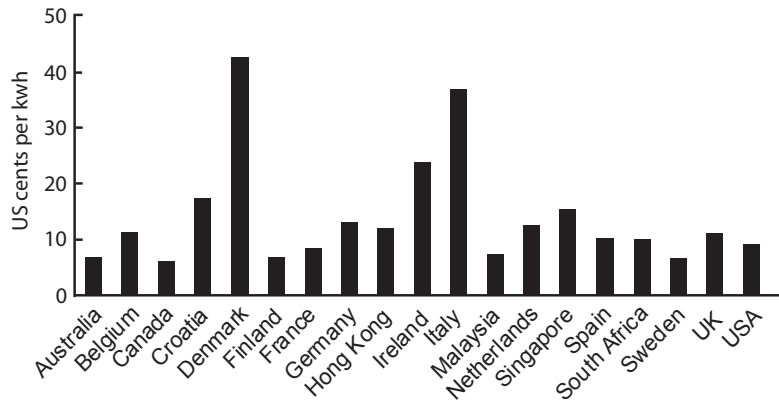
**AUSTRALIAN ENERGY RESOURCES**

Especially since it has been privatised or otherwise commercialised, Australia’s electricity supply industry is among the lowest cost in the world. Generation comprises:

- 56 per cent black coal
- 24 per cent brown coal
- 13 per cent gas
- 5 per cent hydro
- less than 0.5 per cent wind, which is highly subsidised.

We have hundreds of years’ supply of black coal that is of inferior export quality and ideal for local use, and over a thousand years supply of brown coal that is not transportable at all. Supply continuity is not a problem. As Figure 10.1 illustrates, this availability of coal gives Australia particularly low-cost electricity compared with other countries.

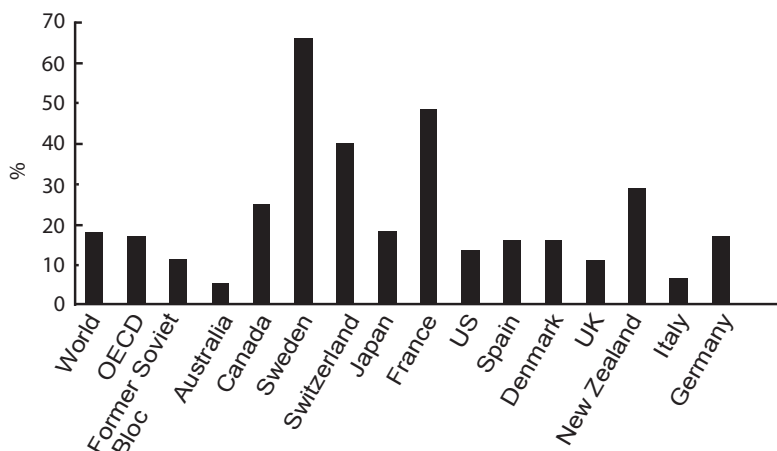
**Figure 10.1: Average electricity prices**



Source: International Energy Agency

The sustainability of Australian prices at these levels changes with a cap on carbon emissions and the associated tax. Australia’s particular vulnerability to these measures is illustrated by comparing our generation source profile with that of other countries. As shown in Figure 9.2, less than 5 per cent of Australian energy is derived from sources other than fossil fuels. With nuclear and hydro, Sweden, Switzerland and France have over 40 per cent of their energy from non-fossil fuel sources, and most other countries are at 10–20 per cent.

**Figure 10.2: Share of non-fossil fuel energy supply**



Source: International Energy Agency

## A CARBON TAX AND ITS EFFECTS

In terms of electricity generation costs, a carbon tax of \$40 per tonne of CO<sub>2</sub> doubles the price of Australian coal based electricity. However, the objective is not to increase the price of electricity but to markedly reduce carbon emissions. With known technologies, and even without political constraints on the use of nuclear power, this would require far greater price effects to force the sort of reductions envisaged.

Carbon Capture and Storage (CCS) development requires one third of coal inputs for CO<sub>2</sub> capture even before transport and storage costs are added. Wind and solar technologies can never contribute more than a small share of a modern power system.

Irrespective of the costs, it is not possible for Australia to meet its targets, without CCS, if coal is used.

Natural gas is a replacement source of energy for coal and only incurs half the carbon tax. It also involves a lower capital outlay for electricity generation and less risk in the event of it not proving the best bet to combat regulatory measures. Australia has considerable reserves of gas, especially coal seam gas in Queensland. This is, however, more expensive to develop than conventionally mined natural gas. More importantly, gas in Australia is 20–30 per cent more expensive than coal for base load supplies, a premium that may rise as a result of

international demand boosting domestic prices.

The real issue regarding the substitution of gas for coal in electricity generation, transitional considerations aside, is that it is a self-denial of the cheapest form of electricity, the consequences of which reverberate through that is basic to the competitiveness of key Australian industries.

Even if all countries were to apply a similar tax, as was envisaged in the Copenhagen treaty, Australia would still lose its competitive edge since this is based on supplies of well-located coal which would become dearer than nuclear energy, the likely dominant source of electricity generation in a carbon-constrained world.

Once in place, the carbon tax means that an aluminium smelter, a steelworks or any other facility that makes use of Australian low-cost energy won't be built. The location of these major energy-intensive facilities in Australia owes much to the oil crises of three decades ago when smelters, based on fuel-oil generated electricity, became uneconomic. The gravitational pull, created by Australia's coal, was a vital part of the development and prosperity that we have since enjoyed, and which government policy would reverse.

### **APPLICATION OF A CAP-AND-TRADE CARBON TAX IN AUSTRALIA**

On any basis, a cap-and-trade carbon tax will raise colossal revenues. Revenues in Australia are envisaged to be somewhat differently expended from those in the US and EU. In Australia, the government is offering compensation to the brown coal generators of only about 35 per cent what the generators themselves think they should have.

It is also making that compensation contingent on the generators remaining open. This is an ostensibly ridiculous condition, since coal-supplied generators themselves must close if meaningful reductions in emissions are to be brought about. However, the requirement recognises that if any existing major generator closes, there will be an immediate electricity price increase. The electoral downside of this is clear and would be far greater if all coal-powered electricity generation ceased because Australia would lose 85 per cent of its generation capacity, with Victoria losing 95 per cent.

The Commonwealth Treasury's October 2009 mid-year statement



estimated revenues from the government's proposed Carbon Pollution Reduction Scheme of \$16 billion per year by 2020 and growing.<sup>3</sup> These estimates were based on inadequately specified prices, but if Australia reduces emissions by 5 per cent below 2000 levels by 2020, in line with the government's minimum intentions, this would entail \$16 billion costs at a price of \$40 per tonne of CO<sub>2</sub>. If this is the assumed price, it means the government is not budgeting for purchases of overseas emission rights. Although the Treasury discusses these purchases, it does not quantify them in its latest document. Previous Treasury modelling estimates overseas purchases at \$26 billion per year by 2050.<sup>4</sup>

Like with the energy intensive industries, one outcome of the ETS tax effect is that no firm can ever again build a coal-based power station unless it receives a tax indemnification from the government. Claims that all we need is to clarify the regulatory arrangements so industry has certainty are false. The only certainty is that the carbon tax rules out, as it is intended to, any private investment in a coal-fired power station.

Gradually, even if not suddenly, this brings increased costs and a reduction in reliability of the electricity system. A corollary is a slow strangulation of supplies and an exit from the country of industries like smelting which uses about a quarter of existing electricity supplies. Existing measures and threats of a carbon tax have brought a hiatus on building new coal power generation, so that even unwinding the death sentence on existing coal based power stations would not undo the damage that has been done. Australia has not had a major power station commissioned since 2002 and this leaves a gap in supplies, meaning higher prices that strangle energy-intensive industries.

Mollified by the Treasury analysis, the government is remarkably complacent about the effects on the economy.

Treasury modelling shows a smooth progression to a carbon-free energy environment as the century progresses. The Prime Minister said:

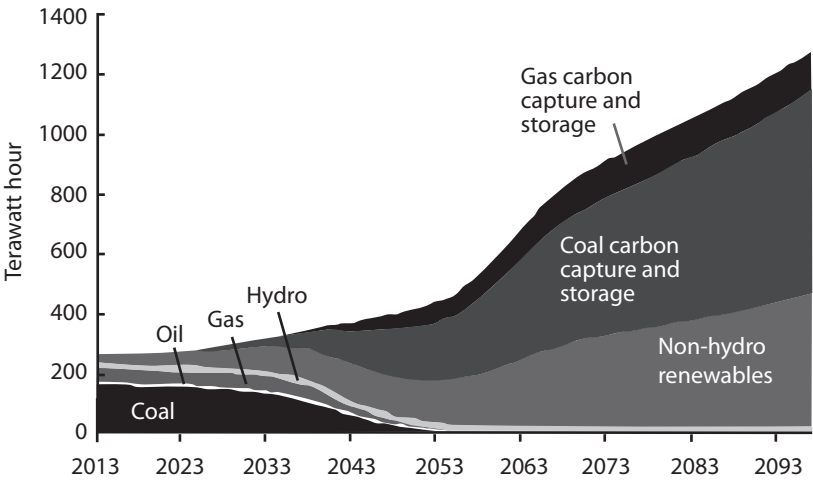
Treasury modelling done in 2008 demonstrates Australia can continue to achieve strong trend economic growth while making significant cuts in emissions through the CPRS. Treasury modelling also demonstrates that all major employment sectors grow over the

years to 2020—substantially increasing employment from today’s levels. Treasury modelling also projects that clean industries will create sustainable jobs of the future—in fact by 2050 the renewable electricity sector will be 30 times larger than it is today.<sup>5</sup>

Figure 10.3 reproduces one scenario which the Australian Treasury envisages from the taxation regime recommended. By around 2050, 80 per cent of electricity is modelled as coming from exotic renewables and from gas and coal incorporating CCS.

The numbers rule out the use of nuclear power for political reasons. That aside, they are pure conjecture. Though the economic modelling driving them is based on empirical observation, the uncertainties of projections going decades into the future are seldom raised.

**Figure 10.3: Australia’s electricity generation technology shares, 550ppm scenario**



Source: Australian Treasury

The models themselves rest on demand and supply responses estimated as a result of known relationships between different products. But information on the relationships that are central to modelling forecasts is based on quite narrow ranges of observations.

Though the demand and supply responses can also change markedly over time, many relationships within the operational parameters of these models are likely to be stable. We can be fairly certain, for example, of

the demand response for, say, coal and the implications throughout the economy where prices rise by 10 per cent. We would see some shift to other energy sources which have costs below the 10 per cent price increase; we would see some reduction in the end products using coal as a result of higher costs. And we would see some expansion in demand for products that use less coal and less energy, since these will have become relatively cheaper. All these changes would offset somewhat the initial loss caused by the increased cost.

We also have experience of considerable changes in energy supply and the associated price increases. During the 1970s the price of crude oil quadrupled over a short period of time. This caused major economic dislocation and the worst recession since World War II. However, adjustments were made relatively easily because ways were found to economise on oil. These included substitutions by coal and natural gas and, for those nations not spooked by green witchcraft, nuclear power. The higher prices also stimulated increased oil supplies. Such a cushioning effect by increased use of other carbon-based fuels would not, of course, be available under carbon emission reduction policies.

At issue is whether the carbon tax effect being modelled is comparable to what we would face in estimating the effects of a tax designed to eliminate a product within a class of goods or that designed to eliminate the entire class. This can be visualised best with respect to the food sector. We could, for example, be quite confident of assessing the effects of a tax that drove out the use of oranges. People would choose alternative goods; there would be some loss of welfare, perhaps measurable in terms of gross national income. But there would be little major change. Substitute for that measure a tax designed to eliminate consumption of all known foods. Clearly there would be mass starvation, and considerable loss of income, though new foods might be developed to allow continued human existence.

Some say such effects overstate the implications. After all, energy is only five per cent of GDP and rather less than this if its distribution costs are excluded. But much the same can be said of food, which in rich countries comprises only some twelve per cent of GDP and most of this is distribution and value-added features.

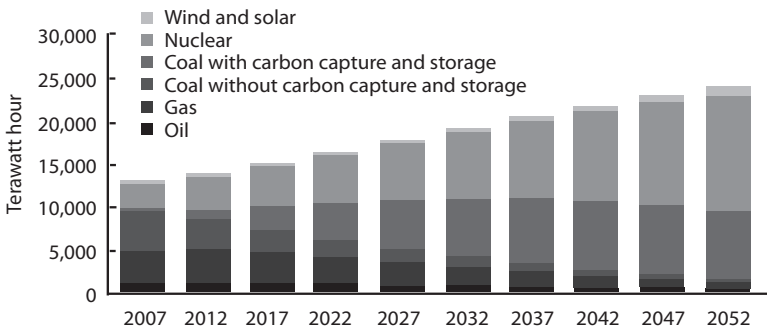
The question about a carbon tax forcing countries such as Australia to reduce their emissions by 80 per cent is whether the better analogy

is the tax on oranges or a tax on the whole class of foods.

Present-day energy consumption is highly reliant on carboniferous fuels. Energy itself is, second to food, the basic building block of all human activities. The only substitute we have for carbon-based energy is nuclear energy. With a carbon tax, we have only the flimsiest of experience on which to model the effects. Unlike the case of oil in the 1970s, the substitutes do not exist, except for nuclear, and to enable that to replace carboniferous fuels requires great ingenuity—especially in finding ways to replace oil for motor vehicles, ships and aircraft.

In addition to such considerations, the modelling assumes a steady state movement from one pattern of the economy to another—it assumes that we simply move from coal to gas to some as-yet-undiscovered renewable, carbon capture, or nuclear. Such a movement is unlikely to occur without, at the very least, considerable transitory turmoil.

**Figure 10.4: OECD estimates of world electricity generation**



Source: OECD

Importantly, Australian Treasury’s modelling, in addressing a frictionless move to alternative energy sources, is driven by assumptions about new technologies yet to be devised like CCS. There is no evidence that such new technologies will prove economically feasible. Yet, without such assumptions, the costs of forcing emission reductions would be driven to astronomical levels and would bring a rapid reduction in living standards.

As shown in Figure 10.4, the OECD climate change projections actually forecast only a minor role for renewable energy. The OECD

projection's credibility is also enhanced by envisaging a sizeable increase in nuclear but it too has CCS playing a major role at some 30 per cent by 2050.

Many would agree with Al Gore's view that CCS will never work. Less plausible is his opinion that because Australia has a lot of sunshine it has massive potential for renewable energy. Similarly absurd are statements, including by Prime Minister Kevin Rudd, on the basis of the garbage-in-garbage-out, assumption-driven Treasury modelling to say we will have more green jobs and full employment. Such statements fail to understand that full employment is a basic assumption—not an outcome—of economic modelling.

### EXISTING MEASURES

The foregoing examines the issues from the point of view of Australia's ETS greenhouse gas tax. However, this is not being introduced within a policy vacuum. Already Australia, like other countries, has a considerable number of de facto taxes and subsidies ostensibly designed to combat CO<sub>2</sub> emissions. These include:

- Subsidies to green energy that amount to at least \$1 billion a year.
- The Mandatory Renewable Energy Target which requires 9,500 gigawatt hour (GWh) of renewable electricity by 2011—about four per cent of total supply. The states have supplementary schemes. Victorian Premier Bracks in November 2005 argued that a 'lack of national leadership' by the Federal Government in not increasing the MRET scheme from the 9,500 GWh target, 'is costing Victoria—economically and environmentally—and cannot be allowed to continue.'<sup>6</sup> Victoria's scheme requires an additional 3,274 GWh a year of renewable electricity by 2016.

The state schemes are to be folded into the recently passed requirement for 20 per cent renewable energy. In a triumph of hope over logic and experience, this regulatory measure requires a doubling of renewable energy use by 2020. Based on the penalty costs involved, and excluding the (commercial) hydro portion, this entails annual aggregate costs of \$1.8 billion.

The identified subsidies and estimated tax costs of the renewable requirement of \$2.8 billion a year can be viewed as a tax on the 205 million tonnes of CO<sub>2</sub> emitted in the course of electricity generation. This is the regulatory equivalent of a carbon tax of over \$13 per tonne of CO<sub>2</sub>, a level that at one time many said was within the ballpark required to bring about the full necessary abatement. And these cost impositions exclude the tax effect of regulatory measures of hundreds of millions of dollars a year designed to bring lower emissions from housing and other expenditures.

### EXPORT EFFECTS

Rarely mentioned in the Australian context are energy exports. Coal accounts for twenty-three per cent of exports, with gas and oil another ten per cent.

The logic of a world in a carbon lockdown is that all of these exports would eventually be eliminated—the coal in the ground even with a value of only \$10 per tonne is worth approximately one year's national income. Although Australia also has massive uranium resources these would not provide adequate compensation.

### CONCLUSION

The Prime Minister says that Treasury modelling shows that deferring action will increase the costs of achieving the results by fifteen per cent compared to taking action now.

In fact, from the Australian Treasury modelling it is possible to infer the costs of doing nothing to 2020, and then catching up with the 2050 target thereafter—should the need and achievability of such action prove necessary. The cost of deferring action to 2020, then catching up by 2050, according to the Treasury model is 0.3 per cent of GDP. Even if this is not overstated, 0.3 per cent of GDP seems a reasonable insurance policy price to pay to avoid imminently embarking on measures that would have dramatic consequences on a small economy that is highly dependent on carboniferous fuels. By 2020 we will be clearer on the need for emission reduction policies and we will, presumably, have access to all the technological advances that modellers claim will be forthcoming.

Another way of analysing this is to determine the costs that

would allegedly be incurred from taking no action at all. Again using the Treasury modelling we can see the costs of doing nothing to defray emissions is five per cent of GDP by 2050. Significant though this may be, it is dwarfed by the increase in a business-as-usual increase in GDP of 66 per cent per capita over the next 40 years. The costs of defraying action are therefore readily affordable even if they exist.

There may be a risk from severe anthropogenic induced climate change. But there is also a risk of severe economic consequences in seeking to address such change. Deferring action until the costs and the implications of doing nothing are clearer is likely to be the best approach given the costs involved.

The Prime Minister says ‘the CPRS holds in its hands our children’s fate—and our grandchildren’s fate. It’s time to remove any polite veneer from this debate. The stakes are that high.’<sup>7</sup>

This is incontestable. If we take early action that involves imposing draconian taxes on our energy industries and the assumptions of a rapid and low cost adjustment response are misplaced, we condemn our offspring to a marked reduction in living standards.

## 11

### What does the government's CPRS modelling tell us?

Alex Robson

On 30 October 2008 the Rudd government released *Australia's Low Pollution Future: The Economics of Climate Change Mitigation* (henceforth referred to as 'ALPF'), which contained the results of economic modelling it undertook on its planned Carbon Pollution Reduction Scheme (CPRS).

This chapter examines some of the principle assumptions and results of that modelling exercise.<sup>1</sup>

The government has not modelled key aspects of its actual climate change policies. The government has provided no information on some of the key economic effects of its planned emissions reductions policies, including possible effects on unemployment, interest rates and inflation.

And finally, the government's own modelling results show that the present value of the costs of emissions reductions could easily exceed Australia's entire current gross domestic product (GDP).

#### THE ALPF MODELLING VERSUS THE GOVERNMENT'S ACTUAL POLICY

The first important point to note is that the ALPF modelling was undertaken during 2008 and published in October 2008—well before the government announced its actual policy targets in *Carbon Pollution Reduction Scheme: Australia's Low Pollution Future* (henceforth referred to as the 'White Paper') on 15 December 2008.<sup>2</sup> The government's actual policy consists of the following broad parameters:

- 'An unconditional commitment to reduce carbon pollution by 5 per cent by 2020.'



- 'A commitment to reduce carbon pollution by 15 per cent by 2020 if there is an agreement where major developing economies commit to substantially restrain emissions and advanced economies take on commitments comparable to Australia's.'
- 'Reduce Australia's carbon pollution by 25 per cent below 2000 levels by 2020 if the world agrees to an ambitious global deal to stabilise levels of CO<sub>2</sub> equivalent at 450 parts per million or lower.'<sup>3</sup>

In contrast, the ALPF modelling examines several possible mitigation scenarios, *none* of which assume that Australia implements an unconditional emissions reduction of 5 per cent.

In other words, the government's modelling does not examine the economic or environmental impacts of the government's actual policy targets. This is a crucial oversight.

In addition, there has been no modelling of the economic effects of delaying the CPRS by one year—a policy change which the government announced on 4 May 2009.<sup>4</sup>

In the ALPF report, the government conducts a sensitivity analysis to determine the costs of delaying a global emissions trading scheme (ETS) by seven years (why this period is chosen is unclear). The thought experiment is that the entire world (not just Australia) delays an ETS by seven years and then implements an ETS that tries to achieve the same targets by the same dates. There is no modelling detail of the consequences to Australia of either the rest of the world delaying its ETS, or of Australia delaying its ETS. In addition, there is no modelling of the consequences of implementing a poorly designed ETS earlier, versus a better designed ETS later. Thus, the key economic issues relating to delay are not documented in a manner that allows them to be scrutinised.

Finally, the ALPF modelling assumes that CO<sub>2</sub> permit prices will grow at a rate of 4 per cent per year in real terms, whereas the government's White Paper assumes that permit prices are capped in the first five years of the scheme and will grow at a real rate of 5 per cent per year during the capped period, with the permit price fixed at \$10/tonne in 2011–12.

These policy parameters were announced well after the ALPF modelling was released, and so their economic effects and costs are not included in the ALPF document.

### THE MODELLING ASSUMPTIONS

In the ALPF modelling, the reference or baseline scenario assumes that no country undertakes any new policies to reduce emissions, and that there are no economic effects of climate change.

On the other hand, the policy scenarios 'assume coordinated global action to reduce greenhouse gas emissions'. In particular, all policy scenarios assume that a global mitigation agreement is reached by 2010 and is sustained forever. The precise features of mitigation vary across each of the scenarios as follows:

- In the two Carbon Pollution Reduction Scheme scenarios (which assume Australia reduces its emissions by either 5 or 15 per cent of 2000 levels by 2020), there is a staged approach in which Annex B (developed) countries begin mitigating from 2010, with China and higher income developing countries mitigating from 2015. India and middle income countries begin mitigating from 2020, and low income developing countries begin mitigating from 2025. All Annex B economies diverge from their reference scenario emissions at the same rate, reflecting the 'principle of comparable effort'. (These two scenarios will henceforth be referred to as *CPRS -5* and *CPRS -15*.)
- In the two Garnaut Climate Change Review scenarios (which assume Australia reduces its emissions by either 10 or 25 per cent of 2000 levels by 2020) all countries join and participate in a global ETS beginning in 2013. Countries converge to the same per capita emissions over time. (Henceforth referred to as *Garnaut -10* and *Garnaut -25*.)

The economic effects of these policies depend crucially on assumptions around technology and other parameters. In each of the policy scenarios, the ALPF modelling assumes that carbon capture and storage (CCS) begins to be commercially adopted between 2020 and 2025 (when the real permit price is around \$40–\$65 depending on the scenario), everywhere around the world. Coal carbon capture and storage is adopted first, with gas carbon capture and storage requiring a higher emission price to be competitive with conventional gas-fired generation, reflecting its lower emission intensity than coal.

However, even with these optimistic assumptions on CCS, investment in the coal industry is projected to be between 8 and 19 per

cent lower than the reference scenario in 2020, and between 26 and 42 per cent lower than the reference scenario in 2050. Output in the coal industry is also between 26 and 42 per cent lower than the reference scenario. Without CCS, the government expects that Australia's coal production will fall to 18 per cent below *current* levels by 2050.

Sensitivity analysis is performed in the *Garnaut -10* scenario to see what happens if CCS is not available. The result is that nuclear comprises nearly 50 per cent of electricity generation by 2100. The ALPF modelling assumes that Australia cannot adopt nuclear; as a result, mitigation costs are 23 per cent higher than they otherwise would be for Australia in 2050 when CCS is also not available.

In addition, it is also important to note the ALPF modelling's treatment of the Rudd government's expanded Renewable Energy Target (RET). It is well known that the RET adds to the costs of an emissions trading scheme, driving permit prices above what they would otherwise be, without any additional return in terms of emissions reductions in excess of the target. In the CPRS scenarios, the expanded 45,000 gigawatt hour (GWh) RET is included. The target is assumed to increase linearly to 22,000 GWh in 2015, then linearly to 45,000 GWh in 2020. The target is held constant at 45,000 GWh until 2024, then phased out over the period to 2035. The Queensland 15 per cent Gas Scheme and the voluntary market program (Green Power) are also assumed to remain in place. All other supplementary policy measures are assumed to cease upon introduction of the CPRS.

In the Garnaut scenarios, the ALPF modelling assumes that the expanded RET ceases when emissions trading starts. Thus, to the extent that the RET increases the economic costs of emissions reductions, those costs are not captured in the ALPF's Garnaut scenarios. Some other notable modelling assumptions include:

- In the CPRS scenarios, agriculture is covered after 2015, and in the Garnaut scenarios agriculture is covered from 2013. Note, however, that the government's current legislation excludes agriculture for an indefinite period.
- In the CPRS scenarios, land use change is excluded, whereas in the Garnaut scenarios it is not excluded.
- In the CPRS scenarios, there is limited international trading of permits before 2020; in the Garnaut scenarios, unrestricted international permit trading is allowed from 2013.

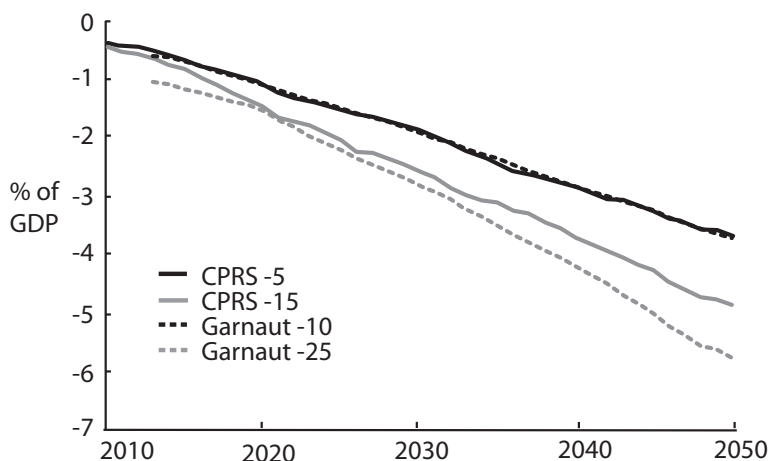
- In the CPRS scenarios, energy-intensive trade-exposed industries (EITEs) are shielded as per the government's proposals, but only until 2020. In the Garnaut scenarios, EITEs are not shielded.
- In all scenarios, permit revenue is returned to households in a non-distortionary fashion. To the extent that compensation to households will be distortionary (i.e. higher effective marginal tax rates), this assumption means that the welfare costs of the CPRS under all scenarios have been underestimated.
- In all policy scenarios, the transitional costs of adjustment are ignored. For example, the introduction of a CPRS will mean that there will be a significant reallocation of capital and labour from mining to other sectors. The ALPF assumes that such resource reallocations are assumed to occur without cost.
- Even though the aggregate demand for labour falls and there are significant sectoral reallocations of factors of production over time, no results for unemployment are reported.
- Results for the inflationary impact of the CPRS in 2010 are reported, but no results for inflation after 2010 are reported, even though the permit price is assumed in all scenarios to rise by 4 per cent per year in real terms. If the price change was just a one-off effect, then this would not be such a problem; but it is not—the effects of a rising permit price on the Consumer Price Index are ongoing.
- Similarly, the effect on low income households is only reported for 2010, when the scheme starts. The effect of an increasing permit price over time on distribution and low-income households is not modelled or considered.
- No results for real or nominal interest rates are reported. With so much capital likely to be reallocated between sectors, it is reasonable to expect that such reallocations of capital may have implications for domestic and world real interest rates.
- Real wages decline steadily over time, relative to the reference scenario. This assumes that individuals will willingly accept ongoing downward real wage adjustments below what they otherwise would have received, without any adverse impacts on the labour market. This assumption, together with the lack of reported results on unemployment, ignores the institutional realities of the Australian labour market (and, of course, it also ignores the institutional realities of labour markets in other countries).

- Resources are shifted into sectors with low productivity; but no results for aggregate productivity growth are reported for each scenario, although they are published for the reference case.
- In the government's modelling, carbon leakage—the prospect that carbon intensive industries will simply migrate to other countries—is not an issue, because it is basically assumed away. In the Garnaut scenarios there is no carbon leakage because all countries face the same world price immediately. In the CPRS scenarios, China is assumed to face the world emissions price by 2015, so any leakage is by definition minimal—the net present value of the additional profit that could be gained by a company moving to China between 2010 and 2015 would be quite small, given that permit prices are assumed to equalise in 2015.

## THE ECONOMIC COSTS OF EMISSIONS REDUCTIONS

Under all policy scenarios, investment in every sector in the economy except agriculture is lower than under the reference scenario. The effect is significant in coal mining, other mining and construction. As a result, the ALPF modelling shows that the economic costs of emissions reduction will not be insignificant or trivial. Figure 11.1 below shows that emissions reductions will reduce GDP relative to the assumed baseline in each and every year, and that these GDP losses increase over time.

**Figure 11.1: GDP effects of various emission reduction scenarios<sup>3</sup>**



Source: Australia's Low Pollution Future, Chart 6.10

There are several ways of expressing these costs, but the usual practice in cost-benefit analysis is to first assume a *discount rate*, which converts future costs into current dollar values, and then to add these discounted costs up as they accrue over time. In this way, future costs can be expressed in terms of today's dollars, and policy decisions can be taken based on a consistent comparison of costs and benefits. The ALPF modelling undertakes exactly such an exercise at various points, but unfortunately does not do so for the aggregate GDP costs under each of the four mitigation scenarios shown in Figure 11.1. However, the ALPF website does publish data for the percentage GDP loss under each of the policy scenarios, as well as GDP levels under the reference scenario. Thus, it is straightforward to compute the projected actual GDP loss in each period under each of the policy scenarios, and then compute the discounted present value of these costs.

For example, Concept Economics undertakes these calculations for the CPRS-5 and CPRS-15 scenarios; these results are reported in Table 11.1, together with the discounted present value of the costs of the Garnaut scenarios.<sup>4</sup>

**Table 11.1: Economic Costs of CPRS and Garnaut Scenarios  
by discount rate (AU\$ billion)**

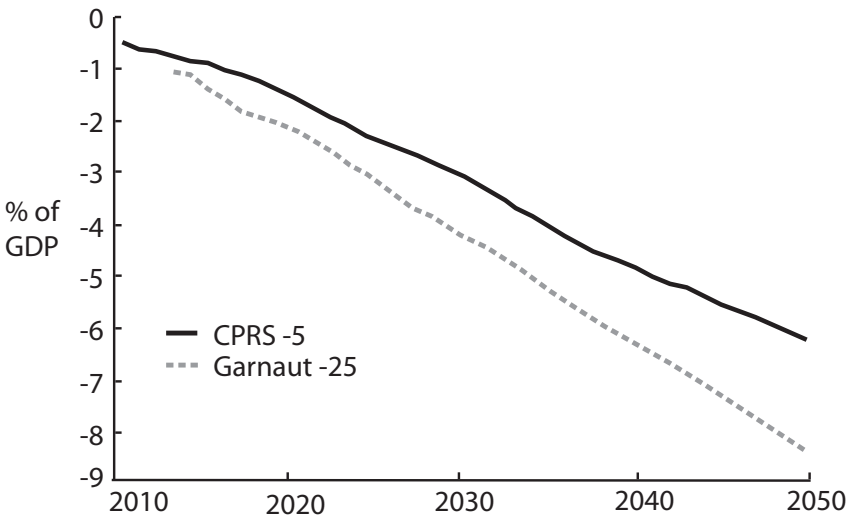
Discount Rate	CPRS-5	CPRS-15	Garnaut-10	Garnaut-25
0.0%	1,881	2,472	1,857	2,794
0.5%	1,626	2,139	1,605	2,414
1.0%	1,412	1,857	1,392	2,091
1.4%	1,264	1,661	1,244	1,868
1.5%	1,230	1,616	1,210	1,817
2.0%	1,074	1,412	1,055	1,583
2.5%	941	1,237	922	1,384
2.7%	893	1,174	875	1,312
3.0%	827	1,087	809	1,213
3.5%	729	958	712	1,067
4.0%	644	847	628	941
4.5%	572	751	556	832
5.0%	509	669	493	739

Source: *Australia's Low Pollution Future*, Chart 6.10; Concept Economics (2009);  
author's own calculations

The results show that for a range of discount rates (in particular, the discount rate of 1.4 per cent assumed by Professor Nicholas Stern), the present value of the costs of the government's planned emissions reductions exceed current GDP (remembering that these costs are computed on the basis that the entire world also implements emissions trading and undertakes emissions reductions).

These costs have important regional components, which have yet to be fully explored in the public debate over emissions trading. Queensland is the most affected state under all scenarios. Its gross state product (GSP) is projected to decline by between 6 and 8 per cent relative to the reference scenario because of its reliance on coal-fired electricity, coal mining production, and aluminium production. Figure 11.2 illustrates the GSP loss relative to baseline under the *CPRS-5* and *Garnaut-25* scenarios.

**Figure 11.2: Queensland gross state product under CPRS-5 and Garnaut-25 scenarios**



Source: *Australia's Low Pollution Future*, Charts 6.17 and 6.18

### CONCLUSIONS

Modelling the economy-wide effects of emissions reductions policies is not an easy exercise. The ALPF document attempts to be comprehensive and deals with a wide range of issues. Unfortunately, it falls short on several of the most important issues and fails to provide key information to policymakers.

Most notably, the document does not model the actual policy that the government plans to put in place. Instead, it relies on a number of unrealistic but crucial assumptions, including the assumptions of a comprehensive global agreement and the existence of emissions trading schemes in all countries. The effects of the government's planned unconditional emissions reduction have yet to be modelled. The government's ALPF document also fails to report on crucial aspects of the effects of planned policies, including possible effects on unemployment, inflation, interest rates, and the distributional (and highly regressive) effects on households over the medium to long term.

Finally—and most importantly—the modelling fails to show that the CPRS would pass a cost-benefit test, whilst showing that the present value of the costs of emissions reductions could easily exceed Australia's entire current GDP.



## 12

### **The politics and economics of climate change**

Nigel Lawson

**O**ver the past half-century we have become used to planetary scares of one kind or another. But the latest such scare—global warming—has engaged the political and opinion-forming classes to a greater extent than anything since, a little over 200 years ago, Malthus warned that, unless radical measures were taken to limit population growth, the world would run up against the limits of subsistence, leading inevitably to war, pestilence, and famine.

This is partly perhaps because, at least in the richer countries of the world, we have rightly become more concerned with environmental issues. But that is no excuse for abandoning reason. It is time to take a cool look at global warming.

By way of preamble, I readily admit that I am not a scientist. But nor are those who have to take the key decisions about these scientists, let alone climatologists.

They are responsible politicians who, having listened to the opinions of the scientists, have to reach the best decisions they can in the light of the expert evidence available to them—just as I did, for example, in a not wholly unrelated field, when I was energy secretary in Margaret Thatcher's first government in the early 1980s.

More important still, the science is only part of the story. Even if the climate scientists can tell us what is happening and why—not that they all agree about this, anyway—they cannot tell us what governments should be doing about it. For that we also need an understanding of the economics, of what is the most cost-effective way of tackling any problem that may arise. And we also need an understanding of the politics: of what measures are politically realistic, a particularly tricky matter given the inescapably global nature of the issue.

It is frequently claimed, by those who wish to stifle discussion, that the science of global warming is 'settled'. Even if it were, for the reasons

I have already indicated—political, but above all economic—that would not be the end of the matter.

But in fact, while some of the science is settled, there is much that is not. So let us start with the facts.

It is customary to focus on three of them. The first is that, over the past hundred years, the Earth has become slightly warmer. To be precise, there has been a rise in global mean annual temperature of some 0.7°C.

The second is that, over the past hundred years, the amount of carbon dioxide in the Earth's atmosphere has risen sharply, by well over 30 per cent, largely as a result of carbon-based industrialisation—in particular, electricity generated in coal- and oil-fired power stations, and motorised transport.

And the third fact (and this is the settled science) is that carbon dioxide is one of a number of so-called greenhouse gases—of which far and away the most important is water vapour, including water suspended in clouds—which in effect trap some of the heat we receive from the sun and thus keep the planet warmer than it would otherwise be.

So is it not clear that the warming we have seen over the past hundred years must be due to the massive rise in man-made carbon dioxide emissions, and that unless we substantially decarbonise the world economy the warming will continue, bringing doom and disaster in its wake?

No: it is not at all clear. In the first place, while atmospheric carbon dioxide concentrations have grown steadily over the past hundred years, and indeed continue to grow briskly, the warming has occurred in fits and starts. To be precise, it has been confined entirely to two periods: from 1920 to 1940, and from 1975 to 2000. Between 1940 and 1975 there was a slight cooling; and so far this century (and contrary to all predictions) there has been no trend one way or the other.

So clearly carbon dioxide is only part of the global temperature story: it is very far from being the whole story.

And this is borne out by the longer-term historical record. It is well established, for example, that a thousand years ago, well before the onset of industrialisation, there was what has become known as the Medieval Warm Period, when temperatures were probably at least as high as, if not higher, than they are today. Going back even further,

during the Roman Empire, agricultural records suggest that it was probably even warmer.

So we are left with a double uncertainty. Firstly, while we know that, other things being equal, rising atmospheric concentrations of carbon dioxide will warm the planet, we have no true understanding of how much they will do so. And secondly, we know that, in fact, other things are very far from equal. So even if we did know the answer to the first question, we would still be unable to predict what the world's temperature will be a hundred years from now. These uncertainties clearly have a profound bearing on the economics of global warming, and thus on the policies it is sensible to pursue. For while we can do our best to make an estimate of the cost of substantially decarbonising the world economy, we have no idea of what benefit that will bring in terms of a lower mean global temperature than would otherwise be the case.

Not that it is clear, even if we could predict the temperature of the planet a hundred years from now (which we can not), how much economic damage a given rise in temperature would do.

It was to advise governments on these issues that the Intergovernmental Panel on Climate Change (IPCC) was set up in 1988, under the auspices of the United Nations. The IPCC concludes, on the basis of, to say the least very, slender evidence, that 'most'—note, not all—of the warming that occurred during the last quarter of the twentieth century was very likely due to the growth of atmospheric carbon dioxide concentrations.

But even if—and there is clearly a case for erring on the side of caution—this is so, and even if, as the IPCC blithely assumes, the natural forces that affect the world's temperature in often unpredictable ways can be safely ignored, the policy conclusions which are widely believed to follow from this are very suspect indeed.

In a nutshell, to get a line on how much global warming there is likely to be over the next hundred years, and what the practical impact of the consequent rise in global temperatures might be, the IPCC adds to the assumed nature of the link between atmospheric concentrations of carbon dioxide and temperature, estimates of how much CO<sub>2</sub> emissions are likely to increase over the next hundred years, based on a number of different economic development scenarios; and then assesses, largely in quantified form, the likely consequences of the resulting rise in world temperature.

All the IPCC's scenarios, incidentally, assume that, over the present century, faster economic growth will mean that living standards in the developing world, in the conventional sense of GDP per head of population, will to a very considerable extent catch up with living standards in the developed world.

In other words, by 2100 poverty really has become history. If nothing else, this should cheer up those who have been told that disaster stares us in the face if we do not take urgent action to save the planet.

It is only fair to add that what I have just spelled out is what emerges from the IPCC's scenarios before deducting the projected costs to the economy of twenty-first century global warming. It will be seen that it does not fundamentally change the picture.

It is also of course true that the IPCC's projections of twenty-first century economic growth may prove to have been too optimistic; but in that case, given the assumed growth-emissions-temperature nexus, there will be less global warming, too.

As it is, the temperature projections it does come up with in its fourth and latest report range from a rise in the global average temperature by the year 2100 of 1.8°C for its lowest emissions scenario to one of 4°C for its highest emissions scenario, with a mean increase of slightly under 3°C.

At this point it might be a good idea to leave the rarefied world of the IPCC for a moment and take a brief reality check.

Is it really plausible that there is an ideal average world temperature, which by some happy chance has recently been visited on us, from which small departures in either direction would spell disaster? Moreover, while a sudden change would indeed be disruptive, what is at issue here is the prospect of a very gradual change over a hundred years and more.

In any case, average world temperature is simply a statistical artefact. The actual experienced temperature varies enormously in different parts of the globe; and man, whose greatest quality is his adaptability, has successfully colonised most of it. Two countries at different ends of the Earth, both of which are generally considered to be economic success stories, are Finland and Singapore. The average annual temperature in Helsinki is less than 5°C. In Singapore, it is in excess of 27°C—a difference of more than 22°C. If man can successfully cope with that,

it is not immediately apparent why he should not be able to adapt to a change of 3°C, when he is given a hundred years in which to do so.

The IPCC seeks to assess the likely impact of projected global warming over the next hundred years in two ways. First, it looks separately at five major headings: water, ecosystems, food, coasts, and health. Then it adds all these impacts together to provide an overall figure of the cost to the world of the projected warming. This last is of course intended to be the net cost.

It is clear that while warming brings costs, it also brings benefits. Given the wide geographical variation in temperatures around the world, it is obviously likely that, while in the warmer regions the costs could be expected to exceed the benefits, in the colder regions the benefits might well exceed the costs.

The IPCC Report claims to take into account both costs and benefits, yet it devotes large amounts of space to the costs and very little to the benefits. It is difficult not to sense a lack of even-handedness, leading to a bias in the overall assessment.

But let us first take a brief look at the IPCC's five impact headings.

The first is water. There is indeed a worldwide water problem, but it has nothing whatsoever to do with global warming. Indeed, scientists agree that carbon dioxide-induced warming will tend to increase, rather than reduce, rainfall. The problem is the huge increase in the world's population, which has led to a massive increase in the demand for fresh water without any corresponding increase in the effective supply.

Thus improved water resource management, and above all the proper pricing of water, are of the first importance. But what is abundantly clear is that cutting back on carbon dioxide emissions is irrelevant.

As to ecosystems, here again it is well established that those animal species at risk of extinction are threatened far more by other factors, such as deforestation, than they are by warming, which is at most of marginal significance.

The IPCC's third heading, food, is clearly of the first importance to mankind. But what it has to say here has not been sufficiently reported. I quote: 'Globally, the potential for food production is projected to increase with increases in local average temperature over a range of 1–3°C, but above that it is projected to decrease.'<sup>1</sup>

It will be recalled that the mean temperature increase suggested by the IPCC's various scenarios for the end of the present century is a little under 3°C.

Moreover this is an area where the scope for adaptation is particularly pronounced. It is not simply a matter of farmers being able to make better use of irrigation and fertilisers, and indeed to switch to strains or crops better suited to warmer climates, should the need arise—something, incidentally, which will happen autonomously, without any need for government intervention. It is also because we are in the early stages of a revolution in agricultural technology, through the development of bio-engineering and genetic modification.

The IPCC's fourth impact category is coasts, where it is concerned about sea level rise, brought about by a combination of ocean warming expanding the volume of water and some melting of the Greenland and West Antarctic ice sheets, causing coastal flooding in low-lying areas. Sea levels have, in fact, been rising very gradually for as long as records exist, and there is little sign of any acceleration so far—indeed, if anything the reverse is the case.

The fifth and last of the IPCC's impact categories is health. There are, of course, very serious health problems of many kinds throughout much of the developing world, which need to be tackled in their own right—global warming or no global warming—much more urgently than they are being at the present time. There is no medical mystery about how to do so.

But the connection with global warming is, if anything, the reverse of what the IPCC assumes. The major cause of ill-health, and the deaths it brings, in the developing world is poverty. Faster economic growth means less poverty but—according to the manmade CO<sub>2</sub> warming theory, incorporated in the IPCC's scenarios—a warmer world. Warmer but richer is in fact healthier than colder but poorer.

What, then, of the IPCC's overall figure for the likely net cost of a warmer world, on the assumption that no measures are taken to curb carbon dioxide emissions, and after carefully examining all the likely adverse consequences, and rather less carefully the benefits? It will be recalled that the report's best estimates of the likely warming of the planet over the next hundred years range from a rise of 1.8°C to one of 4°C, depending on the emissions scenario chosen.

The report then takes the upper end of the range—a 4°C warming—

and claims that, overall, this would mean a loss, by the end of the twenty-first century, of anything between 1 per cent and 5 per cent of global gross domestic product. It adds that this is the global average figure, and that developing countries will experience larger percentage losses.

Given that this derives from the top end of the range, and given that the IPCC insists that all its scenarios are of equal validity, it is clear that, on the basis of the IPCC's own methodology, there may be no net cost at all from global warming over the next hundred years: it may even be beneficial.

But let us err on the side of caution, and take not only the top end of the IPCC's warming range—a rise of 4°C over the next hundred years—but also the top end of its projection of the net damages, a loss of 5 per cent of world GDP. A loss of 5 per cent of world GDP is undoubtedly a very large loss indeed; but to put it in perspective we need to do some simple arithmetic.

Heeding the IPCC's very proper warning that the loss will be greater than 5 per cent for the developing countries (and thus less than 5 per cent for the developed world), I shall make the calculations on the assumptions of a 10 per cent loss of GDP in the developing world and a 3 per cent loss in the developed world.

Again, to err on the side of caution, let us look at the gloomiest of the IPCC's economic development scenarios, according to which living standards (measured in the conventional way as gross domestic product per head) would rise, in the absence of global warming, by 1 per cent a year in the developed world, and by 2.3 per cent a year in the developing world. It can readily be calculated—using, to repeat, a cost of global warming of 3 per cent of GDP in the developed world and as much as 10 per cent in the developing world—that the disaster facing the planet is that our great-grandchildren in the developed world would, in a hundred years, be only 2.6 times as well off as we are today, instead of 2.7 times; and that their contemporaries in the developing world would be 'only' 8.5 times as well off as people in the developing world are today, instead of 9.5 times as well off.

And this, remember, is the IPCC's very worst case—and one based, moreover, as they all are, on a ludicrously pessimistic assumption of mankind's ability to adapt to gradual warming, should it occur. Indeed, the single most serious flaw in the IPCC's analysis of the likely impact of global warming is its grudging and inadequate treatment of

adaptation, which leads to a systematic exaggeration of the putative cost of global warming—if, indeed, over the next hundred years there is any net cost at all.

### CAN WE ADAPT?

The IPCC prefaces its assessment with the statement that ‘The magnitude and timing of impacts will vary with the amount and timing of climate change and, in some cases, the capacity to adapt.’ But adaptation will always occur.

The capacity to adapt is arguably the most fundamental characteristic of mankind. We have adapted to different temperatures over the millennia we have been around, and we adapt today to widely different temperatures around the world. And that adaptive capacity is increasing all the time with the development of technology.

Yet the concept of static ‘adaptive capacity’ is central to the IPCC’s analysis. Thus in its review of the dangers in different parts of the world, it explicitly acknowledges that, in the case of Australia and New Zealand, these will be limited by the fact that ‘The region has substantial adaptive capacity due to well-developed economies and scientific and technical capabilities.’<sup>2</sup> Presumably the same applies to Europe and North America, although, curiously, the IPCC does not say so.

But it does express concern about the effect of projected warming on the poorer regions of the world, particularly in Africa and parts of Asia, because of their ‘low adaptive capacity’. This somewhat patronising judgment seems ill-founded for three reasons. Firstly, as we have seen, on the IPCC’s own economic growth projections, on which its temperature projections rest, the poorer regions are, for the most part, not going to be poor in a hundred years. Secondly, for those parts that do remain poor, overseas aid programmes will clearly be focused on improving their adaptive capacity, should the need arise. This is, incidentally, a much more realistic objective for overseas aid than the promotion of economic development. And thirdly, there will almost certainly be substantial technological development over the next hundred years, which will significantly enhance adaptive capacity worldwide, in many cases far beyond what it is at the present time.

In short, the IPCC’s analysis and conclusions are seriously undermined by the systematic underestimation of the benefits of



adaptation, deriving both from its assumption that 'adaptive capacity' is severely and permanently constrained by economic underdevelopment in the developing world, and its assumption that, for the world as a whole, it is constrained by the limits of existing technology—that is, the assumption that there will be no further technological development over the next hundred years.

This last is clearly absurd in the important case of agriculture and food production, and is implausible in general. As a result, the IPCC's overall cost assessment inevitably suffers from a pronounced upward bias.

It is true that some forms of adaptation, such as the creation or improvement of sea and flood defences, would, if and when they became necessary, require government intervention. The IPCC, needless to say, adopts its characteristically downbeat approach to this, declaring that 'Adaptation for coastal regions will be more challenging in developing countries than developed countries, due to constraints on adaptive capacity.'<sup>3</sup>

It must be said that the challenge ought to be a manageable one: the Dutch, after all, managed it pretty effectively even with the technology of the sixteenth century, and technology has scarcely stood still over the past half millennium. But this might well be a suitable focus for overseas aid, should the need arise.

In short, even if the conventional scientific wisdom is correct, there remains the fundamental question of what is the most cost-effective way of addressing the likely consequences of global warming. Is it to adapt to them, as man has adapted throughout the ages and throughout the world to the vagaries of the climate, or is it to attempt to prevent them, even if this means radically transforming the global economy at very considerable cost? The answer, I believe, is clear.

## FEAR OF THE NIGHTMARE SCENARIO

The alarmists reply that global warming presents some threats to the planet that are so dire that adaptation is not possible. But there is nothing in the current state of climate science to warrant this. Let us take a look at the three most frequently mentioned catastrophic consequences.

First, in the light of Katrina, hurricanes. The facts are that, of the

ten most severe Atlantic hurricanes since 1900, five occurred in the first half of the period and five in the second half. Seven out of the ten occurred before 1975, that is to say, before the period when the bulk of the modest twentieth century global warming began. The worst of all, by far, was the Great Miami Hurricane of 1926.

In the eyes of the insurance industry, there has of course been a significant rise in hurricane damage over the years. But that is simply because the huge rise in both population and property values in the affected areas has inevitably caused a substantial increase in damage costs for any given tropical storm.

Next, the melting of the polar ice sheets, and its alleged effect on sea levels. Clearly, the melting of floating polar ice cannot cause any rise in sea levels—just as the melting of ice cubes in your glass of water cannot cause the water to overflow the glass.

The issue is solely about the land borne ice at the poles. And the overwhelming mass of this, and thus of most significance for global sea levels in this context, is not over Greenland in the north but over the vast continent of Antarctica in the south.

Here it is perfectly true that the West Antarctic ice sheet, covering the peninsula which points its finger towards the southern tip of South America, is showing evidence of melting and glacier retreat. But the peninsula accounts for only around 10 per cent of Antarctic land borne ice, and has a different climate from the rest of Antarctica. In most of the other 90 per cent of the continent, according to the most recent research, the ice sheet appears to be growing.

Finally, in Europe in particular, there is a fear of a reversal of the Gulf Stream and thus—paradoxically—the onset of very much colder weather. Although there is ample evidence of fluctuations in the strength of the Gulf Stream from time to time, research has shown no sign of any secular slowdown over the past decade. Nor is there any reason to suppose that there will be even if there is further global warming over the coming decades, since the Gulf Stream is largely a surface current and thus a wind-driven phenomenon.

It is clear, therefore, that even after looking carefully at the worst nightmare scenarios the alarmists can conjure up, there is no reason to believe that, even if the IPCC's projections of global warming over the coming century are realised, which is unlikely, there is anything to which mankind cannot adapt. Moreover, to the extent that there is

a problem of global warming, it is manifestly a global problem. And if the chosen policy for addressing it is to cut back on carbon dioxide emissions, the cutback clearly has to be global, too.

Thus the perspective of the developing world is of the first importance. And it is in the developing world, particularly China and India, where emissions are growing fastest. Indeed, China has overtaken the United States as the single biggest source of emissions, chiefly because its rapidly growing economy is so heavily dependent on energy-intensive manufacturing industry.

Both China and India have made their position abundantly clear; and it has to be said that it is thoroughly understandable, and reflects the perspective of most of the developing world. Their overriding priority is to continue along the path of rapid economic growth and development. Only in this way can the widespread poverty which still afflicts their people be relieved. They observe that the industrialised countries of the western world achieved their prosperity thanks to cheap carbon-based energy, and they believe that it is now their turn to do the same.

They add that if there is now a problem of excessive carbon dioxide concentrations in the Earth's atmosphere, it is the responsibility of those who overwhelmingly caused it to remedy it.

At the very most, they are prepared to concede that, if and when their emissions per head of population have risen to the levels of emissions per head in the rich world, there might be the basis for an international agreement which would be fair for all. But until then, there can be no question of their agreeing to any restrictions on their emissions.

### **A GLOBAL CHALLENGE?**

So where does this leave the prospect of an effective global agreement to prevent the further growth of carbon dioxide concentrations in the atmosphere? Not, it has to be said, in very good shape. It is perfectly true that spokesmen for both the United States and the major developing countries are from time to time prepared to pay lip service to the idea of a global agreement on limiting emissions, provided the burden of doing so is equitably shared.

But what the United States considers an equitable sharing of the

burden is worlds apart from what China and India consider equitable; and there is no prospect whatsoever of this chasm—it is far more than a gap—being closed. This, then, is where we are now. The Kyoto approach is dead and buried. Admittedly, the European Union is still theoretically committed to going it alone, having agreed in principle to cut its emissions by 20 per cent (below 1990 levels) by 2020.

But the problem with one or more countries going it alone is not simply the heavy cost to those who do so. It is also the nugatory reduction in overall global emissions to which this would lead. This is because the only practical way of cutting back on carbon dioxide emissions is to raise the cost of carbon-based energy, whether by taxation or by the rationing system known as emissions trading; so that energy-saving becomes more attractive and non-carbon-based energy more competitive. But as energy prices in, for example, Australia rise, with the prospect of further rises to come, energy-intensive industries and processes would progressively decline in Australia and expand in countries like China, where cheap energy remained available.

No doubt Australia could, at some cost, adjust to this. But it is difficult to see the point of it. For if carbon dioxide emissions in Australia are reduced, only to see them further increased in, for example, China, there will be little if any net reduction in global emissions at all.

Meanwhile, the most striking feature of the so-called climate change debate is the complete disconnection between the rhetoric and the reality. Despite the posturing of politicians throughout much of the world, despite the declarations that global warming is the greatest threat facing the planet, despite Kyoto and despite innumerable international gatherings of the great and the good, little in practice has been done and global carbon dioxide emissions continue to rise.

The reason for this, of course, is that fine words are cheap, whereas the 70 per cent reduction in global carbon dioxide emissions which would be required to stabilise carbon dioxide concentrations in the Earth's atmosphere would be very costly indeed.

#### **THE COST OF WARMING AND THE COST OF MITIGATION**

So how much would it cost to reduce carbon dioxide emissions per unit of output to the extent allegedly required? The only honest answer is that we do not know; but all the signs are that it would prove very

expensive indeed. One test is to consider how high a carbon tax would need to be in order to generate the necessary change in behaviour, both on the supply side and the demand side.

And it is significant that this is something which those politicians who identify global warming as the greatest threat facing the planet are conspicuously reluctant to discuss, let alone to propose. The IPCC 2007 Fourth Assessment Report, suggests that ‘the costs and benefits of mitigation ... are broadly comparable in magnitude’<sup>4</sup>—although in fact, as we have already seen, it greatly exaggerates the benefits of mitigation by its systematic undervaluation of adaptation.

But even if it were the case that the costs and benefits of mitigation are broadly comparable in magnitude, the fundamental question, when comparing the costs and the benefits—even if we accept the conventional wisdom so far as the science is concerned, and even if we assume that a global agreement is attainable, however unlikely that may seem—is this.

How great a sacrifice is it either reasonable or realistic to ask the present generation, particularly the present generation in the developing world, suffering as it still does from extreme poverty, malnutrition, disease and premature death, to make in the hope of benefiting substantially better-off generations a hundred or two hundred years hence?

The answer is clear: not a lot.

It is not that we don’t care about future generations. It is that we do care about the present generation.

Nor does invocation of the so-called precautionary principle overturn this conclusion. The fact that climate science is so uncertain that we cannot be absolutely sure that there is not a catastrophe awaiting the people of the world a hundred or two hundred years hence cannot rationally be used as the basis for horrendously costly policy decisions now.

In a world of inevitably finite resources, we cannot possibly spend large sums on guarding against any and every possible eventuality in the future. Reason suggests that we concentrate on present ills, such as poverty and disease, and on future dangers, such as nuclear conflict and terrorism, where the probability appears significant—usually because the signs of their emergence are already incontrovertible.

The fact that a theoretical future danger might be devastating is not enough to justify substantial expenditure of resources here and now, particularly since there are many other such dangers wholly unconnected with global warming.

### CAN ANYTHING BE DONE?

Does all this mean that we should do nothing about global warming? Not quite, although doing nothing is better than doing something stupid. But there are, in fact, some sensible things that can be done. It clearly makes sense to press ahead with research and development in technologies that might assist the process of adaptation should that be required, as well as having practical utility even in the absence of warming.

Another form of research and development which is rightly taking place at the present time, although so far only in the United States, involves what has become known as geoengineering; that is, the technology of cooling the planet, in relatively short order, should the need become pressing. The front-runner here is the idea of blasting sulphur aerosols into the stratosphere, so as to impede the sun's rays.

This is not as far-fetched as it seems. It is what happens naturally, when large volcanoes erupt. The most recent such occasion was the eruption of Mount Pinatubo, in the Philippines, in 1991, which led to a two-year cooling of the Earth's temperature, with no adverse side-effects.

More importantly, there is of course the need to do whatever is needed to adapt to a warmer planet, should the late 20th Century Warming, which has for the time being paused, soon resume, as the majority of climate scientists are currently predicting. For the most part this can and will happen spontaneously and autonomously, just as mankind has always adapted to the environment around him, wherever he lives, without any need for government intervention.

But there are some exceptional areas—what the economists call the supply of 'public goods'—where governments do need to stand ready to act. The provision of adequate sea and flood defences is the most obvious example. Moreover, as we have seen, even though the IPCC's projected warming over the next hundred years, if it occurs, may well not be harmful overall, there would be losers in the warmer

regions of the developing world.

Should this seem likely to occur, I believe we have a clear moral obligation to help them. It is true that the record of overseas aid in promoting economic development is very disappointing. But that is no argument against assistance in, for example, the building of effective sea defences.

Of course it would cost money. But quite apart from our moral obligation, it is only a minuscule fraction of what it would cost to attempt, by substantially cutting back on carbon dioxide emissions, to control the global temperature. What is important is that the practical measures I have outlined represent the sum total of what we should be doing.

It has to be said that this is not the easiest of messages to get across—not least because the issues surrounding global warming are so often discussed in terms of belief rather than reason. Indeed, the more one examines the current global warming orthodoxy, the more it resembles a *Da Vinci Code* of environmentalism. It is a great story, and a phenomenal best seller.

It contains a grain of truth—and a mountain of nonsense. And that nonsense could be very damaging indeed. We appear to have entered a new age of unreason, which threatens to be as economically harmful as it is profoundly disquieting.

It is from this, above all, that we really do need to save the planet.

## Notes

### CLIMATEGATE: A FAILURE OF GOVERNANCE — SINCLAIR DAVIDSON

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#### **CARBON MYOPIA: THREE FALLACIES ABOUT MAN-MADE CARBON DIOXIDE – WILLIE SOON AND DAVID R. LEGATES**

This is an enhanced version of our original paper published in *Ecology Law Currents* at the University of California, Berkeley to provide expanded focus on the science and more detailed citations. There is also a clear difference in the language adopted between the two versions of our article owing to different editorial preferences. As scientists, we remain neutral in this regard, since our goal via this additional publication is to open the channel for more objective discussion.

1. The principle of such global governance ideals is indeed stated in paragraphs 36-38 of the negotiating text for Copenhagen, pp. 18-19, available at [http://unfccc.int/documentation/documents/advanced\\_sEarth/items/3594.php?rec=j&preref=600005444#beg](http://unfccc.int/documentation/documents/advanced_sEarth/items/3594.php?rec=j&preref=600005444#beg). Such a global governance view is encapsulated, for example, in Glasbergen's *Global*

*Environmental Change*, in press, 2009, where new Global Action Networks, as agents for collective action, 'attempt to create a morally inspired voluntary sustainability agenda and new sustainable practices that transcend sovereign territories.'

2. Revealing emails among key IPCC lead authors and participants, including IPCC chairman Dr. Rajendra Pachauri, demonstrate quite clearly that some of the primary claims and conclusions by the IPCC about climate change being man-made and dangerous were political constructions, rather than neutral and objective scientific findings that fair-minded people would expect and demand (e.g., in the main science reports from the second through the fourth assessments). The emails suggest a systematic, long-term effort to conceal and manipulate air temperature data, influence the peer-review process, and prevent other scientists and experts from examining their raw data, computer programs and analyses. These revelations underscore the critical need for further investigation and extreme caution, rather than blindly accepting IPCC reports and claims for policy decisions that would cost trillions of dollars and impact jobs, economic growth, living standards and personal freedoms. It is vital that citizens, legislators and scientists alike review and rely on the large bodies of research results and conclusions published by independent scientists and authors across the world, rather than simply accepting IPCC claims and conclusions.
3. The phrase 'global temperature' and 'heat' are used here in a layman's sense, rather than in the correct manner as properly founded in physics. For a more in-depth study and discussion on 'heat' and 'global temperature,' we recommend Romer, *American Journal of Physics*, 69 (2001): 107-109, 2001, and Essex, Kennedy and Berry, *American Journal of Physics*, 71 (2003), 969-978, 2003, and Essex, McKittrick and Andresen, *Journal of Nonequilibrium Thermodynamics*, 32 (2007): 1-27, respectively.
4. See, for example, the discussion and illustration in Figure 1 of an article by Soon and Legates, available at <http://www.quadrant.org.au/blogs/doomed-planet/2009/08/answering-3-simple-questions>.

5. See the updated summary and Figure 4 in this discussion by Bob Tisdale available at <http://bobtisdale.blogspot.com/2009/10/nodc-corrections-to-ocean-heat-content.html>. For a more formal source, consider Figure 4 in Willis et al., *Journal of Atmospheric and Oceanic Technology*, 36 (2009): 846-852. We also wish to clarify that all the results cited here are for ocean heat content of the top 700 meters of the world oceans, and that there is a new paper published by von Schuckmann et al., *Journal of Geophysical Research*, 114 (2009), doi.10.1029/2008JC005237, that shows an increasing ocean heat content from 2003 through 2008 for the top 2000 meters of the world's oceans. As scientists, we are naturally excited about the possibility of heating of the world ocean from below (since there is clear evidence for an increasing trend in ocean heat content at the top layers); however, we were equally cautious that instrumental calibration for the deeper layers may be problematic. This is why we were surprised when one of us (W. Soon) wrote to Dr. Karina von Schuckmann, the lead author of the paper, to request the digital values for one of her figures and we were met with a refusal: 'We do not distribute the time series as they should not be used without the explanations given in the paper' (from her August 12, 2009 email). At it now stands, the key point of our discussion here is still that climate models did not predict the observed changes in the ocean heat content correctly (either viewed solely for the top 700 meters or the totality of the vertical column of ocean heat content changes down to 2000 meters with the scenario of warming from below as noted).
6. See Soon, *Geophysical Research Letters*, vol. 32 (2005): doi.10.1029/2005GL023429, and also Soon, *Physical Geography*, vol. 30 (2009): 144-184.
7. See for example, Pielke Sr. and 16 colleagues in *Journal of Geophysical Research*, 112 (2007): doi.10.1029/2006JD008229; Fall et al. in *International Journal of Climatology*, in press (2009);, doi.10.1002/joc.1996; Rosenzweig and 11 colleagues in *Bulletin of the American Meteorological Society*, 90 (2009): 1297-1312; Christy et al. in *Journal of Climate*, 22 (2009): 3342-3356 and Christy et al. in *Journal of Climate*, 19 (2006), 548-563.

8. See Essex, *Pure and Applied Geophysics*, 135 (1991): 125-133; Soon et al., *Climate Research*, 18 (2001): 259-275; Lindzen, *Energy and Environment*, 18 (2007): 937-950; and Koutsoyiannis et al., *Hydrological Sciences*, 53 (2008): 671-684. For the discussion and evidence of the secondary role of atmospheric carbon dioxide and methane on the large glacial-interglacial climate transition of the past 1 to 2 million years or so, see Soon, *Physical Geography*, 28 (2007): 97-125.
9. See Lindzen and Choi, *Geophysical Research Letters*, 36 (2009): doi.10.1029/2009GL039628, 2009, for evidence on how all current climate models incorrectly represent climate feedbacks, which are rooted in fast processes of hydrology and clouds in the tropics. Those processes are extremely important as an amplifier to the small warming from greenhouse effects of added atmospheric carbon dioxide.
10. Massachusetts et al v. Environmental Protection Agency et al., 05-1120 (2006) (Stevens).
11. See, for example, Figure 23 of Robinson, Robinson and Soon, *Journal of American Physicians and Surgeons*, 12 (2007): 79-90, which republishes as Figure 23 the Figure 6 of Idso and Idso, *Agricultural and Forest Meteorology*, 69 (1994): 153-203. Although Long et al. in *Science*, 312 (2006): 1918-1921, appeared to have created a sensation—by claiming that the plant response data shown in Robinson et al.'s [2007] Figure 23 were exaggerated—Tubiello et al., *European Journal of Agronomy*, 26 (2007): 215-233 and Asseng et al., *Crop Physiology*, Chapter 20, pp. 511-543, 2009] have reconfirmed its accuracy and applicability. It is surprising (and revealing) that Long et al. has been cited in the recent literature without reference to the strong criticism offered by Tubiello et al.—and that Long et al. have offered no response to that criticism.
12. It is interesting in this context that in the Netherlands, for example, CO<sub>2</sub> from industrial exhaust gases is used today on a large scale to increase the growth rates of vegetables in greenhouses, thus yielding a higher food production. A cursory check reveals that the greenhouse vegetable industry is big business; in Canada in 1999, for example, the industry was worth about \$1.45 billion dollars (Canadian).

13. For evidence and discussion on both causal and related factors for ocean acidification, we recommend a careful and objective look at the actual published data and papers, including Dore et al., *Proceedings of the National Academy of Sciences of the USA*, 106 (2009): 12235-12240, and Byrne et al., *Geophysical Research Letters* (2009): doi.10.1029/2009GL040999, 2009, in press (available online November 25, 2009). One fact is clear—not all changes in pH are directly related to increasing atmospheric CO<sub>2</sub>. Consider this conclusion from Dore et al. (2009): ‘Here we report the results of nearly 20 years of time-series measurements of seawater pH and associated parameters at Station ALOHA in the central North Pacific Ocean near Hawaii. We document a significant long-term decreasing trend of  $-0.0019 \pm 0.0002/\text{y}$  in surface pH, which is indistinguishable from the rate of acidification expected from equilibration with the atmosphere [Note, however, Figure 2 of Dore et al. (2009) shows that the model predicted an increase, rather than a decrease, in pH for the bottom 1000 to 4500 meters of ocean which did not agree with the measurements of no change in pH]. Superimposed upon this trend is a strong seasonal pH cycle driven by temperature, mixing, and net photosynthetic CO<sub>2</sub> assimilation. We also observed substantial interannual variability in surface pH, influenced by climate-induced fluctuations in upper ocean stability. Below the mixed layer, we find that the change in acidification is enhanced within distinct subsurface strata. These zones are influenced by remote water mass formation and intrusion, biological carbon remineralization, or both.’ (p.12235).
14. Note too that most of the papers cited were published after the UN IPCC 2007 report. See, for example, Bessat and Buigues in *Palaeogeography, Palaeoclimatology, Palaeoecology*, 175 (2001): 381-392; Iglesias-Rodriguez et al. in *Science*, 320 (2008): 336-340, 2008; Herfort et al. in *Journal of Phycology*, 44 (2008): 91-98; Feng et al. in *European Journal of Phycology*, 43 (2008): 87-98, 2008; and Tortell et al. in *Geophysical Research Letters*, 35 (2008): doi.10.1029/2007GL032583. We further encourage readers to study the published exchanges between Riebesell et al. and Iglesias-Rodriguez et al. *Science* vol. 322, 1466b-

1466c, 2008 on issues of phytoplankton calcification. In those exchanges, Iglesias-Rodriguez and colleagues concluded that the bottom line had not changed: the experimental methodology (hydrochloric acid, rather than bubbled carbon dioxide gas) employed by Riebesell was improper. As Iglesias-Rodriguez et al. emphasised, 'a previous report [Ribesell et al., *Nature*, vol. 407, 364-367, 2000] has confounded the issue by using an approach (acid/base manipulation of seawater) that is not appropriate for predicting the calcification response of *E. huxleyi* in a future high-CO<sub>2</sub> ocean.'

15. *Fast Breaking Papers*, (accessed April 2009); available from <http://sciencewatch.com/dr/fbp/2009/09apr/fbp/09apr/fbpRod>.
16. 'Most of these experiments used semi-continuous cultures, in which the carbonate system was modified by the addition of acid and/or base to control pH,' in Iglesias-Rodriguez et al. *Science*, vol. 320, p. 336, 2008. '[Szmant] faults previous lab studies because they used hydrochloric acid, not carbon dioxide, to lower the pH of the water in the calcification studies,' in Elizabeth Pennisi, *Science*, vol. 323 (2009): 27, quoting Alina Szmant, a coral ecologist.
17. Putz and Redford, *Global Environmental Change*, 19 (2009): 400-401.
18. Botkin et al., *BioScience*, 57 (2007): 227-236.
19. Willis and Bhagwat, *Science*, vol. 326, 806-807, 2009. The five specific examples highlighted offer the following insights: (1) 'A coarse European-scale model (with 16 km by 16 km grid cells) predicted a loss of all suitable habitats during the twenty-first century, whereas a model run using local-scale data (25 m by 25 m grid cells) predicted persistence of suitable habitats for up to 100 per cent of [alpine] plant species', in Randin et al., *Global Change Biology*, 15 (2009): 1557-1569. (2) 'A model that included climate and topographical heterogeneity (such as elevation range) predicted only half of the [European butterfly] species losses in the mountainous areas for the period 2051 to 2080 in comparison to a climate-only model. In contrast, the number of species predicted to disappear from flatlands doubled in the climate-topography model relative to climate-only model.', as shown in Luoto

- and Heikkinen, *Global Change Biology*, 14 (2008): 483-494, 2008. (3) 'In a census on the presence of 972 forest butterflies over the past 16 years [in West Africa], Larsen found that despite an 87 per cent reduction in forest cover, 97 per cent of all species ever recorded in the area are still present. For reasons that are not entirely clear, these butterfly species appear to be able to survive in the remaining primary and secondary forest fragments and disturbed lands in the West African rainforest.' (Larsen, *Biodiversity and Conservation*, 17 (2008): 2833-2847, 2008].) (4) 'The results indicated that when the CO<sub>2</sub> fertilization effects are considered, they overwhelm the impacts arising from temperature; rather than the large-scale die-back predicted previously, tropical rainforest biomes remain the same or substituted by wetter and more productive biomes. However, for 2 of the 14 [IPCC] models, this result was dependent on the dry season not extending beyond 4 months; if it does, then the tropical biome becomes savanna.' (Lapola et al., *Global Biogeochemical Cycles*, 23 (2009): doi.10.1029/2008GB003357). (5) 'Hole et al. recently studied model-projected shifts in the distribution of sub-Saharan Africa's breeding bird fauna. They found that in the Important Bird Area protected network, species turnover is likely to be substantial and regionally variable, but persistence of suitable climate space across the network as a whole is remarkably high, with 88 to 92 per cent of species retaining suitable climate space.' (Hole et al., *Ecology Letters*, 12 (2009): 420-431).
20. Avila et al., 'Mass extinctions in the Azores during the last glaciation: fact or myth?', *Journal of Biogeography*, no. 35 (2008): 1123-1129.
  21. Van Loon, *Earth Science Reviews*, no. 62 (2003): 177-186.
  22. We also find the discussions and insights by Willis and Birks, *Science*, 314 (2006): 261-1265, to be very important and helpful for any science-based conservation strategy.
  23. Van Loon estimates that some 50 billion species are thought to have existed during the 3.5 billion years of life on earth. Assuming that the latter 2.5 billion years have seen an active appearance of new species and the disappearance of older ones, and if this process has been rapidly accelerating (approximately

exponentially) over those 2.5 billion years, van Loon suggests that ‘an estimate of about a hundred new appearances and equally many extinctions per year for our time might be a value in the correct order of magnitude.’ van Loon also noted that “new” species are being discovered and described in the scientific literature all the time, and they outnumber the species that we know to have become extinct recently. Scientifically spoken, the commonly assumed present-day mass extinction is therefore at least questionable.’ One can add support to van Loon’s statement about new species being discovered and described all the time with examples like this October 15, 2009 article from the Harvard Gazette: ‘Plant diversity, altitude leave collectors breathless in China. Harvard, Chinese researchers discover 30 new species during remote mountain explorations’ (available from <http://news.harvard.edu/gazette/story/2009/10/biodiversity-altitude-leave-collectors-breathless-in-china%E2%80%99s-hengduan-mountains>).

24. Pielke Jr., *Bridges*, 23 (2009).
25. Searchinger et al., *Science*, 326 (2009): 527-528.
26. Churkina et al., *Global Change Biology*, (2009): doi: 10.1111/j.1365-2486.2009.02002.x.
27. It is also interesting to note that the carbon emission trading price dipped and stayed at a local minimum value of about \$2 after the announcement that the 2007 Nobel Peace Prize would be awarded to Mr. Al Gore and the UN IPCC on October 12, 2007.
28. See the summary chart of the traded prices here (during trading hours) <http://www.chicagoclimatex.com/market/data/summary.jsf> (last accessed December 1, 2009).
29. See the summary discussion at Wikipedia: [http://en.wikipedia.org/wiki/European\\_Union\\_Emission\\_Trading\\_Scheme](http://en.wikipedia.org/wiki/European_Union_Emission_Trading_Scheme).
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