

A REVIEW OF PROFESSOR ROBERT M CARTER'S BOOK:

BOOK: Climate: The Counter Consensus. Stacey International, London 2011 reprint.

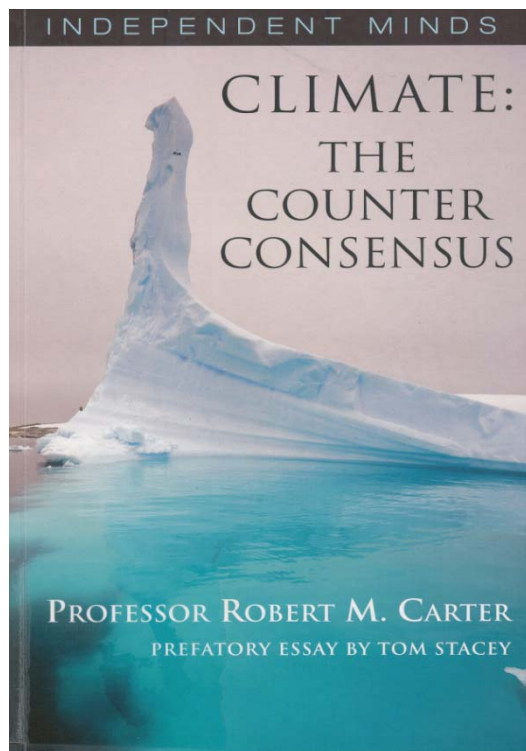
AUTHOR: According to the book, Professor Robert M. Carter is a Palaeontologist, Stratigrapher, Marine Geologist and Environmental scientist and is Research fellow at James Cook University, Queensland. He has had a distinguished career¹.

REVIEWER: Brian Harrisson is a member of CPA Australia and is now retired. He originally graduated in Industrial Accounting later in Economics and Politics and later still in, Advanced Taxation. He was formerly a Corporate Financial Executive, Public Accounting Practitioner, Mining Company Director and Business Strategist. He became interested in the science of climate change through his work on Carbon tax policy. He recently started the web site "brians-satchel.com" The site was developed to discuss issues of community importance and provide reliable information.

COMMENT: This review is really two documents in one. The project was originally begun as a book review but morphed into a larger essay when I found that there were simply too many important and contentious points in the book that needed to be brought to light. The first document is section 1 which is intended to be read as a stand alone review of the book. The second is a detailed essay about the book made up of all sections where Section 1 can be treated as an introduction to the detailed part of the essay.

Section 1 is \approx 3,000 words long. The essay is \approx 20,000 words overall.

DATE: 20th February, 2012



STRUCTURE OF ESSAY

THE BIG PICTURE

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1. REVIEW OF BOOK

*Whose bread I eat, his song I sing.
(German proverb- 12th Century)*

The book, *Climate: The Counter Consensus* presents a series of arguments against anthropogenic warming, or climate warming caused by human actions. The author has been an active participant in the climate debate throughout the world and has made his position clear. It is that the notion of anthropogenic global warming is misconceived and the science underlying it is flawed. The book goes further and asserts that there is an international conspiracy³ to promote the conventional scientific view of the climate world. This comment combined with a careful review of the arguments contained in his book, indicates that the book is as much about the “politics” of the author as it is about the science of climate change. This review starts by shedding some light on the author’s politics then critically examines the author’s arguments about the science and the related aspects he comments on. It then draws some conclusions about both.

The author has been described as a sceptic and a denier⁴ but both cannot be true. The former seeks to find the scientific truth while the latter does not⁵. How then should the author be described using this dichotomy? Drivers of denial⁶ include special interest groups whose motivations include self interest and ideology. They are exemplified by the current carbon lobbies which promote the continued use of carbon based fuels and right wing political groups which promote extreme ideas about freedom. There are no doubt others. In Australia and the USA, the lobbies have shown themselves to be inherently antagonistic towards rational policy responses to climate change such as putting a price on carbon, even though it is in the public interest. They perceive such actions as a threat to their economic, political and social interests and have funded⁷ networks of people and organizations to defend their interests against such threats⁸. The networks use “denial” as a strategic weapon⁹ and have done so with powerful effect of recent times in Australia¹⁰. A search of the author’s background using the internet indicates that he is active in these networks¹¹. Many of the references in his book emanate from denial sources¹². The two organizations mentioned in the “Acknowledgements” section of the book are denial organizations¹³ and some of the people mentioned there are associated with denial networks¹⁴. His pleading for the coal industry¹⁵ is consistent with these observations.

Given this background I had expected to find some bias in the way the science of climate change was portrayed in the book but I was not prepared for the level of distortion that actually occurred. I do not have any problems with an attempted demolition of the notion of anthropogenic warming provided the attempted demolition is based on sound evidence¹⁶ and accurate analyses, but the authors attempted demolition is not based on either. Just how far the book falls short of these ideals is explained in terms of three realities of climate change around which the author organizes his book. They are Science, Virtual and Public realities¹⁷.

Science reality: The author believes that “the true scientific debate¹⁸... is about the sign and magnitude of global human effect... and its likely significance...” The overwhelming majority of climate scientists support the view that the planet is warming and that it is likely that human activities are a major driver. Those scientists have minimal doubt about the scientific evidence and how to interpret it so contrary to the assertion of the author there is little debate in professional

climate science circles about the substance of the science. The debate that is occurring is in the public arena. Here two diametrically opposed sides are trying to win the hearts and minds of the public to accept their view of the issue as the public perception will ultimately govern the policy responses Governments take on the issue. Although the debate nominally involves scientific issues such as what is causing the planet to warm, it is really about trying to convince the public to accept a given point of view and so it is about the politics of climate change and important values that are associated with it. These are whether vested interests should prevail over community interests, whether professional pragmatism should prevail over scientific integrity and whether ideology should prevail over logic. These dichotomies in values probably indicate why the debate has become increasingly hostile. People who are trying to make sense of the various claims and counter claims in the debate could do worse than ask themselves the question “what is stopping us cleaning up an increasingly polluted planet?” and then think about what those obstacles might be, why they are being put there and by whom.

The author touches marginally on these issues when he alludes¹⁹ to the ad hominem “abuse” of independent scientists²⁰ and asks why such people are regarded as being in the thrall of the oil and coal industries²¹. In using the term independent he fails to distinguish between those scientists who are genuine sceptics who by definition are truly independent, and those scientists who are deniers and who can not be regarded as being independent for reasons that have been touched on earlier. If true sceptics become damaged in this “climate war” being fought with evidence, ideas and words and money, obfuscation, deceit and spin, this is a cause for both concern and regret. The responsibility for this outcome however does not lie with the scientific process problematical though it can sometimes be, but with the behaviour of the vested interests that interfere in it. In an ideal world, organizations that are not directly involved in the scientific process would keep their noses out this critically important debate about the science and let the scientists settle it. Being what it is, self interest makes this aspiration unachievable and when all is said and done we live in a democracy which is based on the underlying assumption that everyone is entitled, within reasonable limits, to have their say on most issues irrespective of the their motivations.

Given this background and the author’s denial associations I should not have been surprised to find that he would find fault with almost every aspect of conventional climate science. Starting at the top he criticizes the world’s top climate scientific body, the Intergovernmental Panel on Climate Change (IPCC) and methodically works his way through virtually every important climate and related issue. He sets the political context for his book by asserting that the utterances by the IPCC are treated by the press and politicians as a kind of holy writ and attributes this to superb marketing by a group made up of the IPCC and the many scientific academies and environmental NGO’s that support it, a strong media bias towards alarmist global warming views and legislators lacking in scientific knowledge²².

Criticisms of the IPCC and in particular the science it propounds are easily made but are more difficult to justify with evidenced backed arguments and this is where the book falls well short of this basic requirement. This failure becomes obvious when the books arguments about anthropogenic warming are compared with the conventional²³ scientific evidence that supports four simple propositions²⁴ that capture the notion of anthropogenic caused climate change:

- Global temperatures are rising
- Rising temperatures can be destructive
- CO2 is driving the rising global temperatures
- Anthropogenic CO2 has contributed to (that) warming

The book generates a lot of “noise”²⁵ in relation to each of these areas of the science but fails to provide one skerrick of evidence or argument that rebuts the conventional scientific evidence supporting each of them²⁶. The use of half truths, cherry picking of “evidence” and misrepresentation in the book is common²⁷ and a significant mathematical error²⁸ that just happens to understate the size of the anthropogenic contribution to the global warming problem, adds to the flaws in the book.

The mode of narrative accentuates these shortfalls. Throughout the book and especially when considering Risk management²⁹ strategies the book conveys an air of infallibility³⁰ which immediately puts it at odds with accepted scientific norms. It is a scientific axiom that nothing in the science is ever certain yet the author acts as though it is. Almost the whole climate science community considers that the planet is warming and that it is likely to be driven by human emissions, yet the author appears to give zero weight to those views when considering the ways to manage risks associated with climate change. Precaution and adaptation are two important risk management principles have been put forward to manage climate change, yet the author rejects the former (a stance that is consistent with that of the carbon lobby) and only accepts the latter when both are critical defensive strategies in dealing with the potential dangers associated with future anthropogenic climate change³¹.

All up the quality of the criticisms of conventional climate science are poorly developed and the proposals on how to manage the risks associated with climate change are inadequate.

Virtual reality: Computer models used in the science represent the author’s virtual reality. He asserts that the General circulation models (GCM’s), the “super” models that have been developed to simulate the effects of future climate change, are deterministic, inaccurate and produce output that is not evidence.

Modelling the outcomes of complex systems especially over lengthy time frames is a worthy, albeit challenging endeavour³² that the author fails to acknowledge. His criticisms fail to recognize that these invaluable instruments have already produced valuable insights into future climate. At this stage of development the models can not reasonably be expected to “predict” or indeed “forecast” future climates as the author implies they should. He seems not to want to accept the reality that even with the challenges they confront models can be used to give a “feel” for a range of “what if” future scenarios where precision in a scientific sense is not necessarily required. That their outcomes are not acceptable to some people does not diminish their value as a risk management tool or the value of the output they produce provided that the strengths and weaknesses of their output are understood. His proposal that an alternative kind of model that uses historical climate patterns to project future climate would be better suited to the science overlooks the fact that models of this kind would fail to capture the effects of anthropogenic emissions. This phenomenon doesn’t have a significant history³³ and his model would fail to capture the effects of human activities on climate.

Public reality: The analysis of what the author calls public reality is arguably the most surprising of the three realities even if we put aside his claims of an international scientific conspiracy³⁴. The book contains comments that, to this reviewer, are naïve. Examples include the authors claims that: he, the author, is independent, when the evidence suggests that he is not; he wants people to think for themselves on the climate issue, when the book is likely to mislead people on this very important issue, and that it is wrong to assume that scientists who are paid by the fossil fuel industry are merely repeating their spin, when commercial common sense suggests it is unlikely to be otherwise. In a section towards the end of the book the author describes an event that is known as “climate-gate”³⁵ as a world scientific scandal. His claim is that emails illegally hacked from the University Of East Anglia, a primary centre of climate research, provided unequivocal evidence of climate data manipulation. He fails to mention that these claims have been investigated by eight important and relevant committees which found that there was no evidence of fraud or scientific conduct. The author should have known this. A search of the internet would have revealed that fact^{36 37}.

CONCLUSIONS

How then should the author be described using the sceptic/denier dichotomy referred to at the start? The author’s record of denial association plus the distortion of the science in his book leads this reviewer to conclude that it is reasonable to describe him as a climate change denier.

As to the book itself, it’s portrayal of the three realities of climate change, are not accurate, balanced or persuasive. The quality of the book served to emphasize just how well conventional climate scientists are doing their jobs.

IMPORTANT COMMENT:

I wrote to Professor Carter towards the end of 2011 advising that I had written a review of his book and said that I planned to post it on my web site early in the new-year. I asked whether he would like to write a response which I indicated would be posted concurrently with the review. Professor Carter said that instead of writing a reply he would prefer the following comment to be posted in association with the review.

“Other reviews of Bob Carter’s book are available here”:

http://members.iinet.net.au/~glrmc/new_page_1a_CTCC.htm.

2. SCIENCE REALITY

The review set the scene for the book but the real devil of the book is in the detail to which I will now turn.

3. GLOBAL TEMPERATURES ARE RISING

This proposition is supported by three main lines of evidence³⁸:

3.1 RECORD OF ATMOSPHERIC TEMPERATURE – The atmospheric evidence supporting warming is summarised in the appropriately titled “Hockey stick” graph³⁹ of average global temperatures over the last 1,000 years. The graph showed that temperatures gently declined over the first 900 years and markedly increased over the last 100. Over this 100 year period average global atmospheric temperatures have increased by around .8C of a degree and about ¾ of this has occurred in the last 3 decades. At a global level these increases are regarded as significant⁴⁰.

3.2. RECORD OF OCEAN TEMPERATURE: The rise in atmospheric temperatures was matched by rises in ocean temperatures. For the period 1961-2003 global ocean temperatures have risen by about .1°C from the surface to a depth of 700m. Within that period there were fluctuations⁴¹.

3.3. NATURAL CLUES –Are a range of real world phenomena that indicate planetary warming is occurring. The phenomena include widespread reductions in glaciers, ice sheets and snow cover, reductions in the levels of sea ice, coral bleaching, spread of tropical diseases, shifting ecosystems, and increasing number of catastrophic weather events. Temperatures in the equatorial belt have exhibited little historical seasonal variation so changes in tropical land ice in that belt suggest long term temperature change. Mt Kilimanjaro has lost an estimated 80% of its ice cap since the early 20th century. Glaciers in Ruwenzori range in Uganda and the ice cap on Mt Kenya have shrunk significantly. Over the last 50 years glaciers in North America, the Tibetan plateau Greenland and New Zealand have all shown significant retreat. The Greenland ice sheet is shrinking at an accelerated rate. There has been a significant reduction of Antarctic sea ice since 1950. Alaskan glaciers are shrinking quickly. Particular examples on their own are not significant but when looked at in aggregate provide significant evidence indicating that the planet is warming⁴².

3.4. THE AUTHORS VIEWS:

The author’s broad perspective is that the IPCC conclusions are based on flawed methodologies and that the currently perceived warming is nothing unusual when compared with history. If global temperatures are increasing it is because they are in part naturally recovering from the “Little ice age”⁴³. The arguments that support that perspective do not stand up to well to scrutiny:

a. 150 years is an utterly inadequate period over which to understand climate change⁴⁴.

The author asserts that the geological record is encapsulated in the deep sub-oceanic sediments and the ice cores which expose important historical influences on climate. They include Milankovitch⁴⁵ cycles mixed with solar driven climate patterns, abrupt climate events, great climate variability, and

unpredictable events. Compared with geological timescales, the 150 years of meteorological measurements focussed on by conventional climate scientists are inadequate. In this context the warming that is now perceived to be happening will not be seen as anything unusual. Any anthropogenic signal probably lies buried in the variability and noise of the natural climate system⁴⁶.

Human activities that influence climate have become more prevalent over the last 150 years so it is understandable that this time period would be the subject of special focus. This focus has not resulted in the disregard of geological history⁴⁷ as the comment implies. Conventional climate scientists have used historical climate data free of anthropogenic effects to identify and measure the marginal contribution human activities have made to global warming^{48 49}.

More importantly, the author's analysis does not take into account two critical issues. One is the worry that human pollution may cause climate feedbacks to occur that may cause significant human and environmental damage^{50 51}. The other is his reluctance to acknowledge that there is a new potential driver of climate change, namely the pollution caused by effect of human activities; a phenomenon he tries to bury as shown by the last statement in the previous paragraph.

b. Data sets that underpin the official thermometer record...have been subject to heavy manipulation in order to "correct" them⁵².

He supports this with a quotation that "Instrumental temperature data for pre satellite era (1850–1980) have been so widely, systematically and un-directionally tampered with that it cannot be credibly asserted that there has been significant global warming in the 20th Century" ⁵³

The quotation was from a dubious source namely a paper presented under the auspices of a denial organization⁵⁴ and appears to be aimed to discredit the statistical "hockey stick". Putting aside the question of why scientists would attempt to manipulate data in an environment where they would be certain to be found out, the author would well know that claims of data inaccuracy and misinterpretation have been made before⁵⁵. No less than 12 scientific papers subsequent to the original first report using a range of statistical methods and combination of proxy records produced reconstructions similar to the original hockey stick graph⁵⁶. The author fails to acknowledge these facts in his book.

C. Measurement of "Warming" is an ambiguous concept⁵⁷.

He asks "How long is a piece of string"⁵⁸ or essentially what does it mean to say that the planet is warming?" .He argues that as a data set can be used to show that the planet is warming or cooling simply by changing the start and end data points in a time series that fluctuates. This comment is correct but misleading. Measurement is ambiguous only if you want it to be so and don't define the objective and specify the method. The author does not have any problems with ambiguity when he develops his own measurements⁵⁹ and fails to mention that there is no such problem in the climate science community. The "Hockey stick" graph⁶⁰ is a good example of how to measure climate warming. He does not produce the graph in his book.

d. “Natural clues” are not evidence⁶¹.

He asks the question “Is there really any difference between weather and climate?” and argues that both are part of an ever ongoing cycle of major and minor climate change. He then uses this observation to dismiss the “natural clues” evidence described in 3.3, as being consistent with natural events⁶². His point must be heavily discounted by the evidence showing that the natural clues evidence is coincident with the growth of anthropogenic emissions. His point would have been more substantial had he backed up this assertion with evidence identifying what natural factors he believes are causing these clues to emerge.

e. The latest climate trend since 1998 is one of cooling⁶³.

It is not clear to this reviewer how he arrived at this conclusion. The author made this claim in the “Age” newspaper earlier this year⁶⁴. The claim was rebutted the next day on the basis that the data set he used did not include the Arctic region⁶⁵. The author did not clearly explain in the book how he arrived at the claim this time. The comment may have been based on a paper by Judith Perlwitz et al⁶⁶ quoted in his book. If so the author failed to mention that the paper indicated that the cooling was likely to be only temporary⁶⁷. If this is not the source of his assertion may have been based on figure 11b in the book. If a time series is created from that figure beginning in 1998 (the highest recent temperature) and ending in 2010, a line joining the two would show a downward sloping line. This would be a flawed methodology. Apart from demonstrating the aphorism that there are “lies, damn lies and statistics” the point is quite trivial when the seriousness of the issue it relates to and the other evidence of warming is considered. The use of a period of a mere 12 years also contradicts an earlier assertion the author made that climate should be looked at in terms of geological time scales (see note 3.4a).

f. Oceans are cooling⁶⁸.

Chapter 4 of his book is devoted to the oceans. The first 14 or so pages of the chapter are devoted to discussing the question of rising sea levels and ocean acidification. At the end of that discourse he adds the comment out of the blue, that “oceans...are cooling” but does so without any prior discussion or evidence to support that comment. I could not find any evidence in the book that supports his claim.

None of the comments by the author represent evidence that rebuts the proposition that global temperatures are rising.

4. TEMPERATURE CAN BE DESTRUCTIVE

This proposition is supported by four lines of evidence⁶⁹.

4.1. THE HISTORICAL RECORD – Shows that the speed of Global warming can destroy life⁷⁰. Take two examples. The effect of warming during the Cretaceous period (-146my to -65my) was mild as it occurred over millions of years and gave life time to adapt. During the Palaeocene /Eocene (P/E) epochs (-65my to -34 my) warming took place over thousands of years. Life had less time to adapt and there were a significant number of extinctions in the sea but life on land had time to adapt. If significant warming is spread over a period of only tens of or perhaps hundreds of years as now seem to be occurring, the effect on natural life is likely to be worse than during the (PE) epoch. Speed of change is clearly a key issue in determining the damage warming can potentially do to the residents of the planet.

4.2. ANALYSIS – The magnitude of a change in temperature will be a key determinant of the magnitude of any future destruction. A rise in average global temperatures compared with current norms, of say 1°C is likely to have a marginal effect on planetary residents. An increase of say 4°C, which scientists tell us is possible if we continue the current pollution trend, can have a more profound effect⁷¹. Change of this magnitude will potentially have both negative and positive effects. The negatives include, agricultural disruptions, migration of disease bearing insects away from the tropics, polar, glacier and permafrost melting, rising sea levels and ocean acidification, flooding of low lying areas, destruction of infrastructure, regional crop devastation, loss of life and changes in precipitation in food producing areas. The positives potentially include improved agriculture in regions of higher latitude such as Greenland, increased cod fishing, an ice free NW passage, improved health in northern regions, and improved plant growth in some regions. On balance the Stern Report tells us that climate change threatens the basic elements of life for people around the world.⁷²

4.3. RISING SEA LEVELS – Global sea levels rose at an average rate of around 1.8 mm/pa between 1961 and 2003 while during the period 1993 to 2003 they rose by 3.0 mm/pa indicating that the rising is accelerating⁷³. At this stage it is not clear whether the observed acceleration reflects an increase in the long term trend. The causes of the rises are thermal expansion and melting ice. Even with immediate action to mitigate warming the rises are likely to continue. The magnitude of an ultimate sea level rise will be influenced by the extent of future global warming and our future pollution

4.4 OCEAN ACIDIFICATION – This is the term used to describe a reduction in the oceans pH levels or the ocean's alkalinity. Between 1751 and 1994 pH levels reduced from 8.25 to 8.14 or about 30%⁷⁴. The scale is logarithmic. The rising acidification is caused by rising levels of CO₂ in the system relative to the past. The extent of future changes in pH levels will depend on the extent of warming and the action taken to limit anthropogenic CO₂ emissions. (Also see section 7 of this essay).

4.5 FEEDBACKS – This is the process in which changing one quantity changes a second quantity which in turn changes the first in a continuing cycle. The IPCC indicates that anthropogenic warming could lead to some effects that are abrupt and irreversible⁷⁵. The reference provides examples of possible feedback points in the climate system. There are historical examples of them in operation.

Feedbacks by their nature can be probabilistic and unpredictable. This uncertainty does not mitigate their importance or the potential danger to the world community they can present. A potential danger is strictly not evidence but it is still a risk that needs to be managed.

4.6. THE AUTHOR:

The author deals with the potentially destructive effects of global warming by, challenging the notion that the warming is real as noted in section 3, and by asserting that its effects on the oceans will be benign. In coming to this position he points out that the oceans heat capacity is 3,300 times that of the atmosphere albeit with a comparatively greater lag in response times. It requires more energy to heat it up than air⁷⁶. One consequence of that is that it is almost impossible for the atmosphere to exert a heating effect on the ocean⁷⁷. He accepts that sea levels change at different rates at different locations around the world as a result of geological and glacial influences and claims that the use of eustatic (overall) sea level changes as a measure of rising sea levels is misleading and its use as a methodology is inadequate. His bottom line is that it is fundamentally implausible that a continual small rise in average global sea levels or that small shift in ocean average pH will cause catastrophic environmental damage⁷⁸. In essence the author believes that there is no cause for alarm. Flawed arguments and a failure to consider relevant evidence make that perspective suspect:

a. The author fails to acknowledge the destructive affect that speed and/or magnitude of warming has been shown to have on the earth and its residents^{79 80}.

b. He also fails to provide evidence to support his claim that there is no scientific basis for alarm about rising sea levels⁸¹:

- Any increase in the rate of rise in sea levels is just as likely to have been caused by oceanographic forcing as by anthropogenic forcing⁸².

This is unsubstantiated speculation.

- There is no cause for alarm⁸³.

Evidence⁸⁴ indicates that sea level rises have accelerated. As the extent of future rises will depend on the extent of future atmospheric warming he is not in a position to make that assertion.

- Rising sea levels are not accelerating⁸⁵.

Recent research confirms that the rate of rise is accelerating⁸⁶

C. Makes assertions about the effects of increased CO₂ on ocean acidification that he cannot substantiate:

He asserts that claims that increases in levels of atmospheric CO₂ will cause the ocean to acidify are exaggerated and explains that “as more CO₂ is added to the atmosphere, more is in turn dissolved in

the ocean and this eventually leads to the accumulation of solid carbonates on the sea floor...”⁸⁷ The system he theorizes about would quickly and effectively take most of the CO₂ out of the system, without disturbing the oceanic pH levels significantly. The upshot of this analysis is that there will be a small fall in the oceans pH levels (slightly increased acidity) but the acidity of the oceans will remain within the range of tolerance of most marine organisms⁸⁸.

The author’s grounds for making such assertions are dubious. The current rate of ocean acidification is 100 times faster than the most rapid events in the Geological past⁸⁹ and the effect of large amounts of anthropogenic CO₂ on the ocean and its ecosystems is poorly understood as shown below⁹⁰. Gaps in knowledge include:

- The processes in atmosphere/ocean exchange⁹¹.
- The speed with which this exchange takes place⁹².
- Mechanisms by which carbon is distributed within oceans (solubility/biological pumps)⁹³.
- Effect of climate change on oceans currents, stratification and nutrient supply⁹⁴.
- Effect of increased oceanic CO₂ on deep sea fish⁹⁵
- Effect of acidification on fish, in general⁹⁶.
- Effect of increased oceanic CO₂ on marine ecosystems⁹⁷.
- Effects of pH reduction on oceans on marine biota⁹⁸.
- Effects of ocean acidification on calcium carbonate calcification and dissolution⁹⁹.

Other flaws in his analysis include: his claim that the system can quickly¹⁰⁰ deal with additional CO₂, as it is an unproven assertion and unlikely to be true¹⁰¹, and his disregard of the adverse effect the speed of acidification can have¹⁰² on sea life.

He also fails to acknowledge that:

- The mechanisms that control the air/sea transfer velocity of CO₂¹⁰³ are not understood.
- There is limited understanding that science has about the effects of pH reductions has on biota¹⁰⁴.
- There is a lack of knowledge about how increased CO₂ will effect ocean stratification and nutrient supply¹⁰⁵
- Researchers have few answers to the question of the extent to which the absorption of CO₂ will have on marine organisms and ecosystems¹⁰⁶.
- No one knows what the effect of global warming at a rate that is 100 times the rate of warming previously experienced, will have on ocean acidification.

Given these uncertainties and failures the author is not in a position to know let alone make statements about how increased quantities and levels of atmospheric CO₂ will affect ocean acidification and the marine environment, or indeed the climate system overall.

d. Fails to acknowledge the potentially damaging effects positive feedbacks can cause (see 4.5).

None of the comments by the author represent evidence that rebuts the proposition that global temperatures are rising.

5. CO2 IS DRIVING THE RISING GLOBAL TEMPERATURES

There are three lines of evidence supporting this proposition¹⁰⁷:

5.1. MEASUREMENTS OF ATMOSPHERIC GREENHOUSE GASES (GHG's)

CO₂ is the most prevalent GHG after water vapour. It has increased in atmospheric from pre industrial levels of 270/ppm, to 389/ppm in 2010¹⁰⁸. Since about 1900 CO₂ increases have correlated with increases in global warming over the same period. While this is not proof of a causative connection between increases in anthropogenic CO₂ and temperature it is informative when considered in conjunction with facts shown below.

Less attention has been paid to other GHG's. These include Methane (CH₄), Nitrous oxide (N₂O), and a range of others. The quantities of these gasses relative to atmospheric CO₂ are small but all have grown since pre-industrial times. Their growth presents a potentially new threat because of their powerful warming potential. In equivalent CO₂ terms the global warming potential over a 20 year time horizon for methane is 72, nitrous oxide 289 and the others that range between 5,160 and 16,300 times that for CO₂¹⁰⁹. To the extent that discussion of forced warming has been limited to CO₂ and the exclusion of other GHG's, the GHG effects have been understated. If these other atmospheric gasses are taken into consideration at their current quantity weighted, 20 year global warming potential (GWP) levels, and expressed in CO₂ equivalent terms, the current equivalent atmospheric CO₂ level would much higher than the existing atmospheric CO₂ reading of 389/ppm shown above. Simple calculations suggest that this figure would nearly double. On this basis the Global warming equivalent effect of all greenhouse gasses would be nearly double the CO₂ reading of 389ppm on its own¹¹⁰.

5.2. HISTORY AND FEEDBACK – Changes in atmospheric CO₂ has been shown to be related to the large climate swings over the last 65million years. During periods of low solar activity CO₂ the greenhouse effect (below) has contributed to preventing the earth becoming a virtual block of ice. The process of warming is understood to be that variations in the earths orbit initiated some warming which caused the release of CO₂ and methane from land, plants and oceans. This then amplified the warming effect through further repeats of that process (feedbacks). Data taken from the ice cores show a positive relationship between temperature and atmospheric CO₂ over the last 100,000 and 800,000 years¹¹¹. Less direct Geological evidence indicates that CO₂ values higher than current levels were last seen 20 million years ago¹¹². This indicates we are now in a new climate ball park.

5.3. GREENHOUSE EFFECT – Water vapour, clouds, CO₂ and other gasses in the earth's atmosphere create the GH effect by trapping some solar radiation rather than allowing it to radiate into space.

The molecules absorb some of the radiation (heat) omitted from the earth's surface. Without the GHG effect the earth would not retain adequate heat and the earth's temperature would theoretically be an iceblock at ≈ -18 to -19°C or $\approx 33^\circ\text{C}$ lower¹¹³ than current average temperatures.

5.4. THE ELECTRO MAGNETIC SPECTRUM (EMS) – Atmospheric CO₂ absorbs heat radiated from earth at the infrared wavelength. Satellite measurements show that the quantity of radiation emitted into space at that level has significantly reduced indicating that increasing levels of CO₂ are causing an increase in heat retention in the climate system or a reduction in the level of energy escaping into space¹¹⁴.

5.5. THE AUTHOR:

The author's position is that only minor warming will result from further increases in atmospheric CO₂¹¹⁵, that rising sea levels and ocean acidification scares are environmental exaggerations...¹¹⁶ and that there is no case for the assumption that higher levels of CO₂ are of themselves harmful¹¹⁷. Higher CO₂ levels are not harmful because warming is likely to be a net climate benefit. Higher CO₂ levels "enhance plant growth and aids efficiency of water use"¹¹⁸.

Comments that require a response include:

a. Rising sea levels and ocean acidification scares are environmental exaggerations...¹¹⁹.

The author points out that climate is continually changing¹²⁰ and being influenced by natural phenomena including Milankovitch cycles, variations in the sun's magnetic fields, sunspot activity, geological events, and more. A warmer or cooler planet than it is today is (therefore) far from unusual and nature recognizes nothing ideal about 20th century temperatures¹²¹.

He fails to mention that CO₂ levels have not been above 300ppm for a long time. One source suggests for over the last 650,000 years¹²². According to another source less direct geological evidence indicates that than current levels were last seen 20 million years ago¹²³ while another source suggests that one would have to go back at least 15 million years to find CO₂ levels as high as they are today¹²⁴ when global temperatures then were $\approx 3 - 6^\circ$ warmer and the sea level was 20 – 40 meters higher than at present. He also fails to make any allowance for adverse feedback effects¹²⁵. There is evidence that runaway methane clathrate (methane trapped within a crystal structure) breakdown may have caused drastic alteration of the ocean environment and atmosphere on a number of occasions in the past causing extinctions¹²⁶.

b. Changes in temperature precede their parallel changes in CO₂ by 800 to 2,000 years CO₂ and therefore rule out CO₂ as a primary forcing agent¹²⁷.

The evidence is not that simple¹²⁸. Ice core evidence obtained in the 1990's showed that a powerful feedback mechanism has amplified the changes forced by sunlight. It is believed that a slight change in the tilt in the earth's orbit exposed the tundras to more light causing the release of some greenhouse gases into the atmosphere causing some atmospheric warming. This in turn increased

surface warming causing further release of greenhouse gasses and so on. The bottom line is that tiny shifts in the earth's orbit could set in train enormous swings in a CO₂ driven glacial cycle. This example shows how a change in level of anthropogenic atmospheric CO₂ might be amplified through a feedback loop¹²⁹.

C. Burning all available fossil fuel resources would increase atmospheric CO₂ concentrations by 20%¹³⁰.

The author would appear to be referring to the oceans and atmosphere as a system. He refers to a report by Dr. Tom Segalstad, a geologist at the Geological Museum at the University Of Oslo, Norway that states that burning all currently available fossil fuels would increase the CO₂ concentration of atmospheric CO₂ by just 20%. Dr Segalstad's opinion was apparently part of a report by the organization European Science and Environment Forum (see 12.7). It is now defunct but had as its business members Dr. Gerd-Rainer Weber, a scientist with the German Coal mining association and Richard S Courtney spokesperson for the British Association of Colliery Management. I will say no more.

d. The relationship between temperature and CO₂ declines in a negative logarithmic fashion¹³¹

The author asserts that as the relationship between temperature and CO₂ declines in a negative logarithmic fashion, the increase in CO₂ from the pre industrial level of 280 to (the current) 380ppm must already have caused most of the warming that is supposedly being caused by a increasing levels of atmospheric CO₂¹³². The implication is that further increases in CO₂ will have at worst only minor effects on warming¹³³. He is effectively arguing that atmospheric CO₂ would reach saturation levels reasonably quickly.

Figure 15 in the book is used to substantiate the assertion. Although this claim is old science the information conveyed by this figure would be a potentially important new piece of evidence if its veracity and balance were to be proven and can be shown to apply in a climate context. In an endeavour to examine this evidence, this writer tried but could not access let alone develop a view on the reference. The book indicates that figure 15 is based on the MODTRADA atmospheric model at the University of Chicago. It gives the name of an article but not the name of the author/ creator. The source is shown as the 2nd Heartland Conference¹³⁴. Putting aside the implications of the name Heartland, the conference web site was accessed through Google and lists 75 untitled videos showing the speaker's name but not the title of the presentation. Printed matter was not referred to. There was no obvious way to match the information on the web site with the reference in the book.

In retrospect the claim of a negative logarithmic relationship is highly likely to be invalid because:

- According to current science, the rate of atmospheric absorption of radiation (one of the forms energy takes) is an intricately varying function of its wavelength and is influenced by a number of factors that include: the CO₂ content, temperature and pressure, the state of the various layers of atmosphere and the mechanism by which the contents of the atmosphere respond to

added or reduced CO₂¹³⁵. The equations reflecting the science indicate that if it is assumed that the atmosphere starts with the preindustrial CO₂ level of ≈300ppm, a quadrupling of CO₂ to 1,200ppm would reduce the transmission in the 10-22 micron wavelength band by about 11% leaving approximately 60% of the energy input still being transmitted through the atmosphere¹³⁶. This indicates that even though there is an exponential factor in the relevant equations it does not work in the way the author outlined because of the other factors at work. The essential conclusion is that there is no prospect of a saturation of the atmosphere with CO₂¹³⁷ as the author has asserted.

- It is one thing to claim that there is the X/Y relationship that the author does, but it is quite another to demonstrate an understanding of it. If the figures are from the ice core data, as the author indicates, they must reflect surface temperatures and pressures. As shown above, both atmospheric pressure and temperature (which affect the rate of the absorption factor otherwise called the energy decay) vary with height above surface levels so his figures are not representative of the effects in the total atmosphere.
- The y axis of fig 15 in the book shows CO₂ increments in steps of 20ppm starting at zero. The earth has never atmosphere CO₂ levels so low, so the figures lack reality.

e. Climate sensitivity to a doubling of atmospheric CO₂ levels is less than that proposed by the IPCC¹³⁸.

This implies that a doubling of atmospheric CO₂ will increase temperatures by a much lower magnitude than is assumed by conventional science. The author claims that the IPCC cherry picked evidence by taking positive feedbacks into consideration but not negative feedbacks. In support of this assertion he quotes an opinion by R D Lindzen in the Wall Street Journal, on 30th November 2009, who thinks that a climate system dominated by positive feedbacks is implausible¹³⁹. The author claims that this intuition is supported by many research papers suggesting that net climate feedback of doubled CO₂ will be at most a few tenths of a degree of warming¹⁴⁰.

A quote from a daily newspaper reporting an intuitive feel by a scientist hardly represents evidence. He indicates that many research papers by independent science papers support that intuition¹⁴¹. He fails to mention that of the many papers (13 are listed) he refers to, at least 7 were written by or involved authors whom he would call independent but who would define by others as deniers^{142 143}. He also fails to mention that the overwhelming majority of climate scientists support the conventional climate science view. The issue is undoubtedly complex as shown by section 3 of IPCC paper which involved over 60 distinguished authors¹⁴⁴ and many papers on the issue. A selection of papers following a Google search for academic papers relating to “Doubling of atmospheric CO₂”, suggest that the feedback effect will be worse than the author suggests¹⁴⁵. Although it is accepted that there are papers that support the author’s views, the picture he paints misleads by failing to indicate the extent of the range of views on the matter.

f. CO₂ is always good.

The author asserts that CO₂ enhances plant growth and improves the efficiency of their water usage. Neither does any case exist for the assumption that higher levels of carbon dioxide, of themselves, are harmful¹⁴⁶.

The author has selected his words carefully. In a climate context CO₂ can have both good and adverse effects. If a feedback effect of the kind outlined in 5.2 were to be caused by global warming the adverse consequences could be very serious indeed.

g. The author fails failure to acknowledge the EMS evidence¹⁴⁷.

The author should be aware of the EMS evidence but chose to ignore it.

h. Increases in atmospheric CO₂ shows a poor correlation with temperature¹⁴⁸

Temperature is influenced by various factors including CO₂ variations. Modelling from ice core data suggests that over the last 800,000 years the correlation between CO₂ and temperature has been high. That there has been a low correlation between the two at other times does not discount the influence it is likely to have exerted on climate. (See references at 5.2).

None of the author's comments or arguments represents evidence that overturns the proposition that "CO₂ is driving global warming".

6. ANTHROPOGENIC CO₂ HAS CONTRIBUTED TO (THAT) WARMING

This proposition is based on three lines of evidence:

6.1. HUMAN ACTIVITIES PRODUCE SUBSTANTIAL VOLUMES OF CO₂ – In 2008 the annual production of anthropogenic CO₂ was running at ≈ 10 GT of carbon¹⁴⁹ (or ≈ 37GT of CO₂.) Human activities have produced ≈839b metric tonnes of carbon since the start of industrialization¹⁵⁰. This figure is enough to raise the atmospheric level of CO₂ to 500ppm. It is "only" 388ppm today¹⁵¹ because the oceans and biosphere have absorbed the balance. Even so we still produce CO₂ faster than they can absorb it¹⁵².

6.2. ISOTOPE GROWTH – The atmosphere in the normal course of events contains the isotopes C₁₂ and C₁₃ in given proportions measured by the ratio (C₁₃/C₁₂). Fossil fuels namely oil, coal and gas, contain much more of the isotope C₁₂ than they do the isotope C₁₃. In the atmosphere the fraction of the lighter isotope is growing significantly and reducing the ratio (C₁₃/C₁₂). This indicates that that the rise in CO₂ levels is likely to be from humanities use of fossil fuels¹⁵³.

6.3. NON NATURAL GASSES – Some atmospheric gasses do not have a natural origin yet are showing up in increasing amounts in the atmosphere. These gasses include halo carbons which are used for refrigeration, air conditioning and fire fighting systems, ozone which sources from petrochemical

smog and nitrous oxide which are from the combustion of fossil fuels and biomass, and also from fertilizers¹⁵⁴.

6.4. THE AUTHOR:

The author's broad perspective is that the influence of humans on climate is small and that anthropogenic caused increases in atmospheric CO₂ only have local effects and that any human signal is probably buried in the variability and noise of the natural climate system¹⁵⁵. The arguments that support this view include:

a. Humans contribution to global warming is at worst, small¹⁵⁶.

His general point is that the scale of anthropogenic CO₂ emissions in relation to the planetary carbon system is small and should not be of serious concern¹⁵⁷. He argues that of the ≈ 7 GTC/PA¹⁵⁸ that humans add to the atmosphere half is unaccounted for. Given this and that the inventory of atmospheric carbon is 780 GTC, then humans contribute about .45 of 1%, ($7/2 * 780$) of the greenhouse warming in a year¹⁵⁹. This means that 99.55% of the greenhouse gas effect has nothing to do with human emissions. The implication is that human contribution to warming is small.

This argument is flawed on a number of counts:

First, he understates the current levels of anthropogenic caused carbon emissions. If the effects of all human activities are included, the figure for annual human emissions of carbon for 2008 is 8.67 GTC¹⁶⁰ from burning fossil fuels alone plus the effect of land use change of 1.2 GTC¹⁶¹ gives total anthropogenic caused carbon emitted in 2008 of 9.87 GTC or ≈ 10 GTC/PA. This is over 40% different from the author's figure of ≈ 7 GTC/PA.

Second, the use of mass of the carbon content of CO₂ as a metric rather than the mass of the CO₂ itself may create the impression that anthropogenic emissions are smaller than they really are. The carbon figures should be multiplied by ≈ 3.7 ¹⁶² to convert them to CO₂. The resulting figure of 36.6b tonnes of CO₂ ($9.87b * 3.7 \approx 36.6$ billion tonnes annually) gives a better idea of the significance of annual human emissions. Gas is conventionally thought in terms of volume in litres (vl). The annual mass of human CO₂ emissions, converted to volume is $1.863 * 10^{16}$ litres¹⁶³ or 18.63 quadrillion litres of CO₂ caused by humans each year. To put that into perspective, humanity emits or causes to be emitted a volume of CO₂ each year of 18,630,000,000,000,000 litres.

Third, when establishing what he asserts is the numerical significance of the anthropogenic contribution to the greenhouse warming he does not properly measure the relevant numbers on a like with like basis. Anthropogenic carbon emissions are part of annual flows or fluxes¹⁶⁴. The level of atmospheric carbon is an inventory¹⁶⁵ or reservoir, albeit a theoretical one measured at a theoretical point in time and affected by over 100 years by of human activity and anthropogenic emissions whereas the flow is for a single year only. Hence it is wrong to divide anthropogenic annual flows by the total atmospheric carbon inventory and on that basis of this calculation conclude that the

anthropogenic contribution to greenhouse warming in a year is only .45 of 1% per the calculation above. The correct calculations depend on what you are trying to achieve. Take two examples.

If the anthropogenic share of total annual carbon flows is required the answer is $1.7\% = 3.5^{166} / 210^{167}$. It could then be validly concluded that 1.7% of the annual flows of carbon is anthropogenic¹⁶⁸ assuming the figures are accurate. Little more could be said about the size of the influence of human emissions on warming, without further information.

If the anthropogenic share of the atmospheric carbon inventory is required the process is a more complicated. if X is taken to be the quantity of human generated carbon still in the atmosphere out of a total atmospheric carbon inventory of 780 GT, the proportion the anthropogenic proportion of atmospheric carbon would then be $(X/780=Y)$ where Y is the proportion of human emissions still in the atmosphere. If the assumptions shown in the book are used to get a feel for Y, answer would be $\approx 10.7\%$ ¹⁶⁹. The Carbon Dioxide Information Analysis Centre puts a higher figure on anthropogenic CO₂ from fossil fuels alone, still in the atmosphere at 14%¹⁷⁰. Whether flows or inventory is used as a basis to indicate the size of human effect, the author has significantly understated the significance of human emissions in the climate equation.

Fourth, he provides no evidence to show that the greenhouse effect of carbon on climate is related to size. Even if his figure of .45 of 1% were to be accepted for purposes of this discussion, its “small” size can not be used to assert that its contribution to the greenhouse effect is also small without backing this up with theoretical or observational evidence that supports the assertion. The author simplifies what is a complex issue. There are examples in science where the very small can have an effect disproportionate to its size¹⁷¹.

b. The IPCC’s estimates of residence time of CO₂ in the atmosphere are likely to be overstated by two orders of magnitude¹⁷².

The author raises two reasons to justify this assertion. The **First** reason is that natural factors could be driving the declining (C_{13}/C_{12}) ratio as described in 6.2 above. Specifically he indicates that soil and forest carbon are strongly depleted in C_{13} and these may be partly driving the decline. He also asserts that Independent studies imply that the natural processes of marine out-gassing of CO₂ and juvenile out-gassing from volcanic sources must be more important than argued by the IPCC¹⁷³. The **Second** reason is that the numerical calculations of atmospheric CO₂ residence times provided by independent scientists show that the IPCC is significantly overstating these times. The author concludes on the basis of the two points that the burning of fossil fuels in contributing to rising CO₂ levels is less than argued by the IPCC^{174 175}.

The qualification of the first reason by the terms “may” and “imply” indicate that his comments are speculative and do not represent evidence and should be disregarded.

His second reason oversimplifies what is a complex matter:

- The author quotes a paper by Professor Lam¹⁷⁶ to show that all published models up to the third IPCC assessment report show an average CO₂ atmospheric residence time of 400 years¹⁷⁷.

Professor Lam's paper actually shows it as 400 years plus or minus 20% and later in the paper indicates that this measure of the atmospheric residence time of that order of magnitude is probably correct¹⁷⁸. He also comments that "it is not possible to experimentally measure the value of the residence time without measurements over many centuries"¹⁷⁹.

The author asserts that abundant published research shows that the atmospheric lifetime of CO₂ of 400 years (he attributes to the IPCC) is inflated by two orders of magnitude compared with the 5-15 years estimated by independent scientists¹⁸⁰. The abundant published research the author refers to are four papers. Three of these are by T V Segalstad, a scientist who appears to have denial associations¹⁸¹. The other reference was a 1985 paper by E T Sundquist. Later work by G H Meehl in 2007 gave a range of 30-95 years subject to qualification and as already noted, Professor Lam considers that a 400 year atmospheric residence time is probably correct. The author does not acknowledge that there is a wide range of views about estimated atmospheric lifetime of CO₂.

- A recent paper has argued that shorter CO₂ atmospheric resident times do not support the argument that increased atmospheric CO₂ is not due to anthropogenic emissions. This is because the rate at which atmospheric concentrations rise and fall depends on the net difference between fluxes into and out of the atmosphere rather than their total volume therefore the long term rise in atmospheric CO₂ levels, is essentially independent of residence time of CO₂ in the atmosphere¹⁸².
- The above two dot points indicate that the author is not in a position to make the assertion outlined in **b** above.

C. Science provides no unambiguous evidence that dangerous or even measurable human caused global warming is occurring¹⁸³.

Perhaps evidence is in the eye of the beholder. This reviewer believes that the evidence at points 6.1, 6.2 and 6.3 read in conjunction with sections 3, 4 and 5 rebuts this assertion.

d. No human caused greenhouse signal has been measured or identified¹⁸⁴.

He does not define what he means by a greenhouse signal and its context does not make it clear. The evidence at points 6.1, 6.2 and 6.3 read in conjunction with sections 3, 4 and 5 provides sound grounds for believing that human activities are contributing to global warming.

e. The IPCC's hypothesis that human caused global warming has been repeatedly tested and failed¹⁸⁵.

He does not provide any evidence to support his assertion of repeated testings and failings. The evidence at points 6.1, 6.2 and 6.3 read in conjunction with sections 3, 4 and 5 provides sound grounds for believing that human activities are contributing to global warming.

f. The proper null hypothesis that the global changes we observe today are natural in origin has yet to be disproven¹⁸⁶.

This comment has been dealt with at 8.1g

g. Anthropogenic caused increases in atmospheric CO2 only have local effects¹⁸⁷.

He does not adduce adequate evidence to support this assertion.

h. Any human signal is probably buried in the variability and noise of the natural climate system¹⁸⁸

The likely effects of anthropogenic activities on temperatures, has been measured¹⁸⁹.

None of the author's comments represent evidence that could be used to overturn the proposition that "Anthropogenic CO2 has contributed to (that) increase".

7. VIRTUAL REALITY

Conventional climate scientists have concluded that the planet is warming and that it is likely to have been influenced by human activities. The "historical" evidence for this has been described in sections 3, 4, 5 and 6. What about the future effects? Putting aside forcings from climatic cycles, whose effects can be anticipated and from random events which cannot. They will be influenced by the speed and magnitude of temperature change which in turn will be influenced by the level of future emissions from human activities and by climate effects already in the pipeline. These things cannot be known before the event but judgements about them can and have been made with the aid of computer modelling based on a range of "what if" assumptions.

This work has concluded that temperatures are likely to rise a further 1.1°C to 2.9°C for the lowest levels of emissions scenarios and 2.4°C to 6.4°C for the highest levels¹⁹⁰ of CO2 emissions assumed in the calculations. As it is highly likely that carbon based fuels are driving these outcomes the obvious response of society is to curtail their use.

The lobbies see this information as a threat to their future welfare and attack the veracity of the models. Recent research¹⁹¹ has confirmed what has long been suspected that projecting outcomes accurately can be problematical. Precision is not needed so the key issue is not the scientific precision with which they project outcomes but whether projections give a reasonable feel the future climate. The judgement of the climate science community is that the projections do give a feel for the future.

Specific criticisms of models by the author are:

a. The models are unable to provide accurate predictions¹⁹².

Any criticism of projections can by definition only be based on theoretical arguments as it is not possible to gather evidence about the future and know whether the models “predictions”¹⁹³ are accurate or are not. Their technical capabilities have been improving massively over recent times and the author has not adduced any recent specific arguments to justify his assertions. Some models have produced a good match between observations of global temperatures¹⁹⁴ and at other times have presented challenges. They have been validated using techniques described in (d). Although they have strengths and limitations¹⁹⁵ they represent the only way to obtain a rational view of future climate.

b. There is no theory of climate like there is a theory of gravity or general relativity, therefore no theoretical computer model can predict future global climate¹⁹⁶.

With this comment the author is intruding into the realm of one of the social sciences that deals with the way modern man constructs reality. In the particular science reality scheme which “science” has constructed, modern concept of Gravity can be regarded as a subset of general relativity which in turn can be regarded as a subset of Astrophysics which in turn can be regarded as a subset the discipline of Physics. There is no such thing as a theory of Physics except to the extent that there are theories underlying the subsets that are captured under the rubric of Physics. Likewise there is no theory of climate except to the extent that there are theories of the subsets of which it is composed.

C. The use of parameterization leaves models open to tweaking¹⁹⁷.

His use of the term tweaking implies manipulation to achieve the “required” answer. Wikipedia describes the term **Parameterization** in a weather or climate model within numerical weather prediction as “a method of replacing processes that are too small-scale or complex to be physically represented in the model by a simplified process”¹⁹⁸

It is a process used in a range of commercial and computer applications and has no vice as the author is perhaps trying to imply. Modelling of any kind can be subject to manipulation in a number of ways, with or without the use of parameterization. Having raised this point he does not adduce any evidence to demonstrate that manipulation is happening or has happened with the climate models. (See also, d below).

d. The IPCC models have not been validated¹⁹⁹.

Climate models are validated by a process called “hind-casting”. This is a process where the veracity of a model is validated by ascertaining whether it can project a known period of climate history from defined starting point, reasonably accurately (also see a). If the model projects that period of climate history reasonably accurately its structure and operation is assumed to be good enough to project future scenarios. Given that the future is not yet with us, the author has not indicated how he would like to see the projected outcomes validated. (See above).

e. Computer models suffer from, “the Kelvin fallacy.”²⁰⁰

According to the author this means that their operations assume that there are “no unknown unknowns”²⁰¹ and are therefore flawed. The point is nonsense.

f. Implies that statistical climate models would perform better than, the deterministic models being used²⁰².

The term “Statistical models” as described by the author project future outcomes based on historical data. Projections by these models are not, by definition, able to identify the elephant in the room namely the historically recent and unprecedented effects of anthropogenic activities on climate. The proposal also misses the point that modelling scenarios for a range of alternative scenarios, as done by the IPCC, is another way of taking climate uncertainty into account.

g. There are 7 inadequacies in the computer models²⁰³.

Two examples are considered. In one example he states that “the models understate surface evaporation in response to increased temperature by a factor of three.” Putting the accuracy of this assertion aside, the author is blaming the tool when he should be blaming the tradesman. The author is confusing two separate issues.

Take another example. “No IPCC model was able to successfully forecast the temperature record that actually elapsed between 1990 and 2009.” GCM’s were never intended to predict or forecast specific events. (See narrative above) They only ever intended give a feel for a particular situation which they do quite adequately do.

h. Computer model projections on deterministic models do not represent evidence²⁰⁴.

No matter how we describe the output of the models (evidence or not evidence) the key issue is the extent to which the models outcomes give a reasonable feel for what climate problems are likely to eventuate if we continue to use carbon based fuels, and pollute the way we have over the last century. None of the author’s criticisms showed that the current models do not give a reasonable “feel” for the future for various pollution scenarios.

8. PUBLIC REALITY

8.1. THE AUTHOR:

By public reality the author means the public belief that anthropogenic warming is occurring. He claims that the public reality is driven by the flawed IPCC reports, bullying by extreme environmental NGO’s and scientific academies ably supported by the press and media who carry the required message²⁰⁵.

The author:

a. Asserts that science is not about consensus²⁰⁶.

Achieving a consensus has historically been the way the scientific and indeed any other professional community signify their acceptance of an idea or principle for general use within the profession. It would be difficult to visualize how professional life would be able to progress without it. Thomas Kuhn²⁰⁷ explained years ago that the (scientific) truth can not be established solely by objective criteria but as defined by a consensus of a scientific community”.

b. Fails to produce balanced commentary²⁰⁸.

Scientists recognize that certainty in science does not exist²⁰⁹, and express their findings to reflect the uncertainties. Hence conclusions are often expressed in terms of verbal probabilities such as “likely”, “very likely”, “unlikely” and “not likely”. Typically the author’s comments are in the form of unqualified assertions that leave no room for doubt when often there is clearly room for it (See section 9).

c. asserts that the science of humanity caused global warming has become an ideologically driven world conspiracy. To quote “...the global warming conspiracy...is the greatest self-organized scientific and political conspiracy that the world has ever seen...²¹⁰”.

Given the strength of the evidence that supports the 4 propositions quoted earlier herein, the author’s assertion sounds somewhat hollow.

d. Uses copious references from denial sources.

The following examples are typical of the point.

- Reference (8), quoted 4 articles by J McLean, is in a publication by the Science and Public policy Institute, a right wing think tank whose personnel listed on their web site included the Author as a scientific advisor.
- Reference (87), included Christopher Monckton whose career can be obtained from Wikipedia. He asserts that global warming will be no more than a few tenths of a degree. Monckton is referred to by the author as a scientist but not usually regarded as such. He is however a well known climate denier and inter alia, holds the position of Chief Policy advisor to the Science and Public policy Institute.
- Reference (221) quotes himself in a popular UK magazine Energy and the Environment in 2006. This is one of seven he makes to himself or his work.
- Reference (307) is to president Vaclav Klaus, an Economist and President of the Republic of Czechoslovakia. The author describes Dr Klaus as “one of the few heads of state in discerning the threat that it poses”. The meaning of “it” is not totally clear but seems to mean his reluctance to accept conventional climate science of global warming and the associated recommended action. In his recent trip to Australia Dr Klaus equated climate action by Government with bureaucratic control and analogous to Communism.

- Reference (112) uses the NONIPCC as the authority for the claim that two widely held assumptions about rising sea levels are wrong. It is apparently a parody of the IPCC and has been formed to oppose the notion of anthropogenic caused climate change. This organization is an offshoot of the Heartland Institute a right wing think tank.
- Reference (64) is to an article by C Loehle in “Energy and Environment” whose editor is Sonja Boehmer – Christiansen. The editor has stated: “all voices should be published and debated. However, the opposite then happened in her journal once climate research...“became de facto servants of global and EU energy ambitions.”
- The reference (165) for the section on “other limitations of GCM’s²¹¹” included a paper co authored by Dr. Willie Soon an Astrophysicist who sits with the author on the Science & Public Policy Institute, referred to earlier and a chapter by Professor Christopher Essex in a book published by the Fraser Institute an “extreme right-wing libertarian think tank”.
- The rare insider insight into the deficiencies of GCM’s²¹² is an article in “Quadrant” by John Reid. The article is an essay about the politics and philosophy of global warming and within the CSIRO and his general views on modelling. It is a fine essay by an author who appears to be a true sceptic. It does not give the rare insider insight claimed by the author and hardly represents quality evidence to support the author’s negative views of computer models.
- Of the many references that are now available to support the notion of anthropogenic warming, not one was alluded to, to provide a counterpoint.

e. Misrepresents the significance of the event referred to as “Climategate”²¹³.

The event began when servers at the Climate research Unit (CRU) at University of East Anglia, were hacked, and emails stolen. Some the emails between climate scientists were published on the internet. Specific quotations therein were seized upon, misinterpreted and used to claim that there was a conspiracy to manipulate data and to falsely justify and maintain a claim that the planet was warming. The author’s book states that this event “shows unequivocal evidence for data manipulation aimed at the suppressing the medieval warming pattern, as required by IPCC orthodoxy...”

The facts are different. The most readable popular account of the affair is by Fred Pearce a respected journalist and science writer, who investigated the events and embodied the results in his book, “The Climate Files”. He concluded that “none of the 1,073 emails or the 3,587 files containing the documents, raw data and computer code upsets the 200 year old science behind the greenhouse effect”. The official investigations included that by the House of Commons Science Technology Committee, The University’s own Scientific Assessment panel and the Royal Society all of came to conclusions that cleared scientists of wrongdoing. The author ignored this evidence in the book and continued peddling the same disinformation in the “Age” newspaper as recently as 27th June, 2011.

f. Claims that he is independent²¹⁴.

The author claims that he is a voice of reason that stands between two extreme positions on the issue. He will find that this position will be difficult to maintain in the public domain as he has been and is perceived to be a climate denier. This essay shows that the book does not present a balanced

view of climate change and I find it difficult to understand why he finds it necessary to pretend that he is independent when he is clearly not.

g. Claims that the null hypothesis that “causes (presumably of global warming) have a natural origin”, remains unfalsified²¹⁵.

This comment is misleading. There has been ≈ 100 years of science²¹⁶ leading to the acceptance by the overwhelming number of climate scientists that recent warming is likely to have been caused by human activity. This is now the current scientific wisdom. If there is an hypothesis that needs to be falsified it needs to be this one that is generally accepted within the scientific community namely that “causes (of global warming) have an anthropogenic origin”

h. Asserts that “there is simply no credible published research that shows that the net human costs and environment risks of a given amount of future global warming exceed the costs and risks of an equivalent global cooling²¹⁷”.

I think the author is trying to say that all options for dealing with climate change have not been properly investigated and evaluated from an economic viewpoint. The lack of research he may be referring to is a “Cost benefit analysis” (CBA) typically used by Governments to, inter- alia, evaluate usually economic policy options under conditions of uncertainty. If this is so, the option with the highest net present value (NPV) or lowest net present cost (NPC)²¹⁸ is the principle by which the preferred option is determined. The weaknesses in the method are legion. The most significant of these is that its processes are value laden and present ridiculous decision options when used outside a purely economic context, as shown by one simple (totally artificial) example.

Assume that the cost to the world of limiting warming to <2 degrees C over the next 50 years will have a Net present cost to the world of \$US5 trillion ($\$5 \cdot 10^{12}$) but that this expenditure will save 1 million people in Bangladesh from death? Does each person have a NPV of at least \$US5 million each? As the examples become more complex the logic underlying the CBA becomes less relevant and increasingly bizarre.

i. Claims that his objective is to encourage people to “...trust authority less and use their own brains more”²¹⁹.

For people to be able to meet his aspiration, requires a flow of accurate information which the author’s book fails to provide as evidenced above. There is an obvious gap between the author’s apparent aspirations and his actions reflected in the book.

j. Implies that assumptions made about denialists are wrong²²⁰.

Two examples he gives are that people say: He is paid by the fossil fuel industry, and is merely repeating their spin and she works for a left/right wing think tank, so her work is tainted.

The reason people are likely to feel this way is because those assumptions meet the test of commercial common sense. (See section 1).

9. RISK MANAGEMENT

The author asserts²²¹ that the precautionary principle²²² is not a sound basis on which to develop policies to deal with climate change. This assertion is consistent with his beliefs that global warming is not real. He asserts that even if global warming is real, it will not be problematical and asserts that in any event human action can not prevent the climate changing so preventative action would be both unnecessary and costly. He proposes strategies of adaptation as a replacement for precaution. These views contrast with the “Stern report” which indicates that both precautionary and adaptive actions will be required²²³ to deal with the worst aspects of climate change.

a. The unqualified confidence with which the author dismisses precautionary action as a strategy to mitigate the effects of global warming is fraught. “Nothing in science is certain²²⁴” is a scientific axiom so his apparent absolute belief in his own views. This problem is accentuated by the fact that his views are the opposite of a whole scientific community. Although he has bagged their views and work, it is simply not rational to assign zero value to their opinions as the author has implicitly done.

b. The author sees no need to subject his ideas to a risk analysis or to apply the precautionary principle²²⁵ because, to quote²²⁶ “No scientist can tell you with confidence whether the temperature in 2020, let alone 2100, will be warmer or cooler than today’s. The author should know that forecasting temperatures for specific years is not what the models are used for and are not needed in any event. They are risk management tools that provide a range of information based on different assumptions that help scientists and decision makers understand the range of possible future climate outcomes. See also section 7 that deals with related issues.

C. His other reasons for avoiding the use of precautionary principle include:

- To quote²²⁷: “Any such cooling will have a strong negative impact...In such circumstances, the precautionary thing to do would be to increase the amount of CO₂ in the atmospheres because of its mild warming and plant fertilization effects”.
- To quote²²⁸: “At the same time given its value as a non renewable energy source, it would be a sensible precaution not to irresponsibly squander the extra 30-40% of coal that is required to sequester the CO₂ emitted by coal fired power plants, at the same time thereby happily avoiding the great costs that are engendered for no measurable environmental benefit should a sequestration policy be implemented.”
- To quote²²⁹: “The only sensible precaution that can be taken in our present circumstances is to plan for a continuation of the present climate trend...”

I will let these quotes to tell their own story.

10. CONCLUSIONS

See section 1.

11. AUTHOR AND AUTHORS “ACKNOWLEDGEMENTS”

The denial connections of the following people listed in the “Acknowledgements” are shown below showing only abbreviated names of the organizations it is alleged they are associated with. Section 12 gives the unabbreviated names of the organization, a brief profile of each and the source of the information:

11.1 THE AUTHOR

Robert (Bob) Carter is an Australian marine geologist and AGW denier who is an adjunct Research Fellow at the Marine Geophysical Laboratory at James Cook University^[1] in Australia; he is also on the academic advisory council of the Global Warming Policy Foundation.^[2] According to the *Sydney Morning Herald* in 2007, Carter was "on the research committee at the Institute of Public Affairs, a think tank that has received funding from oil and tobacco companies, and whose directors sit on the boards of companies in the fossil fuel sector" and believed, SMH said, that "the role of peer review in scientific literature was overstressed."^[3] (THE CITATIONS RELATE TO THE INTERNET ARTICLE NOT THIS ESSAY).

Carter is Chief Science Advisor to the International Climate Science Coalition^[1], funded in part by the Heartland Institute^[4], which is funded by the industries involved in producing greenhouse gases. Carter was a speaker at the International Conference on Climate Change (2009), organized by the Heartland Institute^[5] Carter is also listed as a speaker for the Heartland Institute's June 2009 Third International Conference on Climate Change.^[6] Carter's climate reasoning is selective and raises questions:

"Carter goes to some length to claim that the surface temperature record (according to institutions like NASA GISS) is unreliable. In fact he implies that it's downright useless. Yet he also states that the satellite record is reliable... [But] if the satellite record is so reliable but the surface record is so useless, why do they agree so closely?"^[7] In March 2007, the *Sydney Morning Herald* reported that Carter asserted that the Intergovernmental Panel on Climate Change had uncovered no evidence the warming of the planet was caused by human activity. He said the role of peer review in scientific literature was overstressed, and whether or not a scientist had been funded by the fossil fuel industry was irrelevant to the validity of research. 'I don't think it is the point whether or not you are paid by the coal or petroleum industry,' said Professor Carter. 'I will address the evidence.'"^[8] Carter has also asserted that "atmospheric CO2 is not a primary forcing agent for temperature change," and claimed that "any cumulative human signal is so far undetectable at a global level and, if present, is buried deeply in the noise of natural variation".^[9] Carter is a member of the right-wing think tank the Institute of Public Affairs^[10], and a founding member of the Australian Environment Foundation, a front group set up by the Institute of Public Affairs.

Carter is a geologist who writes in the field of geology^[13]. Some of Carter's work has involved what is known as "paleo-climatic research," including participation in the Ocean Drilling Program Leg 181 try to create a benchmark of the 4 million year-long, mid-latitude climate record.^[14] Funding for this program reportedly "came to its planned and natural end"^[15] around 2002. Journalist Robyn Williams wrote that with the end of the drilling program,

"...many of us began to receive helpful items from Carter, clearly meant for publication, most knocking the orthodoxy, the bleak line on global warming. The first, a scripted talk, I duly put to air. Then a similar piece turned up in The Australian newspaper; then he was on Counterpoint, ABC Radio National, twice, all with the same position. "This was becoming not so much the availability of a helpful boffin, more pressing a line.... I...discovered that Professor Bob Carter, geologist from Townsville, was a vocal member of the Institute for Public Affairs (IPA)."^[16] In 2005, Carter was appointed by the Australian Minister for Environment, Ian Campbell, as a judge for the Australian Government Peter Hunt Eureka Prize for Environmental Journalism.^[17] He is an advisor to the Campaign to Repeal the Climate Change Act (repealtheact.org.uk)^[18]

Source: http://www.sourcewatch.org/index.php?title=Bob_Carter

The author's personal biography can be seen at <http://members.iinet.net.au/~glrmc/>

11.2 Authors acknowledgements in book

The abbreviations after the name are organizations which can be identified in section 12.

1. William Kininmonth
Connection references –ACRI, FI, HI, LG, LG, SPPI, and ICSC. (Source of info = “desmogblog”)
2. David Evans
Connection references –ICCC, LG, and LVMI.
(Source of info = “desmogblog”)
3. Willie Soon
Connection references –CSPP, FI, GMI, HI, SPPI, and GCS.
(Source of info = “desmogblog”)
4. Jennifer Marohasy
Connection references –IPA in WA
(Source of info = “desmogblog”)
5. Walter Starck
Connection references –AEF
(Source of info = Sourcewatch)
6. John Mclean
Connection references –NZCSC
(Source of info = http://mclean.ch/climate/global_warming.htm)

12. “DENIAL” ORGANIZATIONS

The sources of information for the organizations are shown at the bottom of the relevant narrative. An organization’s profile of itself can usually be obtained from its web site.

12.1 Australian Climate Science Coalition (ACSC)

Is a climate change skeptics website created by the Australian Environment Foundation (AEF), a spin-off group created by the corporate funded think tank, the Institute of Public Affairs. ACSC states that it works "closely with the International Climate Science Coalition"^[1] (see below) and that it does "not believe that past and current climates are sufficiently well understood to enable projections of future climate changes to be accurately predicted."^[1]

http://www.sourcewatch.org/index.php?title=Australian_Climate_Science_Coalition

12.2 Australian Climate Research Institute (ACRI)

The name appears on his “desmogblog.com” profile but the name does not appear when it is typed into Google. It appears to be an organization run out of William Kinninmonth’s home. Source: desmogblog.com

12.3 Australian Environment Foundation (AEF)

It is a front group founded by the Institute of Public Affairs (IPA), a conservative Melbourne-based think tank. The director of the environment unit of the IPA, Jennifer Marohasy was the founding Chairwoman and is listed as a Director in the organisation's documents with the Australian Securities and Investment Commission (ASIC). Marohasy is also the listed registrant of the group's website, although the address and phone number for the website registration are identical to the address and phone number for the Victorian office of the logging industry front group, Timber Communities Australia. [1] [2] In July 2005, the month after AEF's official launch, it was announced that former television celebrity Don Burke had been appointed chairman. [3] ASIC documents also listed Mike Nahan, the former Executive Director of the IPA, as one of the other founding directors. The documents also listed AEF's registered place of business as the IPA office. (Nahan was ED of the IPA until mid-2005). In a column by Nahan in the *Herald-Sun*, he described AEF as "pro-biotechnology, pro-nuclear power, pro-modern farming, pro-economic growth, pro-business and pro-environment." [4] AEF managed to jump the queue for Deductible Gift Recipient (DGR) Status awarded to not for profit charities whose purpose is to help save the environment. This status was awarded by the Department of Environment and Heritage (DEH) and approved by the Federal Liberal Environment Minister. DGR Status entitles donors to a tax deduction at their marginal rate of tax for every dollar donated. The head of the AEF admitted that it is a group set up to protect timber interests and stop resources being taken away from the industry in an interview on ABC Radio station Triple J's *Hack* program. (Source:

http://www.sourcewatch.org/index.php?title=Australian_Environment_Foundation)

12.4 American Petroleum Institute (API)

Represents the US oil & gas industry.

12.5 Centre for Sound Science & Public Policy (CSSPP) or (CSPP)

Is a non-profit, non-partisan public policy organization. CSSPP relies on scientific experts in many nations and the vast body of peer-reviewed literature to help lawmakers, policy makers, and the media distinguish between scientific findings that are agenda-driven and those that are based on accepted scientific methods and practices. In a timely manner, the Centre's Science Watch Team alerts policy makers, the media, and the public to unreliable scientific claims and unjustified alarmism which often lead to public harm. We strive for a fair and balanced examination of science." (<http://ff.org/centers/csspp/misc/index.html>; accessed 4/21/05)

The Centre for Sound Science and Public Policy, also appearing under the name of the Centre for Science and Public Policy, is run by the Frontiers of Freedom Foundation, an organization founded and chaired by former Senator Malcolm Wallop of Wyoming. Frontiers of Freedom receive money from tobacco and oil companies, including Philip Morris, ExxonMobil and RJ Reynolds Tobacco. Frontiers of Freedom Institute and Foundation has received \$467,000 from ExxonMobil since 1998. (<http://www.exxonsecrets.org/html/orgfactsheet.php?id=35>; accessed 4/20/05) According to the New York Times, Frontiers for Freedom received \$230,000 out of its \$700,000 annual budget from Exxon in 2002, up from \$40,000 in 2001. (Lee, John. "Exxon backs groups that question global warming," The New York Times, 5/28/03) Malcolm Wallop has been a board of directors member of the El Paso Natural Gas Company since 1995. (PR Newswire, "El Paso Natural Gas Company names new director," 1/13/95)

ExxonMobil direct donations to the Centre for Sound Science and Public Policy/Centre for Science and Public Policy:

2002: \$100,000 Source: ExxonMobil 2002 Annual Report
(http://www.exxonmobil.com/corporate/Newsroom/Publications/Corp_P_AnnualReport2002.asp; accessed 4/21/05)

2003: \$50,000 Source: ExxonMobil 2003 Corporate Giving Report
(http://www.exxonmobil.com/corporate/Newsroom/Publications/Corp_P_AnnualReport2003.asp; accessed 4/21/05)

Source:

http://www.cspi.net/integrity/nonprofits/center_for_science_and_public_policy_center_for_sound_science_and_public_policy.html

12.6 Cooler Heads Coalition (CHC)

Its websites, globalwarming.org, were revived by Consumer Alert's National Consumer Coalition in April 2004. The website and group were formed in May 6, 1997, "to dispel the myths of global warming by exposing flawed economic, scientific and risk analysis." Consumer Alert and National Consumer Coalition are industry friendly groups that oppose regulations on industry and advocate "free market" consumer solutions. According to its relaunch press release, "The new web site contains a searchable archive of the Cooler Heads Newsletter, dating back to 1996, and offers users the chance to subscribe to the newsletter. This bi-weekly publication analyzes climate change news and events through scientific, economic and political perspectives." [1]its website states: "The risks of global warming are speculative; the risks of global warming policies are all too real." [2]Originally the group was closely tied to the Competitive Enterprise Institute, and still features many of its industry-friendly analyses of ecological issues. Former CEI director Marlo Lewis chaired the Cooler Heads Coalition. Myron Ebell, CEI's Director of Global Warming and International Environmental Policy, directed it. In March 2001, the nonprofit Clean Air Trust named Ebell its "clean air villain of

the month," citing his "ferocious lobbying charge to persuade President Bush to reverse his campaign pledge to control electric utility emissions of carbon dioxide."Source: http://www.sourcewatch.org/index.php?title=Cooler_Heads_Coalition

12.7 European Science and Environment Forum (ESEF)

Is a defunct organization that existed in the 1990's. It billed itself as "an independent, non-profit-making alliance of scientists whose aim is to ensure that scientific debates are properly aired, and that decisions which are taken, and action that is proposed, are founded on sound scientific principles." Like other "sound science" front groups, its real mission is to disparage the science upon which environmental safety regulations are based, and it was initially a creation of the tobacco industry, which promoted the idea of "junk science" and overregulation. The ESEF was linked, via shared staff (Julian Morris and Roger Bate), to the Institute of Economic Affairs and later the International Policy Network and the Sustainable Development Network. The IEA itself has links to the Adam Smith Institute and FOREST, the UK smoker's rights organisation, and Roger Bate continued to work for the IEA in London, while officially being the Director of the ESEF in Cambridge. In 1996, Roger Bate approached R.J. Reynolds Tobacco Company for a grant of £50,000 to fund a book on risk, containing a chapter on passive smoking [1]. However, the request was denied and the money was never received. In 1997, the ESEF published *What Risk? Science, Politics and Public Health*, edited by Roger Bate which included a chapter on passive smoking; the book's publication was carefully supervised by Philip Morris.

Source: http://www.sourcewatch.org/index.php?title=European_Science_and_Environment_Forum

12.8 Fraser institute (FI)

Is a Canadian think tank. It has been described as politically conservative^{[1][2][3]} and right-wing libertarian^{[4][5]} and espouses free market principles.^[6] Its stated mandate is "to measure, study, and communicate the impact of competitive markets and government intervention on the welfare of individuals."^{[7][dead link]} Named for the Fraser River, the Institute is headquartered in Vancouver, with offices also located in Calgary, Toronto, and Montreal, and ties to a global network of 80 think-tanks through the Economic Freedom Network.^[8] (Source: [Wikipedia, the free encyclopedia](#))

12.9 George C Marshall Institute (GMI)

Is a politically conservative think tank established in 1984 in Washington, D.C. with a focus on scientific issues and public policy. In the 1980s, the Institute was engaged primarily in lobbying in support of the Strategic Defense Initiative.^[1] Since the late 1980s, the Institute has put forward environmental skepticism views, and in particular has disputed mainstream scientific opinion on climate change, although it continues to be active on defense policy. The George C. Marshall Institute has been described by *Newsweek* as a "central cog in the denial machine."^[2] The institute is named after the World War II military leader and statesman George C. Marshall. Historian Naomi Oreskes states that the institute has, in order to resist and delay regulation, lobbied politically to create a false public perception of scientific uncertainty over the negative effects of second-hand smoke, the carcinogenic nature of tobacco smoking, the existence of acid rain, and on the evidence between CFCs and ozone depletion.^[3](Source: http://en.wikipedia.org/wiki/George_C._Marshall_Institute)

12.10 Heartland Institute (HI)

Is a libertarian,^{[2][3][4]} American public policy think tank based in Chicago, Illinois which advocates free market policies. The Institute is designated as a 501(c)(3) non-profit by the Internal Revenue Service and advised by a 15 member board of directors, which meets quarterly. As of 2011, it has a full-time staff of 40, including editors and senior fellows.^[2] The Institute was founded in 1984 and conducts research and advocacy work on issues including government spending, taxation, healthcare, tobacco policy, global warming, information technology and free-market environmentalism. In the 1990s, the group worked with the tobacco company Philip Morris to question the science linking secondhand smoke to health risks, and to lobby against government public health reforms.^{[5][6][7]} More recently, the Institute has focused on questioning the scientific consensus on climate change, and has sponsored meetings of climate change skeptics.^[8] (Source: http://en.wikipedia.org/wiki/The_Heartland_Institute)

12.11 The Independent Summary for Policymakers (ISPM)

Carter is listed as an expert reviewer of the Independent Summary for Policymakers (ISPM), essentially a critical review of the Intergovernmental Panel on Climate Change (IPCC) Fourth Assessment Report. The ISPM is published by the industry-supported Fraser Institute. The Fraser Institute has received over \$60,000 from ExxonMobil and is also financially-supported by several tobacco companies including Philip Morris and British American Tobacco.

The Fraser Institute's **Independent Summary for Policymakers** (ISPM) was published on Feb. 5, 2007, just after the release of the Intergovernmental Panel on Climate Change (IPCC) Summary for Policy Makers, part of the Fourth Assessment Report on Climate Change (AR4). Economist and Fraser Institute Senior Fellow Ross McKittrick served as co-ordinator of the ISPM. The Fraser Institute's ISPM overview page contains an executive summary as well as a link to download the current version of the ISPM. The original version of the ISPM is also available (see section on errors and discrepancies below). For comparison, the various chapters of the IPCC WG1 AR4 report are available at the IPCC AR4 download page. The full citation of this IPCC report is: Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change [Solomon, S., D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Avery, M. Tignor and H.L. Miller (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.

http://www.sourcewatch.org/index.php?title=Independent_Summary_for_Policymakers

12.12 Institute of Public Affairs (IPA)

Is a right-wing, corporate funded think tank based in Melbourne. It has close links to the Liberal Party of Australia, with its Executive Director John Roskam having run for Liberal Party preselection for a number of elections. Following the 2007 federal election defeat for the Liberal Party, *The Australian's* journalist Christian Kerr noted that a new group of federal Liberal politicians were "receiving support from former Howard government staffer John Roskam" at the IPA.^[1] The IPA key policy positions include: advocacy for privatisation and deregulation; attacks on the positions of unions and non-government organisations; support of assimilationist indigenous policy (cf. the Bennelong Society) and refutation of the science involved with environmental issues such as climate change. (Source: http://www.sourcewatch.org/index.php?title=Institute_of_Public_Affairs)

12.13 The International Climate Science Coalition (ICSC)

Is a group of climate change sceptics which describes itself as "an association of scientists, economists, and energy and policy experts working to promote better public understanding of climate change science and policy. ICSC is committed to providing a highly credible alternative to the United Nations Intergovernmental Panel on Climate Change and helping foster a more rational, open discussion about climate issues. Two panels of distinguished scientists and policy experts from more than a dozen countries oversee the ICSC's research and educational efforts."^[1] (Source as for 12.1)

12.14 International Conference on Climate Change (ICCC)

Is a conference series sponsored by the Heartland Institute which aims to bring together global warming skeptics who dissent with the scientific consensus that human-produced greenhouse gases, predominantly carbon dioxide, are causing the Earth's climate to warm.^{[1][2]} The conference has met six times through July 2011, starting from the first in 2008.^[3] Source: http://en.wikipedia.org/wiki/International_Conference_on_Climate_Change

12.15 Lavoisier group (LG)

Is an organisation based in Australia that promotes scepticism of current scientific consensus on global warming. The organisation questions the fears of the effects of global warming, the idea that human activity causes it, and the wisdom of policies designed to curtail it. They believe that political influence has trumped scientific truth, and that most of the scientists that support the theory that human activity is a cause of global warming do so because scientists that disagree with that prevailing belief lose access to government funding, the primary source of funds for any scientific study.^[citation needed] The sources of funding for the group are not public, but the Sydney Morning Herald claimed it has links to many groups that have until recently been funded as part of the Exxon Mobil climate change skepticism campaign. That campaign recently ceased after a shareholder revolt.^[1] The group was named after French scientist Antoine Lavoisier (1743-1794), the father of modern chemistry who disproved the Phlogiston theory of combustion (source: http://en.wikipedia.org/wiki/Lavoisier_Group)

12.16 New Zealand Climate Science Coalition (NZCSC)

Is an organisation based in New Zealand which has the aim of refuting what it believes are unfounded claims about anthropogenic global warming.^[1] Source: http://en.wikipedia.org/wiki/New_Zealand_Climate_Science_Coalition

12.17 Science and public policy institute (SPPI)

See also Science and Public Policy Institute (disambiguation) for George Carlo's organization. SPPI is a global warming skeptics group which appears to primarily be the work of Robert Ferguson, its President; its website draws heavily on papers written by Christopher Monckton. (Source: [http://sourcewatch.org/index.php?title=Science and Public Policy Institute](http://sourcewatch.org/index.php?title=Science_and_Public_Policy_Institute))

SPPI is an organization which concerns itself with issues related to carbon dioxide and global warming. It is based in Virginia, USA and was founded around 2007. It describes itself as: A nonprofit institute of research and education dedicated to sound public policy based on sound science. Free from affiliation to any corporation or political party, we support the advancement of sensible public

policies for energy and the environment rooted in rational science and economics. Only through science and factual information, separating reality from rhetoric, can legislators develop beneficial policies without unintended consequences that might threaten the life, liberty, and prosperity of the citizenry.^[1]

The organization's Executive Director is Robert "Bob" Ferguson, who was previously executive director of an organisation called **Center for Science and Public Policy**.^[2] He is also a former Chief of Staff to Republican Congressmen Jack Fields (1981–1997), John E. Peterson (1997–2002), and Rick Renzi (2002). The chief policy adviser is Christopher Monckton, a former special adviser to Margaret Thatcher. The chief science adviser to the institute was Willie Soon, PhD an astrophysicist and geoscientist, a sceptic of man made global warming and proponent of the theory that climate change is caused by solar variation. However, Soon appears to have left the organization, as he was no longer listed among its personnel on the SPPI's website in 2011. Joe D'Aleo is the institute's Meteorology Adviser. Further science advisers, as listed in 2011, include:

- Robert M. Carter
- Craig D. Idso
- William Kininmonth
- David Legates

(Source: http://en.wikipedia.org/wiki/Science_and_Public_Policy_Institute)

13. REFERENCES

Fry, J et al, (2010), "Encyclopedia of Weather & Climate change", Hinkler Books.

Hamilton, Clive, (2007), "Scorcher: The dirty politics of Climate Change" Black Inc. Agenda.

Kuhn, T S, (1970), "Structure of Scientific revolutions". – Publisher - International Encyclopedia of Unified Science.

Washington, H & Cook, J (2011) "Climate Change Denial – Heads in the sand", Earth-scan London & Washington, 2011

14. TABLE OF AUTHORS KEY SCIENTIFIC COMMENTS

REFERENCE NUMBER IN ESSAY	AUTHORS CLAIM OR ACTION	IS THIS CHERRY PICKING, PARTIAL TRUTH OR MISREPRESENTATION?	BRIEF NOTE ON WHY? (see essay ref for details)
3.4a	150 years is an utterly inadequate period over which to understand climate change	No	Matter of opinion
3.4b	Data sets that underpin the official thermometer record...have been subject to heavy manipulation in order to "correct" them	No	Matter of opinion. Scientific community consider data fair.
3.4c	Measurement of warming is an ambiguous concept	Yes	Not ambiguous if objectives and method specified.
3.4d	"Natural clues" are not evidence.	No.	Matter of opinion.
3.4e	The latest climate trend since 1998 is one of cooling	Yes.	Evidence indicates global climate is warming.
3.4f	Oceans are cooling.	Yes	Evidence indicates oceans are warming.
4.6a	Fails to acknowledge the destructive affect that <u>speed</u> and/or <u>magnitude</u> of warming has been shown to have on the earth and its residents	Yes	Ignores evidence that either can have disastrous consequences.
4.6b	Fails to provide evidence to support his claim that there is no scientific basis for alarm about rising sea levels	Yes	Evidence indicates that there is cause for prudent action.
4.6c	Makes assertions about the effects of increased CO2 on ocean acidification that he cannot substantiate	Yes	Ignores uncertainties in knowledge.
4.6d	Fails to acknowledge the potentially damaging effects positive feedbacks can have.	Yes	Ignores risks the scientific community

			think are important
5.5a	Rising sea levels and ocean acidification scares are environmental exaggerations	Yes	Ignores risks the scientific community think are important
5.5b	Changes in temperature precede their parallel changes in CO2 by 800 to 2,000 years CO2 and therefore rule out CO2 as a primary forcing agent	Yes	Misrepresents the way CO2 operates within climate system.
5.5c	Burning all available fossil fuels would increase atmospheric CO2 concentrations by 20%.	Yes	Not supported by evidence
5.5d	The relationship between temperature and CO2 declines in negative logarithmic fashion.	Yes	Misrepresents evidence.
5.5e	Climate sensitivity from a doubling of atmospheric CO2 is less than that proposed by the IPCC.	Yes	Author not in a position to make that claim.
5.5f	CO2 is always good	Yes	Partial truth. Ignores evidence that CO2 has been associated with both good and destructive effects
5.5g	Failure to acknowledge the EMS evidence.	Yes	Ignores evidence.
5.5h	Increases in atmospheric CO2 shows a poor correlation with temperature	Yes	Partial truth.
6.4a	Human's contribution to global warming is at worst, small.	Yes	Not in position to make this claim.
6.4b	The IPCC's estimates of residence time of CO2 in the atmosphere are likely to be overstated by two orders of magnitude.	Yes	Ignores diversity of scientific opinion on issue.
6.4c	Science provides no unambiguous evidence that dangerous or even measurable human caused global	yes	Evidence indicates that human actions

	arming is occurring. warming occurring		are influencing climate.
6.4d	No human caused greenhouse signal has been measured or identified.	Not sure.	Statement is ambiguous
6.4e	IPCC hypothesis that human caused global warming has been repeatedly tested and failed	Yes	Untrue statement.
6.4f	The proper null hypothesis that the global changes we observe today are natural in origin has yet to be disproven.	yes	Proposes wrong hypothesis.
6.4g	Anthropogenic caused increases in atmospheric CO2 only have local effects. (Not global).	yes	Evidence suggests otherwise
6.4h	Any human signal is probably buried in the variability and noise of the natural climate system.	yes	The likely human signal has been measured.

15. END NOTES

¹ The authors profile is available on the internet at: <http://members.iinet.net.au/~glrmc/>

² Where possible, references are based on sources that are readily accessible from the internet. Wikipedia is a major source. Wikipedia articles are usually written in a way that is accessible to the public. They also usually give the original sources on which the article is based. This approach gives a reader great flexibility in checking facts.

³ P25-27 and p242

⁴ See <http://www.abc.net.au/unleashed/27606.html> December, 2009

⁵ Washington H & Cook J (2011) Climate Change Denial; Heads in the Sand, Earthscan, London, pp1-2

⁶ See http://en.wikipedia.org/wiki/Climate_change_denial and Washington, H & Cook, J (2011) Climate Change Denial – Heads in the sand P71 ff.

⁷ Washington, H & Cook, J (2011), p71 ff.

⁸ A book by Clive Hamilton entitled “Scorcher: The dirty politics of Climate Change” gives an outstanding political analysis of the issue. A statement on page 226 of the book emphasises just how parochial the carbon lobbies are. The book was written in 2007:

“In preparing this book, I have read volumes of public and private correspondence between members of the greenhouse mafia and between them and the government. It is truly striking that not once in their commentary have any of them expressed concern about climate change...Only one issue preoccupies them: how to protect the profits of the fossil fuel based industries.”

⁹ See blog at brains-satchel.com for recent examples of denial-ism at work in the public arena in Australia.

¹⁰ See details at reference 6.

¹¹ See Section 11.1 for profile of the author.

The internet lists the author’s involvement in these organizations. (See section 12 for full names of the organizations and their profiles):

- (SPPI = abbreviated name)- Scientific advisor. (Source info SPPI site)
- ICSC - Member (Source info –“sourcewatch” & <http://members.iinet.net.au/~glrmc/>)
- 2009 2nd, IPCC conference - Speaker (Source info - Conference web site)
- IPA - Emeritus fellow (Source Biography-<http://members.iinet.net.au/~glrmc/>)
- IPA - Research committee – (Source info - “sourcewatch” & [desmogblog](http://desmogblog.com))
- Tech Central Station – Article writer – (Source info “desmogblog”)
- ISP – Independent Summary of Policymakers – (Source info.”Sourcewatch”)

¹² Point 8.1d in the essay gives examples.

¹³ They are the Institute of Public Affairs in Melbourne and the Heartland Institute in Chicago. Profiles of these organizations are included in Section 12.

¹⁴ See section 11.2

¹⁵ P214

¹⁶ “Evidence” is any thing that increases the estimate of the probability of the truthfulness of the proposition. In this essay it includes:

- Peer reviewed papers
- Consensus views of the relevant scientific profession.
- Information from trustworthy sources.
- Non peer reviewed papers and information, from reputable sources
- Opinions or conclusions that start with a verifiable or acceptable premise and are reached through a process of logic.
- Opinion that is well argued and supported by “facts” irrespective of the source.
- Opinion that can be verified.

The term “evidence” does not include the following:

- Hearsay and rumour.
- Information and opinion provided by vested interests or associates as they do not have my trust.

¹⁷ P27

¹⁸ P23

¹⁹ P203

²⁰ P203 By independent scientists I assume that the author means scientists who do not hold the conventional views of climate science,

²¹ P207/8

²² P26

²³ I have used the term “conventional” to mean generally accepted viewpoint. This obviously includes evidence supported by the IPCC and the worldwide climate science community. The conventional scientific views on global warming are well documented and are available from a variety of sources. As Wikipedia is a reliable, accessible and comprehensive source of information this has been used as the primary source for the conventional scientific view of global warming. The information it provides is consistent with other sources and provides list of [original papers and sources of data](#) on which it bases each article. Other sources supplement it as required.

²⁴ The propositions are 1. Global temperatures are rising. 2. Rising temperatures can be destructive. 3. CO2 is a driver of warming. 4. Anthropogenic CO2 has contributed to (that) warming. Each key climate change proposition represents one key stand alone climate change idea. In aggregate they capture four key ideas that lead to the conclusion that “the planet is warming and that human activities are likely to be causing it”.

²⁵ By noise I mean comments that seek to create doubt on an issue without ever providing evidence that the doubt is justified. For example he asserts on p96 that the rate of rise in the sea levels could “just as likely have been caused by oceanographic forcing as by anthropogenic forcing.” This statement would have been more persuasive and had more substance had it been more constructive and said something like “The rate of rise in the sea levels could not have been due to anthropogenic forcing because...” And then quote the evidence. The book is rife with examples of this kind and has led this reviewer to conclude that the author is intent on casting doubt without ever seeking to provide evidence to justify his positions.

²⁶ Section 3 sets out the evidence supporting the proposition “Global temperatures are rising”, the author’s arguments and an analysis of them, provide evidence of this claim. The same applies to those sections listed below.

Section 4 sets out the evidence supporting the proposition “Rising temperatures can be destructive”, the author’s arguments and an analysis of them.

Section 5 sets out the evidence supporting the proposition “CO2 is driving rising global temperatures”, the author’s arguments and an analysis of them.

Section 6 sets out the evidence supporting the proposition “Anthropogenic CO2 has contributed to warming”, the author’s arguments and an analysis of them.

²⁷ See section 14 for summary with details in sections 3, 4, 5 and 6. A good example is 4.6b.

²⁸ See 6.4 (a) essay

²⁹ See section 9 essay

³⁰ The impression of infallibility is given by his excellent writing skills of the author and the use of positive or strong statements.

³¹ See section 9 for a more comprehensive commentary of his Risk management ideas.

³² See “A formula for Economic calamity”, Scientific American November, 2011.

³³ See section 7 for a more comprehensive analysis of his Virtual reality.

³⁴ The conspiracy referred to in the introductory paragraph of this review.

³⁵ p60 and p229ff.

³⁶ See http://en.wikipedia.org/wiki/Climatic_Research_Unit_email_controversy this reference records on p1 that “Eight committees investigated the allegations and published reports, finding no evidence of fraud or scientific misconduct.^[14] The Muir Russell report stated, however, “We do find that there has been a consistent pattern of failing to display the proper degree of openness, both on the part of CRU scientists and on the part

of the UEA.^{[15][16]} The scientific consensus that global warming is occurring as a result of [human activity](#) remained unchanged at the end of the investigations.^[17]

³⁷ see section 8 for a more complete analysis of his public reality.

³⁸ See: http://en.wikipedia.org/wiki/Global_warming_p1 gives a good overview of the scientific numbers. of GW

³⁹ The graph can be seen at: http://en.wikipedia.org/wiki/Hockey_stick_controversy.

⁴⁰ p1 http://en.wikipedia.org/wiki/Global_warming

⁴¹ P6/7 http://en.wikipedia.org/wiki/Effects_of_global_warming#Ocean_temperature_rise

⁴² Fry, J et al 2010, The Encyclopaedia of Weather & Climate Change Hinkler Books p/l, Sydney gives a range of practical warming clues and <http://www.skepticalscience.com/evidence-for-global-warming.htm> gives a diagram showing 13 generic indicators of global warming.

⁴³ p59

⁴⁴ p39ff

⁴⁵ See http://en.wikipedia.org/wiki/Milankovitch_cycles p1ff for an explanation of these cycles.

⁴⁶ p54

⁴⁷ Access to the various sections of Wikipedia on the internet or shown in this reference list demonstrates this point.

⁴⁸ The term marginal has the same meaning as it does in economics. In climate the marginal effect of humans on Global warming would theoretically be $A-B=C$ where A is total global temperature increase, B is what the temperatures would have been without human influence and C is the temperatures caused by human influence. Pre-industrial temperatures have been used to crudely define B and hence to crudely derive C. An example of this is shown at <http://www.skepticalscience.com/its-not-us-advanced.htm>

⁴⁹ see IPCC graphs 2001 included at http://www.esr.org/outreach/climate_change/mans_impact/man1.html p4.

⁵⁰ See http://en.wikipedia.org/wiki/Climate_change_feedback for implications.

⁵¹ See 4.5 and 5.5b of this essay for an illustration of how feedbacks are understood to have historically worked.

⁵² p60

⁵³ P60

⁵⁴ Science & Public policy institute See section 12 of this essay for an outline of this organization.

⁵⁵ See http://en.wikipedia.org/wiki/Hockey_stick_controversy especially p1 that summarizes the controversy and the following 18 pages which give the detail of the claims and counter claims.

⁵⁶ See http://en.wikipedia.org/wiki/Hockey_stick_controversy p2

⁵⁷ P65

⁵⁸ P65

⁵⁹ For example figs 4-15

⁶⁰ The Hocket stick graph of average world temperatures that can be seen at http://en.wikipedia.org/wiki/Hockey_stick_controversy p1

⁶¹ p65.

⁶² p65 - To quote "... Hurricane Katrina, the two more recent natural disasters in Australia, and the myriad of other similar events around the world, are not just weather events, and nor are they in any way unusual. Rather they represent typical climatological hazards from among the wide spectrum of such events that planet Earth has ever been heir to." It is not clear whether he includes melting glaciers, ice masses and similar phenomena in the category describes.

⁶³ p69

⁶⁴ "The Age" Newspaper 27th June, 2011 – Article R Carter

⁶⁵ "The Age" Newspaper 28th June, 2011 – Article J Cook

⁶⁶ This paper was quoted by the author on p30 in support of his cooling argument but it was no such thing. See note 53.

⁶⁷ The paper by Perlwitz et al can be viewed at: <http://www.agu.org/pubs/crossref/2009/2009GL041188.shtml>. To quote from the abstract "We demonstrate that the anthropogenic impact in 2008 was to warm the region's temperatures, but that it was overwhelmed by a particularly strong bout of naturally-induced cooling resulting from the continent's sensitivity to widespread coolness of the tropical and north eastern Pacific sea

surface temperatures. The implication is that the pace of North American warming is likely to resume in coming years, and that climate is unlikely to be embarking upon a prolonged cooling.”

⁶⁸ p101

⁶⁹ See <http://earthobservatory.nasa.gov/Features/GlobalWarming/page6.php> and http://en.wikipedia.org/wiki/Effects_of_global_warming which gives a particularly good overview of the ramifications of global warming.

⁷⁰ Kump, L R, The last great global warming, Scientific American, July 2011

⁷¹ See sections 3, 4, 5, 6, and 7 of the article, http://en.wikipedia.org/wiki/Effects_of_global_warming for a detailed analysis.

⁷² See summary p2 of http://en.wikipedia.org/wiki/Stern_Review and also

<http://earthobservatory.nasa.gov/Features/GlobalWarming/page6.php>

⁷³ http://en.wikipedia.org/wiki/Current_sea_level_rise, p1

⁷⁴ See p1 http://en.wikipedia.org/wiki/Ocean_acidification

⁷⁵ See p1 http://en.wikipedia.org/wiki/Climate_change_feedback this paper gives a range of examples.

⁷⁶ P87/88

⁷⁷ P88

⁷⁸ p113/114

⁷⁹ See 4.1 this essay and p2 of http://en.wikipedia.org/wiki/Ocean_acidification (which indicates that warming is occurring at a rate 100 times faster than the most rapid events in the geological past”

⁸⁰ See sections 3, 4, 5, 6 and 7 of http://en.wikipedia.org/wiki/Effects_of_global_warming which outlines the seriously adverse effects of global warming and those that can be favourable. A paper entitled “Positives and Negatives of global warming” can also be seen at - <http://skepticalscience.com/print.php?r=168>

⁸¹ The complete quote is: “There is no scientific basis whatever for the oft repeated suggestion that “global warming” will melt so much ice that sea levels will rise by Gore’s imagined 20ft”. See p101. This statement confuses issues. The key questions are: 1. Will humanity keep on pumping growing quantities of CO₂ into the atmosphere? 2. If they do what will average global temperatures rise by? 3. What effects will that have on the cryosphere, atmosphere, oceans and land? What Gore imagines is irrelevant to the facts.

⁸² p96

⁸³ p97

⁸⁴ See section 4.3

⁸⁵ p96

⁸⁶ A July 2011 paper in the Journal of Coastal Research by Rahmsdorf, S and Vermeer, M, confirms this view.

The paper can be seen at http://www.pik-potsdam.de/~stefan/Publications/Journals/rahmstorf_vermeer_2011.pdf

⁸⁷ This is my summary of the key points in his his claims. P107 contains a more detailed description of the mechanisms by which he asserts those outcomes will be achieved.

⁸⁸ p113

⁸⁹ Se p2 of http://en.wikipedia.org/wiki/Ocean_acidification which refers to an article in Scientific American July 2010 by William Howard of the Antarctic climate and Ecosystems Cooperative research Centre providing this information.

⁹⁰ The articles in the bullet points in this paragraph all emphasize the limited knowledge of the effects of increased acidification on marine life.

⁹¹ P3 <http://waterencyclopedia.com/Bi-Ca/Carbon-Dioxide-in-the-Ocean-and-Atmosphere>,

⁹² P1 The ocean Carbon Cycle, Harvard Magazine, September-October, 2011 and p2

http://en.wikipedia.org/wiki/Ocean_acidification

⁹³ P1 The ocean Carbon Cycle, Harvard Magazine, September-October, 2011 and P3

<http://waterencyclopedia.com/Bi-Ca/Carbon-Dioxide-in-the-Ocean-and-Atmosphere>,

⁹⁴ P2 The ocean Carbon Cycle, Harvard Magazine, September-October, 2011

⁹⁵ P1 Portner et-al, Biological Impact of Elevated Ocean CO₂ Concentrations: Lessons from Animal Physiology and Earth History, Review: Journal of Oceanography, Vol 60, pp 705-718

⁹⁶ Ishimatsu, I et al, 2008, Fishes in high-CO₂, acidified oceans, Marine Ecology Progress series Vol 373: 295-302

⁹⁷ Hall-Spencer, J M et al, 2008, Volcanic carbon dioxide vents show ecosystem effects of ocean acidification, Nature letters, vol 454/3 July 2008.

⁹⁸ Caldeira, K & Wickett, J, 2003 Anthropogenic carbon and ocean pH, Nature, vol. 425 September, 2003

⁹⁹ Atkinson M,J, 2008, Possible effects of ocean acidification on coral reef biogeochemistry: topics for research, Marine Ecology Progress series, vol. 373, 249-256, 2008

¹⁰⁰ P107

¹⁰¹ P1, Essay "The ocean Carbon Cycle" in Harvard Magazine, September-October, 2011.

¹⁰² See http://en.wikipedia.org/wiki/Ocean_acidification p3 for possible impacts

¹⁰³ P3 <http://waterencyclopedia.com/Bi-Ca/Carbon-Dioxide-in-the-Ocean-and-Atmosphere>

¹⁰⁴ (Caldeire K and Wickett M, (2003) Nature vol 425, September 2003) and Hall-Spencer, J M et-al, (2008) Nature Vol 454/3 July, 2008, internet availability at <http://www.bioexpress.ac.cn/upload/20080704-nature07051.pdf>

¹⁰⁵ (Harvard Magazine, Sept/Oct 2011)

¹⁰⁶ The general point is at <http://science.daily.com/releases/2008/05/080526162652.htm> and is supported by scholarly papers on the issue that can be accessed at <http://www.bioexpress.ac.cn/upload/20080704-nature07051.pdf> and at Marine Ecology Progress series, vol. 373, 249-256, 2008

¹⁰⁷ http://en.wikipedia.org/wiki/Climate_change#Human_influences

¹⁰⁸ P1 http://en.wikipedia.org/wiki/Greenhouse_gas The CO2 figures do not include any allowance for the other greenhouse gasses referred to in this section, expressed in CO2 equivalent terms.

¹⁰⁹ P3 http://en.wikipedia.org/wiki/Greenhouse_gas

¹¹⁰ P3 of the reference http://en.wikipedia.org/wiki/Greenhouse_gas_gives_the_CO2 equivalents of these gasses for 20 years and p4 gives their current levels. The equivalent CO2 ppm can be calculated from this data.

¹¹¹ See http://earth.rice.edu/activities/earthupdate/activities/EU07_CO2andTemp.pdf and p3 <http://en.wikipedia.org/wiki/File:Co2-temperature-plot.svg>

P3 http://en.wikipedia.org/wiki/Carbon_dioxide_in_Earths_Atmosphere indicates that concentrations have varied between 180-210 ppm during ice ages increasing to between 280-300 ppm during warmer interglacials.

¹¹² See p2 http://en.wikipedia.org/wiki/Global_warming

¹¹³ P1 http://en.wikipedia.org/wiki/Greenhouse_effect

¹¹⁴ P 1 http://en.wikipedia.org/wiki/Infrared_window

¹¹⁵ P84

¹¹⁶ P113

¹¹⁷ P85

¹¹⁸ P84/85

¹¹⁹ p113

¹²⁰ P39ff

¹²¹ P47

¹²² See p1 <http://climate.nasa.gov/evidence/>

¹²³ P2 http://en.wikipedia.org/wiki/Global_warming

¹²⁴ See <http://www.sciencemag.org/content/326/5958/1394.short>

¹²⁵ P18 <http://www.aip.org/history/climate/co2.htm> See also 4.5 this essay.

¹²⁶ See p1 http://en.wikipedia.org/wiki/Clathrate_gun_hypothesis

¹²⁷ p42 & 83

¹²⁸ The record over the last 500 million years shows that the movement of atmospheric CO2 levels has both preceded and succeeded directional temperature movements see p18 of <http://www.aip.org/history/climate/co2.htm> and graph at p2 from an article that appears to be a denial web site titled "Planetary Temperature and Atmospheric Carbon Dioxide (CO2)" and shown at a link namely <http://ff.org/centres/ccspp/library/co2weekly/2005-08-18/dioxide.htm>

¹²⁹ P18 <http://www.aip.org/history/climate/co2.htm>

¹³⁰ See P107 for the source of this quote.

¹³¹ P75/76

¹³² P77

¹³³ P77

¹³⁴ See Heartland Institute section 12

¹³⁵ See 1-2 in part 2 titled: "What angstrom didn't know" and shown at: <http://www.realclimate.org/index.php/archives/2007/06/a-saturated-gassy-argument-part-ii/>

¹³⁶ See p3 in part 2 in ref 126 above: <http://www.realclimate.org/index.php/archives/2007/06/a-saturated-gassy-argument-part-ii/>

¹³⁷ See p6 <http://www.aip.org/history/climate/Radmath.htm> The reference at <http://www.realclimate.org/index.php/archives/2007/06/a-saturated>

opines at p2/3 that the atmosphere would still not be saturated with a

¹³⁸ p77

¹³⁹ P77

¹⁴⁰ P77

¹⁴¹ P77.

¹⁴² See his reference number 87

¹⁴³ See database on Desmogblog.com which list those scientists the members of the site call deniers. This means they are actively involved in denial networks.

¹⁴⁴ <http://www.ipcc.ch/ipccreports/tar/wg1/pdf/TAR-03.PDF>

¹⁴⁵ See <http://www.es.ucsc.edu/~msnyder/papers/2001GL014431.pdf>

<http://nature.berkeley.edu/biometlab/espm298/Sellers%20et%20al.%201996%20Science.pdf>

<http://www.treehugger.com/corporate-responsibility/doubling-of-atmospheric-co2-causes-plants-to-significantly-reduce-evaporative-cooling.html>

[http://www.greencarcongress.com/2009/03/study-finds-](http://www.greencarcongress.com/2009/03/study-finds-dou.html)

[dou.htmlhttp://www.sage.wisc.edu/pubs/articles/A-E/Costa/Costa2000JCLim.pdf](http://www.sage.wisc.edu/pubs/articles/A-E/Costa/Costa2000JCLim.pdf)

¹⁴⁶ p85

¹⁴⁷ The author does not make any comment about the Electro magnetic spectrum evidence.

¹⁴⁸ P77

¹⁴⁹ See p3 http://en.wikipedia.org/wiki/Carbon_dioxide_in_Earths_atmosphere

¹⁵⁰ http://envirowiki.info/One_tonne_of_Carbon_Dioxide , p1

¹⁵¹ P1 http://en.wikipedia.org/wiki/Greenhouse_gas

¹⁵² P1 <http://www.realclimate.org/index.php/archives/2004/12/how-do-we-know-that-recent-cosub2sub-increases-are-due-to-human-activities-updated/>

¹⁵³ P1/2 <http://www.realclimate.org/index.php/archives/2004/12/how-do-we-know-that-recent-cosub2sub-increases-are-due-to-human-activities-updated/>

¹⁵⁴ P2-4 http://en.wikipedia.org/wiki/Greenhouse_gas

¹⁵⁵ P53/54 and pp73/75

¹⁵⁶ P72

¹⁵⁷ p71ff

¹⁵⁸ P71

¹⁵⁹ P72

¹⁶⁰ See p3 http://en.wikipedia.org/wiki/Carbon_dioxide_in_Earths_atmosphere

¹⁶¹ See previous reference

¹⁶² CO2 is 3.67 times heavier than carbon alone. 1 mol of C12 \approx 12g and for CO2 \approx 44g so 44/12 =3.67

¹⁶³

- 1 tonne (of CO2) is 1,000,000gms
- There are 44gms in 1 mol of CO2
- Therefore there are 1,000,000/44 or 22,727 mol in tonne CO2
- There are 22.4 litres in a mole of ideal gas at STP
- Therefore there are 22,727*22.4 \approx 509,000 litres in tonne of CO2 at STP or $(5.09*10^5)$.
- Annual anthropogenic CO2 emissions are 36.6 Bt or $3.66*10^{10}$ tonnes
- So the annual volume of anthropogenic CO2 emitted annually = $[(3.66*10^{10})*(5.09*10^5)] = (1.863*10^{16})$ or 18.63 quadrillion litres annually which is 18,630,000,000,000,000 litres annually using the US system of large numbers.

¹⁶⁴ The term flows will be used here.

¹⁶⁵ The term inventory is used to describe the level of atmospheric carbon or CO2 existing at any point in time to distinguish it from flows or fluxes which are movements into and out of this inventory. The inventory is likely to be growing over time and continuously changing in its composition.

¹⁶⁶ P72, namely the author's anthropogenic carbon flow figures.

¹⁶⁷ P73 The figure he quotes for the amount of carbon exchanged annually 210 GTC between the atmosphere on the one hand and the oceans 90 GTC plus the plants 120 GTC on the other.

¹⁶⁸ Whether this would then justify the claim that ≈2% of the greenhouse warming in a particular year is another matter.

¹⁶⁹ These figures are illustrative only. If 45% of the increase CO₂ levels since 1900 is assumed to be anthropogenic and that this is equivalent to the proportion of atmospheric carbon, then the proportion of anthropogenic carbon still in the atmosphere based on the authors “ppm” figures on p72 would be 10.7% (i.e. $[(380-290\text{ppm}) \cdot .45] / 380\text{ppm} \cdot 100 = 10.7\%$).

¹⁷⁰ <http://cdiac.ornl.gov/pns/faq.html>

¹⁷¹ The author grossly simplifies what is a complex issue. See <http://www.aip.org/history/climate/oothergas.htm> p3 shows how a single nitrate molecule has the power to destroy many molecules of ozone. The article http://en.wikipedia.org/wiki/Greenhouse_gas_on_p14 gives the Global warming potential of greenhouse gases that range between 1 and 16,300 times expressed in equivalent CO₂ warming potential.

¹⁷² p82

¹⁷³ p82

¹⁷⁴ P82

¹⁷⁵ The implication of this conclusion is that anthropogenic CO₂ could not have caused the atmospheric build up of CO₂ over recent times.

¹⁷⁶ The paper is Harvey S H Lam, “Residence Time of Atmospheric CO₂” August 2003, that can be seen at, <http://www.princeton.edu/~lam/TauL1b.pdf>

¹⁷⁷ P82

¹⁷⁸ Paper by Lam p4 <http://www.princeton.edu/~lam/TauL1b.pdf>

¹⁷⁹ P2 <http://www.princeton.edu/~lam/TauL1b.pdf> Professor Lam indicated that the significance of the CO₂ atmospheric time does not seem to be widely recognized or appreciated so he wrote the paper to draw attention to it and engender discussion p1 and 4.

¹⁸⁰ P82

¹⁸¹ See <http://www.desmogblog.com/tom-segalstad> and 5.5c of essay.

¹⁸² See “On the atmospheric residence time of Anthropogenic Sources Carbon Dioxide” by Gavin C Cawley, (ACS Publications)2011. The abstract can be viewed and the full paper purchased at <http://pubs.acs.org/doi/abs/10.1021/ef200914u>

¹⁸³ P21

¹⁸⁴ P29

¹⁸⁵ P30

¹⁸⁶ P30

¹⁸⁷ P23

¹⁸⁸ P54

¹⁸⁹ See IPCC graphs 2001 included at http://www.esr.org/outreach/climate_change/mans_impact/man1.html p4

¹⁹⁰ P3 http://en.wikipedia.org/wiki/Effects_of_global_warming

¹⁹¹ See “A formula for economic calamity” by David H Freeman, Scientific American November, 2011 and <http://www.scientificamerican.com/article.cfm?id=finance-why-economic-models-are...>

¹⁹² P129 the author uses the term “suitable for application in policy settings” which I take to mean accurate enough.

¹⁹³ As noted in this essay GCM’s do not predict.

¹⁹⁴ See history of models in the following essays:p10 of <http://www.aip.org/history/climate/Radmath.htm> and essay on development of simple models at p39 <http://www.aip.org/history/climate/simple.htm>

¹⁹⁵ See “Climate Models: Assessment of Strengths and Limitations” US Department of Energy Publications, University of Nebraska – Lincoln, 2008

¹⁹⁶ P116

¹⁹⁷ p117

¹⁹⁸ See [http://en.wikipedia.org/wiki/Parametrization_\(climate\)](http://en.wikipedia.org/wiki/Parametrization_(climate))

¹⁹⁹ p117

²⁰⁰ p117

²⁰¹ The author attributes the use of this term to Dick Cheney but it was Donald Rumsfeld.

²⁰² P124ff & 129

²⁰³ p119ff
²⁰⁴ P116. His comment refers to the large IPCC models.
²⁰⁵ See P32. The Australian public's opinion is changing. The ABC reported that fewer Australians back climate action. See <http://www.abc.net.au/news/2011-06-27/fewer-australians-back-climate-action-poll/2772402>
²⁰⁶ p191ff
²⁰⁷ Kuhn, T H, The Structure of scientific revolutions, p11
²⁰⁸ His use of Cherry picking and misrepresentation (as shown in section 14) supports my subjective evaluation.
²⁰⁹ Kuhn p145
²¹⁰ p242.
²¹¹ P119
²¹² P116
²¹³ p230ff
²¹⁴ p243 presumably he includes himself in this grouping.
²¹⁵ p145
²¹⁶ See <http://www.aip.org/history/climate/co2.htm>
²¹⁷ p215
²¹⁸ The concept of NPV or NPC is a process of equalizing cash flows over time by expressing future flows in present day values by discounting them by a discount rate. The Stern review uses this method in valuing future events.
²¹⁹ p24
²²⁰ P207ff
²²¹ Pp211-217
²²² See http://en.wikipedia.org/wiki/Precautionary_principle
²²³ http://en.wikipedia.org/wiki/Stern_Review P2
²²⁴ P145 Kuhn
²²⁵ P213/214
²²⁶ p213
²²⁷ p213
²²⁸ p214
²²⁹ P214