

My Life With the AGO and Other Reflections

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I used to work for the Australian Greenhouse Office, and I used to believe that carbon emissions probably caused global warming. I am going to talk about six topics today:

1. My life with the AGO. This might give you a bit of insight into the carbon blamers.
2. The weakening evidence for blaming carbon emissions. It isn't widely appreciated by those who are new to the debate that the evidence for blaming CO₂ was once quite strong. This history is vital to understanding how we got to this point in the public debate.
3. Two challenges for the carbon blamers
4. A bet
5. The Interaction of Science and Politics
6. A Future Scenario. The IPCC has its scenarios, I have mine.

My Life With The Australian Greenhouse Office

I devoted six years of my life to working for the carbon accounting section of the Australian Greenhouse Office, also known as the AGO. The carbon accounting section is one of eleven sections in the AGO. It is a purely technical section; it makes no policy. The section consists of a few public servants and a larger team of contractors who come and go as their technical skills are required. I was employed as a contractor, from 1999 to 2005.

The AGO had a staff of maybe 100, and a budget of about \$150 million per year. There were quite a few contractors, and we were well paid—my salary was well into six figures. These were good, interesting,

well paid science jobs, which are rare in Australia. These jobs would not exist if we didn't blame carbon emissions for global warming—I was on the gravy train!

While I was at the AGO, no one talked to me about the evidence for blaming carbon emissions. It was just assumed. There were graphs of the old ice core data on the walls—atmospheric carbon moved in lockstep with global temperature. Yep, looked like we were working to save the world!

The carbon accounting area isn't like some academic areas where questioning the role of carbon would be career suicide, but it seemed wiser not to question it. After all, it was the “**carbon**” accounting section of the “**Greenhouse**” Office (wouldn't want to jump to conclusions or anything). The people in the accounting section are my friends, and I won't say anything to jeopardize their positions.

The job in our section was to track carbon movements due to humans in Australia's plants, debris, soil, and forestry and agricultural products. These estimates are required in order to measure Australia's compliance with the Kyoto Protocol. Dr Gary Richards and I developed a plant model called FullCAM—the “CAM” part stands for “carbon accounting model”. I made plant models, and then made those models come to life on computers. By the way, I know a heck of a lot about modelling and computers but I am not a climate modeller.

FullCAM is a significant model, and may become a political issue in its own right if we go down the route of carbon trading. FullCAM tracks carbon movements through the plants, debris, and soil on a 25 metre by 25 metre plot, by modelling the growth of plants, the fall of litter, the action of soil bacteria, harvesting, fires, rainfall, frosts, ... just about everything that affects plants or carbon. It is a sophisticated plant model, with over a thousand input parameters.

We ran simulations of the whole continent, on each 25 meter by 25 meter plot. We fed in detailed maps of rainfall, temperature, elevation, soil type, crop yields, etc. The AGO is the biggest customer of NASA Landsat photographs. Anywhere that land clearing or revegetation occurred after 1970 we did a FullCAM simulation. In this manner we got a detailed view of how much carbon was emitted to the atmosphere due to changes in our landscape. Since I left, field trials have verified that our estimates from the Office in Canberra are nearly always right to within 10% for any given site. This is easily the most successful and sophisticated model of its type in the world, and leads the rest of the world in this area by a long margin. It is currently in various stages of export to several other countries. Technically it has been an unqualified success.

Politically it has been interesting too. Our work reliably established that the contribution to carbon emissions from the land-use change and forestry sector was about 20% of Australian emissions in the 1990 baseline year for Kyoto. And our work established that Australia could meet its Kyoto Protocol commitments by business as usual plus merely stopping land clearing in Queensland by 2008 (it had almost stopped in the other states by 1990 anyway). I'm sure you will readily understand why the Howard Government liked this message and was very pleased with the accounting unit.

FullCAM is an excellent tool for plant modelling and land management. It was developed as a carbon accounting tool, but that role is merely a by-product of its function. I resigned in 2005 for personal reasons that had nothing to do with my lack of belief that carbon emissions caused global warming.

FullCAM is also the leading tool for estimating the carbon credits for a plantation or native forest. If you plant a particular tree species on say 100 hectares of this land, where the rainfall is this and the soil type

is that, and your tree management regime includes thinning at 20 years then harvesting at 25 years, what carbon is thereby removed from the atmosphere and what carbon credits should you get? FullCAM answers questions like that. Quite a few contracts have already been written that use FullCAM to estimate the carbon credits.

Remember I said that FullCAM's predictions were verified by field trials to within 10%? If you have a ten million dollar carbon credit for a plantation, a 10% error starts to look pretty significant—enough to pay for a couple of lawyers to go over things pretty carefully. Imagine disputes involving real amounts of money, over the results generated by computer models! Carbon accounting is utterly wide open to cheating because it is nebulous, mostly unverifiable, and full of large uncertainties and convenient assumptions. The FullCAM model may be subject to intense scrutiny in coming years—I'll have a bit more to say about opening models to public scrutiny later.

The Weakening Evidence for Blaming Carbon Emissions

When I started the job in 1999, the evidence that carbon emissions caused global warming seemed pretty conclusive. But since then new evidence has weakened the case. I am now skeptical. As Lord Keynes famously said, “When the facts change, I change my mind. What do you do, sir?”

In the 1990s there were basically four pieces of evidence for blaming carbon emissions:

First. Carbon dioxide is a greenhouse gas. Yep, we proved that in a laboratory over a century ago.

Second. Global temperatures had been generally trending upward for a century and we are told that concentrations of atmospheric carbon have also been rising for a century. Correlation is not causation, but in a rough sense it looked like a fit.

Third. Ice core data, starting with the first cores from Vostok in 1985, allowed us to measure temperature and atmospheric carbon going back through several past global warming and cooling events. The data points were more than a thousand years apart, but atmospheric carbon and temperature moved in lock-step: it looked like atmospheric carbon controlled the earth's temperature! The importance of this evidence is hard to overstate—it was the vital, mind-changing clincher, and it forms the centrepiece of Al Gore's movie.

Fourth. There were no other credible suspects for causing global warming. This piece of evidence is implicit and often overlooked, but it was pretty important.

These were the four pieces of evidence that convinced scientists and politicians in the 1990s to get serious about blaming carbon. But starting in about 2000, the last three of these four pieces fell away or reversed. Let's revisit the four pieces.

First. Yes, carbon is still a greenhouse gas. That evidence did not change, but you cannot reliably extrapolate what happens in a glass container in a laboratory to the real atmosphere, which has many feedbacks, clouds, and an ocean with dissolved carbon dioxide underneath it.

Second. We now know that from 1940 to 1975 the earth cooled while atmospheric carbon increased. That 35 year non-correlation might be explained by global dimming, which was only discovered around 2000. Or it might not. Oddly enough, solar effects would predict a cooling over those same years.

Third. The temporal resolution of the ice core data improved, that is, the time between data points decreased. By 2003 we knew that in past global warmings, the temperature started increasing about 800 years **before** the atmospheric carbon concentrations started rising. Causality does not run in the direction we had assumed in 1999 - it runs the opposite way!

Here's what we now know from the ice core data about a typical previous global warming:

- a. For some reason, that had nothing to do with atmospheric carbon, global temperatures started increasing.
- b. About 800 years later, the oceans had warmed enough to give off carbon dioxide. So atmospheric carbon started increasing.
- c. Rising atmospheric carbon caused more warming, due to the greenhouse effect. And this further warming caused the oceans to emit more carbon to the atmosphere. And so on. This positive feedback loop is called *amplification*. However, the ice cores give no indication of the extent of amplification—it might have some effect, or it might have been completely insignificant.
- d. Global warming eventually reversed itself. Well before the planet got to a runaway greenhouse effect like on Venus, while the oceans could still emit more carbon, global warming turned into global cooling. Therefore, some other force that was much stronger than CO₂ stopped and reversed global warming.

The modern ice core data neither supports, nor rules out, the idea that atmospheric carbon can have a significant effect on global temperature. But given that carbon neither started nor stopped previous global warming episodes, you'd at least have to conclude that atmospheric carbon isn't all important in setting the world's temperature. That contradicts the old ice core data, which seemed to be saying that the world's temperature was set by carbon dioxide levels. The ice core data was very important in convincing scientists and politicians to blame carbon for global warming; that evidence has now reversed.

Fourth. There is now a credible alternative suspect. In October 2006 Henrik Svensmark showed experimentally that cosmic rays can cause cloud formation. Clouds have a net cooling effect, but for the last three decades there have been fewer clouds than normal because the sun's magnetic field, which shields us from cosmic rays, has been stronger than usual. So the earth heated up. It's still too early to judge what fraction of global warming is caused by cosmic rays, but now we have another suspect.

There is now **no** observational evidence to support the notion that global warming is caused by carbon emissions. None. You would think that in over 20 years of intense investigation, after spending \$50 billion of government money on climate change, we would have found something! The **only** current reasons for blaming carbon emissions are the predictions of climate models—which extrapolate a greenhouse effect from the laboratory into the atmosphere.

Models are extended calculations performed by a computer, a mechanism whose rules are only determined by the knowledge we program into them. For example, before global dimming was discovered the climate models omitted global dimming, because no one knew about it. Current climate models ignore the effects of cosmic rays. Models are purely theoretical.

Science is a **method** for acquiring knowledge. The body of knowledge so obtained is properly called *scientific knowledge* (not, as is common, “science”). Science is the most reliable and trustworthy method we humans have evolved for obtaining knowledge.

Science gets around the problems of superstition, political interference, and religious belief by demanding repeatable and independent observations. Indeed cynics would point out that the scientific method evolved precisely in response to the need to acquire knowledge untainted by political bias and religious prejudice.

Historically, science has not progressed by calculations and models as much as by repeatable observations. Some theories that truly were held by a scientific consensus have turned out to be spectacularly wrong. For example, in 1905 nearly all scientists were convinced that heavier-than-air flight was impossible, because the theories of the time unequivocally said so. In 1905 the *Scientific American* magazine dismissed and ridiculed the notion of powered flight and called the Wright Brothers fraudsters—two years **after** the Wright Brother’s first flights! Or there was the celebrated incident with Galileo. For excellent reasons, we have much more confidence in independent observations than in theories!

By the way, do you think that if there were observations that contradicted the idea that carbon was to blame that you would have been told about them? There are such observations, and the carbon blamers keep awfully quiet about them. Greenhouse warming due to carbon emissions should warm the upper atmosphere faster than the lower atmosphere—so if carbon emissions were to blame we should be able to observe increased warming in the upper atmosphere. So people have been looking at where in the atmosphere the warming is occurring. Pretty direct and obvious approach, right? But until 2006 the data showed the warming was not occurring in the upper atmosphere! After intense scrutiny of the experimental uncertainties, the discovery of an error, and more observations, that data now allows that extra greenhouse warming might (or might not) be occurring in some parts of the world. But the observational evidence from the tropics and the some parts of the southern atmosphere still flatly contradicts what the climate model predict should be happening. The hypothesis that carbon emissions are to blame is currently falsified by the observational data. If the scientific method was applied, carbon emissions would not be blamed for causing global warming.

The current situation is not the way science should be done. It isn’t science, it’s politics. The notion that carbon emissions cause global warming is not scientifically defensible on today’s evidence. If this topic was just in the realm of science, blaming carbon would merely be another falsified hypothesis with no supporting evidence and attracting only minor interest from scientists.

But the notion has escaped to the realm of politics. People’s salaries depend on it, and its running rampant. I was on hand to observe a little of this at the AGO.

Two Challenges for the Carbon Blamers

But first, two challenges for the carbon blamers.

I presented the story of weakening evidence to a friend of mine, Peter Duncan, who is on the Board of the CSIRO. Peter informally asked the CSIRO what evidence there was for blaming carbon. Here is the reply he got in April:

“The detail behind the current scientific consensus is being delivered for all to see in the IPCC process, which was been unfolding throughout this year and will be complete with all information in the public domain in some months time (by about November). CSIRO should not spend time reworking this information beforehand, as it is a waste of our time, and we are not at liberty to anticipate the IPCC publication timeline. So on the core science matters, those sceptical of the consensus [will] just have to wait until the consensus views are revealed.”

Well that speaks volumes, doesn't it? More for what it doesn't say. It doesn't say “oh the evidence is this, this, and this. Here are some links to the papers or discussions of the evidence.” Nope, nothing like that. Instead Peter was told that the evidence would be handed down by an authority in due course. That's not science, that's politics.

So the first challenge is this: Show us your evidence. Make any evidence that supports the notion that carbon emissions are the main cause of global warming public. Let's all have a look.

Now just to be clear on what I mean by “evidence”, it must include the following information:

- Who made the observations?
- When were they made?
- What did they observe? In general terms, I don't have to see the raw data.
- How do the observations support the idea that carbon emissions are the main cause of global warming?

Evidence that will **not** suffice includes:

- Evidence that global warming is occurring. That's not the question, everyone knows it's occurring.
- Observations that confirm predictions made by some model. So what? They don't prove the model is correct or that the model will predict correctly in future. And if you find observations that disagree with your model, you adjust the model anyway (hey, I'm a modeller). If enough monkeys bang away on typewriters long enough then eventually one of them will type the complete works of Shakespeare—it's the same with models.
- Something that amounts to “There are no other candidates, so it has to be the one I'm thinking of.” Illogical. In an effectively infinite universe, you cannot rule out all the other possibilities.

- Experiments in glass jars in laboratories whose vital characteristics in any way depend on clouds, convection, feedbacks, interaction with oceans, and so on. The atmosphere is too big and complex to replicate those features in a glass jar.
- Someone else said so. Independent repeatable observations only please, otherwise it's not science.

Here's the second challenge: Make the climate models public. Make a leading climate model, used to make predictions, fully public, with all the working computer code and all documentation, so that I can run it on my computer.

I want to inspect your model to see what assumptions were made. I want to see if solar effects such as cosmic rays were omitted. I want to run your model with different possible inputs, to see what the range of future temperatures it predicts. I'll bet that that the model allows for possible scenarios where the carbon emissions cause only insignificant temperature rises.

I know a thing or two about making contentious models public. I argued with the AGO to make the source code of FullCAM public. The AGO balked at that, but it did the next best thing and made the full specifications and documentation publicly available, and you can run FullCAM on your computer and put in whatever inputs you please. If the world is to go down the expensive and poverty-causing route of curbing carbon emissions, the reasons had better be all above board and open to public scrutiny. So show us your evidence and show us your models.

The incident of the hockey stick graph is instructive here. The hockey stick graph purported to show the temperature for the last one thousand years as deduced from tree ring data. The thickness of a tree ring is related to the temperature that season, so tree rings can serve as a temperature proxy. The tree ring data was processed and the result was a graph of temperature that looked like an ice hockey stick, essentially flat for the last thousand years then rising abruptly for the last three decades. Very dramatic! The 3rd IPCC report included the hockey stick graph. Very scary stuff.

Skeptics asked to see the tree ring data and the computer algorithm that produced the graph from the data. The tree ring data was forthcoming and seemed reasonable enough. But the scientist who produced the graph would not make the computer algorithm public. "Confidential" he said. After two years of pressure and controversy he finally relented and made the algorithm public. It turns out that the algorithm inherently made a hockey stick graph, due to the assumptions programmed into it. People found they could use any reasonable data, even random data, and the algorithm would always produce a hockey stick graph. The hockey stick was built into the algorithm, and it had nothing to do with the input data! The tree ring data was irrelevant. The scientist involved is now widely discredited, and the 4th IPCC report omits all mention of the hockey stick graph—not even an apology. This was politically-inspired fraud, not science. It's an object lesson in the importance of being open.

Science eventually won that skirmish. Now for the main game. Show us your evidence and show us your climate models.

A Bet

It's time to put up or shut up on this topic. It's the old scientific culture of repeated observations versus the new "scientific" culture of theoretical modelling and political meddling.

And in that spirit I made a bet. I bet an environmental lawyer in San Francisco US\$6,000 that the rate of increase of global temperatures would slow over the next 10, 15, and 20 years.

I offered to bet more, but he wanted a smaller bet. The first pay off will be in the dollars of 2019, and those who realize that the money supply in the US, Australia, and the rest of the world is growing at well over 10% a year, and that the definition of CPI has been changed many times since 1980, will recognise that the amount of money involved is going to be almost trivial. Shrug.

It's hard to figure how to profit from the knowledge that carbon emissions are probably having little impact on global temperatures. On the other hand, it's easy for me to profit by taking the view that carbon emissions are to blame—just walk back into a government job in carbon accounting!

The Interaction of Science and Politics

So how did we get into this mess? I'd like to make just one observation on the interaction of science and politics.

The political realm is funnelling a lot of money into the scientific community on climate and carbon. By the late 1990s, lots and lots of jobs depended on the idea that carbon emissions caused global warming. Many of those jobs were bureaucratic, but there were a lot of science jobs too. As mentioned, I was on that gravy train, making a high wage in a science job that would not have existed if we didn't blame carbon emissions. And so were lots of people around me.

Government spending worldwide on climate issues by the late 1990s was enough to employ every climate scientist in the world several times over, plus a lot of other scientists as well. On well-paid, interesting jobs. The social pressure not to upset the apple cart is huge. Talk about a vested interest! Not many scientists wish to risk the wrath of their **peers** by pointing out that the evidence for blaming carbon dioxide is now a bit thin. Peer review of scientific papers is nothing compared to this. This is about money and good jobs. This is a topic that many scientists don't want to think about too hard. Don't go there! No wonder it's mainly retired or independent scientists who are speaking out—it's financial and social suicide for most others to speak out.

Future Scenario

Where are we going next?

It is possible that the theoreticians are right or at least partly right. Human carbon dioxide might be causing some or all of the global warming. We can't rule it out for sure yet. But the lack of observational evidence in favour of that notion, and the observations that suggest it is not to blame, say to me that warming due to CO₂ is probably minor or insignificant.

Imagine the following scenario. Suppose that carbon emissions cause 20% of the current global warming. Some natural force causes the rest, and suppose that in 15 years it has run its course and reverses. So by 2025 global temperatures are dropping. In the meantime, on the basis of models from a small group of climate modellers, but with no observational evidence, the world has dutifully paid an enormous cost to curb carbon emissions. What then? Perhaps politicians in 2025, expressing the anger of the electorate and the apparent futility of all that unnecessary poverty and effort, lead the lynching of the high priests with their opaque models. But in this scenario carbon emissions are slowly raising the temperature baseline around which natural variability occurs, we just don't observe them because they are masked by the larger natural forces. However, we are also overdue for the next ice age, and perhaps we need all the warming we can get. Who knows? The current situation is characterized by a lack of observational evidence, so no one really knows yet.

In the meantime, back in 2007, those still on the gravy train and those in the mainstream media just don't want to hear about true science and about evidence.