The Garnaut Draft Report: A Comment

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Abstract

The Garnaut Draft Report *is serially misleading. The main basis for its alarming predictions of large declines in income and employment and of catastrophic environmental damage by 2100, including disappearance of the Great Barrier Reef, is the extraordinary assumption that it is* ***gross*** *emissions of the greenhouses gases (mainly carbon dioxide) that govern the atmospheric level of carbon dioxide and will cause dangerous climate change over the next hundred years. Underlying this assumption is the assertion that the oceanic and terrestrial sinks are already "saturated" with carbon dioxide, even though for the 50 years since records began at Mauna Loa, the atmospheric level of carbon dioxide has rarely increased by as much as half of the annual increase in gross anthropogenic emissions, and that has occurred only in El Nino years. Other questionable features of the Report include its false characterization of the so-called Prisoners' Dilemma, a parallel failure to address climate change as a problem of the Commons, and erroneous use of marginal utility theory to justify the low discount rates used in its cost-benefit analysis. The centerpiece of the Report, its Emissions Trading Scheme, is equally flawed. It disregards firms' real opportunity costs when forced to buy emission permits, and ignores the income effects on carbon consumption of recycling permit revenue to poorer households whereby even transfers in kind may be resold to allow continued real consumption of fuel and electricity.*

Ross Garnaut's *Draft Report* (2008) makes many dire projections for the future, including the claim that without drastic mitigation there will by 2100 be major declines in GDP across the globe. There is no cited evidence of such effects already becoming apparent despite the warming temperatures experienced since 1976. In the absence of such evidence the Report's predictions cannot be verified by anyone alive today. After a fairly cool period from 1945 to the mid-1970s, we have since had thirty years of gently rising global temperatures, reaching a peak in 1998, and averaging since 1998 slightly above the average from 1976 to 1990. The whole period since 1976 has seen the fastest economic growth ever recorded across almost the whole globe (Sub-Saharan Africa until 2001 and Japan in the 1990s are rare exceptions). If such growth has been achieved despite the onset of global warming, what basis is there for Garnaut's prediction of large declines in world GDP starting now? It turns out the prediction rests on the explicit assumption that all global biospheric uptakes of carbon, through photosynthesis, will cease from 2009 if not before. There is of course no evidence of this. On the contrary the latest data on the level of atmospheric carbon dioxide at Mauna Loa as of December 2007 shows that it still increased by less than the additional CO2 emissions since December 2006 (see my Figs. 2 and 3 below).

Even the Draft Report's summary of climate science (in its Chapter 3) is problematic. It is not enough merely to show a graph of the increasing atmospheric concentration of CO_2 since 1750 and claim that it shows "accelerated growth in recent years" (Fig. 3.1, p.51), when in fact the rate of growth has been slowing over the last 50 years, as

shown here in my Fig.1. This error is repeated when the Report asserts (p.56) the "dominant influence" of carbon dioxide as a greenhouse gas, overlooking the more significant role of water vapour, which is about double in volume and plays a major role (through enhanced cloud cover) in moderating the radiative forcing of increasing CO_2.

Thus the Report's Fig.3.4 omits any reference to water vapour. Garnaut's later discussion of water vapour (p.61) shows that he is unaware that burning fossil fuels can release as much or more water as CO_2 – in the case of Victoria's brown coal, its emissions contain as much as ***five*** times more water vapour than CO_2. His claim that "humans have a limited ability to directly influence its concentration" is curious when burning fossil fuels usually releases both water and CO_2, and Garnaut believes we can and will achieve CO_2 emission reductions. The Report nowhere admits that reducing fossil fuel combustion in Australia will also reduce atmospheric water vapour and thereby precipitation in much of south-eastern Australia.[1] Atmospheric water vapour has a residence time of no more than 10 days before descending as precipitation (IPCC, Penner *et al.* 1999:33). When launching his Report at the National Press Club, Garnaut said he had thought of sub-titling it "No Pain, No Rain" when in fact "Garnaut's Plan means Less Rain" would have been more appropriate.

The Report adds that the "long lived greenhouse gases" (mainly CO_2) "remain for hundreds even thousands of years leading to continued warming". This is nonsense. As much as 12 percent of atmospheric CO_2 turns over every year, as around 100 GtC (billion tonnes of carbon) are absorbed every year from the atmosphere's total CO_2 of 800 GtC (where C is the equivalent of CO_2 at 3.67 tonnes of CO_2 to 1 tonne of Carbon) and then released back to the atmosphere as plant and animal life respires (H. What Garnaut implies is that he knows which CO_2 molecules remain aloft in the atmosphere for "thousands of years" and which form part of the annual flux. If he knows that he will be in line for a real Nobel Prize, not Gore's song and dance awards.[2]

Then Garnaut misreports the IPCC (2007) to the effect that "over the course of a century half of the CO_2 emitted in any one year will be removed" when in fact the IPCC's lead authors (Canadell *et al.* 2007: Table 1) show that ***on average EVERY year*****,** from 1959 to 2006**,** 57 percent of emissions was taken up by the global biosphere (both oceanic and terrestrial). This is not a trivial error, when Garnaut is reporting to a government that has already committed to 60 per cent reductions in emissions from the 2000 level by 2050, so that emissions would fall to 40 per cent of the level in 2000, while the biospheric uptake has been on average 57 per cent of emissions since 1959. Since it is those uptakes that have supported the growth in

[1] Note that the emissions index for jet engines is 3.15 kg of CO_2 and 1.26 kg of H_2O per 1 kg of fuel (Penner *et al.,* 1999:33). Neither CO_2 nor H_2O are pollutants, *pace* Garnaut.

[2] The error here is failure to recognize that the atmospheric concentration of CO_2 presents a classic inventory problem, since it comprises continuous fluxes of emissions of CO_2 not only on one hand from burning of fossil fuels and land use change and also from respiration by animal and plant life, and on the other, uptakes by the biosphere that produce the energy needed by that animal and plant life. Moreover, the Great Celestial Storekeeper is indifferent as to which particular emitted molecules get to be taken up at any time, but with the annual fluxes averaging about 20 percent of the inventory (Houghton 2004: Fig.3.1), the *average* atmospheric residence would appear to be about 5 years.

world food production (Curtin 2008), what will happen to that if emissions are reduced to below the uptake rate?

Another misleading statement in Garnaut's "science" chapter is the claim that "vegetation and soil have had a net decrease in carbon stored [since 1750] – a considerable loss from land use change has been partially (sic) offset by carbon uptake by living organisms" (p.65. This does not match the data in Canadell *et al.* (2007, Table 1) showing that average annual emissions from land use change from 1959 to 2006 were 1.5 GtC (22% of total emissions), while the oceanic and terrestrial sinks accounted for 3.8 GtC p.a. (57%). Similarly these data do not confirm Garnaut's claim that "absorption by both the land and ocean cannot keep pace with emissions from fossil fuels" (p.65), **since in fact such absorption has increased almost exactly *pro rata* with emissions** (see my Fig.2). Ironically, Garnaut's Report cites Canadell *et al.* (2007) but clearly did not study the data in their Table 1 that flatly contradicts their claims that ocean and land sinks are removing a smaller proportion of emissions. One of the problems with Canadell *et al.* (and with the earlier paper by Hansen and Sato 2004) is their inability to do simple arithmetic – they all with Garnaut assert that the "airborne fraction of CO2" is at least 60 per cent and rising, yet their source data show that it was 43 per cent from 1959 to 2006 and growing very slowly if at all (see my Fig.3).

Garnaut's Report suggests that he along with many of the authors of his preferred source (chapter 7 of IPCC WGI) who are also co-authors of Canadell e*t al*. (2007) are quite incapable of computing growth rates. The latter claim (their Table 1) that the growth of atmospheric CO_2 since 1959 has been at the rate of 1.89 percent p.a., whereas the records at Mauna Loa show annual growth rates that have ***never*** reached one percent p.a, and are currently in the range of 0.45 to 0.55 percent.[3] Similarly Garnaut defines the term logarithmic growth (at p.66) to mean that "the same amount of warming will occur from a doubling [of atmospheric CO_2] from 280 ppm (pre-industrial levels] to 560 ppm as from another doubling from 560 pp to 1120 ppm."

However in reality the formula for logarithmic growth is

$$Y = C \log X$$

If we set X = 280 ppm in 1800 and growing with annual increments of 0.5 ppm, and have the constant C at 1.05, this little model yields precisely last year's CO_2 level at Mauna Loa of 384 ppm. The model however takes until 2360 to reach the doubling to 560 ppm and until 3481 to reach 1120 ppm.

Garnaut's climate science is equally suspect. The atmospheric concentration increased by 22 per cent between December 1958 and December 2007, and the warming over that period was 0.7^{o}C (according to GISS). If Garnaut is right about the logarithmic growth of warming with respect to the atmospheric concentration and warming, then it will take until 2044 for a further 22 percent increase in the former (at its average

[3] "The average rate of increase since 1980 is 0.4%/yr. The increase is a consequence of CO_2 emissions" (IPCC 2001, WG1, *Climate Change: the scientific basis*). The same source notes that on average the net oceanic and terrestrial sinks increased from 2.2 Gtc p.a. in 1980-1989 to 3.1 GtC p.a. in 1990-1999 (Table 2).

annual growth rate of 0.55 percent from 1998 to 2007), and thus for another increase in temperature of 0.7°C, and it will take until 2074 for the next round, and 2100 for the next, for total increases in atmospheric concentration of 66 percent and in warming of 2.1°C by 2100. The projected atmospheric level shown here is just 641 ppm, far below Garnaut's worst case (business as usual, BAU) scenario for 2100 in his Report's Chapter 5. The reason for this appears to be that in its previous chapter, which is the basis for the BAU scenario in Chapter 5, the Report **only** projects gross emissions, and **makes no reference at all to net emissions,** i.e. after allowing for global biospheric uptakes.

If Garnaut is right that there will be ZERO net uptakes of carbon by the biosphere ever again, then we are indeed doomed, but there is NO evidence for this assumption. As noted already, Canadell *et al.* (2007: Table 1) show average net uptakes of 5 GtC a year from 2000 though 2006. These uptakes are implicit in Garnaut's Fig.4.13, showing CO_2 emissions from 1970 to 2007, since if absent the atmospheric level would have been increasing by 9 GtC p.a. by 2007 instead of the actual 4.1 GtC. The error arises in the Report's Chapter 4, which leans heavily on the badly flawed paper by Garnaut *et al.* (2008) that discusses only the more rapid growth of *gross* fossil fuel CO_2 emissions since 2000 than had previously been projected by Stern (2007) and IPCC (2007). This paper discusses only gross emissions and fails to mention that biospheric carbon uptakes have grown *pari passu* with emissions over decadal periods. In the science of climate change it is the atmospheric volume of CO_2 that determines any warming effect, not emissions as such, but one would never learn that from Garnaut *et al*. (2008).

The false assumptions in the Draft Report's Chapter 4 feed through to extrapolations in the next chapter where in Fig. 5.4 we find that the BAU level of atmospheric CO_2 equivalent greenhouse gases reaches 1500 ppm by 2170, simply as a result of the assumption there will never again be any net biospheric uptakes. Naturally the assumption that *all* future emissions add correspondingly to the atmospheric concentration leads to the wild claims that underpin the whole Report, with a temperature increase of 4.5°C by 2100 under BAU – so much for the admitted logarithmic effect that yields only 2.1°C.

The Draft Report's Chapter 5 only discusses carbon uptakes by the oceanic and terrestrial biospheres after it has implicitly assumed that these uptakes no longer occur. But then we read that the "potential for a terrestrial system to change from a sink to a source is not well understood" (p.135) – which does not prevent Garnaut assuming it will happen tomorrow! This brief passage (which merely paraphrases the IPCC 2007, WG1: 642) like the IPCC offers no evidence. Neither does it offer data to show any existing trend indicating that warming and growing atmospheric carbon concentrations since 1959 are already fulfilling the IPCC's and Garnaut's devout hopes for transition from sinks to sources (the absence of such a trend is shown in Fig.3 here).

This neglect of biospheric carbon uptakes is the more surprising and unacceptable when the Report had correctly noted in the introduction to its Chapter 3 (p.47) that "stabilization of carbon dioxide concentrations in the atmosphere requires the rate of greenhouse emissions to fall to the rate of natural sequestration". But the Report never states what that rate is, let alone that it was actually 57 percent on average since 1959,

nor that then emissions need only be reduced by 43 per cent of the current level at most, not the 60 per cent of the 2000 level that is the Australian government's arbitrary target. Indeed, the Garnaut Report is deceptive in failing to report that despite the more rapid growth of emissions this century than last, the rate of increase in the atmospheric concentration of CO_2 has NOT increased at all – it was in fact lower in both 2006 (0.47%) and 2007 (0.55%) than in 2005 (0.68%). The inconvenient truth that condemns the Garnaut Report is its failure to admit that the global biosphere continues to absorb well over 50 percent of total emissions and thus that ***absorptions grow at much the same rate as emissions*** (see my Fig.2).

A further inconvenient truth is that "the efficiency of the carbon trap is insensitive to the amount of carbon dioxide in the atmosphere: increasing the amount five-fold would scarcely change the trap, in spite of the stories that are currently being circulated by environmentalists" (Hoyle, 1983:130).

Measuring Climate Change

The Draft Report is at pains to debunk the evidence for some leveling-off in the growth of global temperature over the last 10 years. Thus Garnaut recruited his ANU colleagues Trevor Breusch and Farshid Vahid[4] to assess whether "there is a break in any trend present in the later 1990s or at any other point." (p.113). They concluded there was not. Unfortunately Breusch and Varhid used only the weather station data sets (GISS, NOAA, and HadCrut) and ignored the 30 years of satellite data that do not confirm the "trends" in the surface data sets.

However, Andrew Glikson and Graeme Pearman (the latter is chief scientific adviser to the Garnaut Review), have opined (2008) that the average temperature rise (^{o}C/year) from 1990 to 2005 was 0.022, "five times more than the 1850-1970 rate of 0.004 ^{o}C. This looks like a sleight of hand. Their figure for 1990 to 2005 takes the first and last years and divides by the number of years – but the *average* temperature over that period was 14.486oC, hardly different from the 14.48oC in 1990. So there was in truth no real temperature rise over their chosen period. They achieved their figure only by using two years, the last of which (2005) was conveniently warmer

[4] Although the Breusch and Vahid paper is a competent piece of work, it suffers from using world temperature sets going back as far as 1850 or 1880, when until around 1910 most of tropical Africa and parts of Latin America and Australia had no temperature records at all, while GISS has since 1990 ignored the decline in the number of weather stations in Siberia whilst also ignoring known stations in northern Canada and Scandinavia (see www.climateaudit.org for an enumeration of the absent stations, all conveniently in cold areas). In addition both NOAA and GISS have chosen to record weather stations as "rural" even when they are located in carparks and surrounded by airconditioners. There and elsewhere the problem is that modern electronic weather stations need cable connections to recording centres , and these are limited by budget constraints to around 20 metres in length. So instead of being in greenfield sites as they were before about 2000, they are now located within 20 metres of the recording office. The outcome is "global" temperatures that are seriously biased downwards before c 1910, because of the absence of records from the hot tropics until 1910 or later, and biased upwards from the decline in measuring stations in cold areas since 1990. In addition Garnaut ignores the "urban heat island" effect. Almost all of Australia's weather stations reporting to GISS, NOAA, and HadCrut are located at airports. The country's Bureau of Meteorology has never seen any need to correct for the increasing number of planes taking off and landing from such sites.

than the next year (2006). Glikson and Pearman seem ignorant of the limitations of linear trends, dominated as they are by the first and last readings of any short statistical series. More intelligent analysis of time series usually proceeds to inspection of the logarithmic trends shown in Fig.1 here.

The Garnaut Emissions Trading Scheme

When at least we reach an outline of the Garnaut Emissions Trading Scheme, it is very sketchy and remarkably devoid of any indication of quantitative caps on future emissions or the likely proceeds of the auctions of Permits in Australia. But it does at least reveal what may well be the main motivation of the Government, the ALP, and the Greens in the whole exercise, that it is far more about a substantial income transfer from rich to poor than about mitigating climate change. That is because the TOTAL burden of emission reduction falls on the rich while the lower middle classes and the poor may well be enabled to consume as much fuel and electricity, in real terms, as before. The "rich" will no doubt be defined as those with household income of $100,000 and above, that being the 2008 Budget's cut-off for access to solar panel grants, and it is they who will have to pay the *total* costs of mitigation.

All firms will seek to pass on the costs of their emission permits by raising their selling prices. The Garnaut Report proposes that the "poor", those on less than $100,000 p.a., will receive at least half of annual total receipts of the sale of emission permits by the Garnaut Bank. These may well amount to $16 billion initially (at $40 per tonne of CO2, with Australia's non-agricultural emissions being over 400,000 tonnes), rising over time as the falling caps raise the auction price of permits, but poor households can expect to receive around $8 billion in the first year of the auctions. Assuming that 80 per cent of households have income of less than $100,000 (the government's usual means test cut-off), then around 5 million households will qualify for payouts of $1,600 p.a., comfortably enough to cover their total annual spending on electricity and with enough left over to cover some or all of their higher petrol costs, at $468 p.a. if petrol rises from $1.70 a litre to $2, assuming annual consumption of 1,560 litres (if the emissions charge is fully passed on by Caltex *et al.*) No wonder the Rudd government is so pleased about the ETS, it buys votes the same way Mugabe uses international food aid to reward loyal supporters in Zimbabwe.[5]

[5] Garnaut's Report advises against cash payments that will enable the non-rich to maintain their present real spending on petrol and electricity. What we can then assume is that we will receive vouchers that can be used to purchase woollen socks and underwear (to cope with colder weather resulting from a global ETS?), bicycles, and other manifestations of a humbler, poorer life as well as in-kind payments (such as more free computers or yet more rebates for solar panels). These all have income effects and will lead to a secondary market as people seek to trade in such unwanted benefits for cash. The Soviet Union adopted the same policy, distributing cheap shoes and clothing while denying access for most to cars and petrol, but it does not appear to have been a great success. However the Government's Green Paper of 16th July 2008 implies that the cut-off income for compensation for most households will be $53,000 and will be payable in cash, which it claims "should not blunt the incentive to change behaviours in ways that result in lower emissions" (Summary: 25). This is truly The New Economics!

Discount rates and cost benefit analysis of climate change

Garnaut then goes on to discuss the choice of discount rates for assessing the costs and benefits of climate mitigation when as ever the costs are upfront and the benefits if any only accrue down the track, perhaps not for 100 years. But like Stern and almost all economists engaged in climate change policy (Richard Tol 2007 is a shining exception), Garnaut has forgotten, if he ever knew, that the primary purpose of the discount rate is to measure any project's net benefit against the opportunity cost of the funds used to finance the project. It is absurd for an economist of Garnaut's standing to argue that since at a real discount rate of 4 per cent, a dollar in 50 years' time is worth just 13 cents today (or just 36 cents at the real rate on US Treasuries of 2 per cent), we should not use such market rates, since to do so would mean we "are comfortable about living for [our] moment" instead of that of future generations (pp.43-44).

Most economists if not Stern and Garnaut know about opportunity cost. The costs of mitigating emissions that Garnaut's ETS will impose on Australia's enterprises will impact on their profits and on their financing capability for their future investments. None of their modeling ever confronts this feature of an ETS. The benchmark discount rate for most industries and enterprises listed on the stock exchange is usually around 15 percent nominal, or about 11 percent in real terms. Even for prime borrowers the present cost of funds in Australia is of the order of 9-11 percent (which is the range of effective yields on floating rate bonds issued by Adelaide Bank, Macquarie Group, NAB, Suncorp Metway, and Woolworths as of 7th July 2008).

What Stern and Garnaut would have us believe is that these enterprises would consider it beneficial for their shareholders to borrow at around 10 percent p.a. both to finance their purchases of emission permits and to undertake emission reduction programmes that only show a return (in terms of avoided costs of climate change) by 2100 if their discount rate is close to zero 0 - which in no way recoups their initial financing costs. It is incontestable that if today's firms like the above invest in projects returning more than the current cost of commercial paper over the normal project horizon of 30 years, they will in 2038 be in a much better position to invest in whatever climate adaptation projects might then show a reasonable prospective return, without resort to near-zero discount rates – and *a fortiori*, likewise in 2068.

The trouble with Garnaut is that by his own admission he first began to work on climate change mitigation only in April 2007, so he was immediately seduced by the even more dubious Stern Report that had just been published (2007). Stern had begun his post-graduate life as research assistant to Little and Mirrlees, who devised a system of cost-benefit analysis that is no longer applied anywhere, except perhaps at the World Bank. That system had the wonderful attribute, first devised by Lewis Carroll, that world prices of say sugar tea and cotton and local wage levels were not what they appeared to be, but were what Little, Mirrlees and Stern said they ought to be, i.e. at what they termed "shadow prices". This way all kinds of World Bank projects could be and were adopted even though they could not and never did repay to the host governments the costs of their World Bank loans with its interest rates usually at least 7 percent p.a. The same shadow pricing, in this case using non-market discount rates, informs both Stern (2007) and Garnaut (2008).

The Prisoners' Dilemma

Garnaut's Draft Report is again at fault when it describes the task of securing global commitments to carbon emissions reduction as the Prisoners' Dilemma, when what his report should really address is the "Tragedy of the Commons". Misattribution is a poor guide to policy, and will make the diplomatic challenge more difficult. The Prisoners' Dilemma involves two prisoners accused of a crime that they did commit. Let us name these gentlemen as Australia and China, guilty of the same crime, the one being the world's biggest per capita carbon emitter, and the other the world's largest total emitter. Their jailer in the original game offers both a plea bargain, whereby if each implicates the other, he will escape prosecution or secure a light penalty. The dilemma is that neither knows what the other has been offered or whether he will accept the plea bargain. The best course would be for A to accuse C if he could be sure C did not reciprocate, but if both remain silent they will escape prosecution altogether. But since neither A nor C is in prison, and there is no world prosecutor to offer plea bargains, it is difficult to see the relevance of this Dilemma in the context of climate change negotiations. China is well aware that Australia has embarked on the longest suicide pact in history and so far seems disinclined to adopt such selflessness.

The more relevant model is the "Tragedy of the Commons", but even that has a fatal flaw. The world's atmosphere is a Commons, owned by none, and receives all the world's airborne waste products free of charge, including so far those from both Australia and China. Ronald Coase (1961) showed how in a Commons, the best course of action is for A if suffering damage from C's pollution to offer to compensate C for the costs of reducing its pollution. Australia has so far made no offers to China along these lines, and even goes out of its way to deny the country (India) that will soon rival China's emissions the uranium that would substantially reduce its carbon emissions.

But while the Commons model deals with the social costs of alleged pollutants like carbon, which according to Garnaut constitutes the "greatest market failure" the world has ever known, that market failure must also apply to the huge social benefits of carbon dioxide. Those benefiting from the enhanced crop yields enabled by the growing atmospheric concentration of CO_2 never reward the CO_2 emitters for this free benefaction. Without atmospheric CO_2, there would be no life at all and the globe would be frozen at all times. Moreover, there is strong evidence that the gentle growth of atmospheric carbon dioxide, which has never reached even one per cent a year since 1800, and was only 0.55 percent last year, is very strongly correlated with the growth in world food production since then (Curtin 2008).

The St Petersburg Paradox

The Garnaut Report shows also only a superficial understanding of the economics of risk and uncertainty. As Bernstein has noted, "venturesome people place high utility on the small probability of huge gains and low utility on the larger probability of loss. Others place little utility on the probability of gain because their paramount aim is to preserve their capital" (1998:105). As Bernstein adds, "think what life would be like if everyone were phobic about lightning, flying in airplanes, or investing in startup companies [or climate change]". Garnaut's Report demands uniformity of view on such risks, and its ETS proposes to tax all, not equally, but in proportion to their

incomes, because it accepts Daniel Bernoulli's claim that "utility resulting from any small increase in wealth will be inversely proportionate to the quantity of goods already possessed" (quoted in Bernstein 1998).

That belief underlies the low discount rates used by Stern and Garnaut. But while each successive equal increase in income may well yield less "utility" than the previous, by the same token the disutility yielded by a reduction from any given level will necessarily always exceed the positive utility provided by a gain of equal size from that level (Bernstein 1998:112).[6] Garnaut like Stern posits large losses from the putative costs of "dangerous climate change" against their claimed relatively low costs of mitigating such change. As Bernoulli saw nearly 300 years ago, this is a two-edged sword. Gains (in this case avoided losses from higher future incomes) will be valued less than losses incurred on this generation's lower incomes – but Garnaut would have us believe that is not the case in regard to the costs and benefits of mitigating climate change. In a mathematical sense a zero-sum game like an Emissions Trading Scheme (because emission permits saved and sold exactly equal permits bought) is really a loser's game when it is valued in terms of utility (Bernstein, 1998:113). As Bernstein adds, "the best decision … is to refuse to play this game" (1998:113). "Game" is an apt term for Emissions Trading, and it is indeed best avoided.

Conclusion

The Garnaut Draft Report leans heavily on both Stern (2007) and the IPCC, especially the latter's Denison *et al*. 2007 (who include most of Canadell *et al.* 2007). That may explain why it repeats their inordinate stress on gross emissions of greenhouse gases by burning of fossil fuels, which are now growing at over 3 percent p.a., rather than on the atmospheric concentration of CO_2, growing only at around 0.5 percent p.a., which is what actually produces warming effects.

Ross Garnaut also follows Nicholas Stern by claiming that emissions of CO_2 produce only social ("external") costs, "constituting the greatest market failure the world has ever seen", when in reality we all also derive external benefits from CO_2, and owe a debt to the emitters whose output of CO_2 has done so much to enhance global food production (Curtin 2008). Moreover, both Stern and Garnaut, with their cost-benefit evaluations of present costs against future benefits (of avoided dangerous climate change) ignore the St. Petersburg paradox, whereby their low social discount rate (based on the falling marginal utility theory of income) falsely minimizes the present costs and maximizes future benefits.

The Rudd Government's Green Paper with its pejorative title *Carbon Pollution Reduction Scheme* (2008), issued barely two weeks after Garnaut's Report, has not accepted the recommendation that there should be no exemptions from his Emissions Trading scheme, with coal, petrol, aluminium and probably LNG already outside or about to be (LNG) the scope of the ETS. As these account for about 25 per cent of

[6] For example Garnaut posits that "with unmitigated growth in global emissions [we] may see GDP fall from the reference case by around 4.8 percent…" by 2100. The present costs of mitigation until 2050 are estimated at 0.7 percent of GDP. In marginal utility terms these numbers may well reverse.

Australia's total emissions, the remaining sectors will have to bear the brunt of the targeted total emissions reductions by 2050 of 60 percent of the 2000 level, namely by 80 percent, or to 20 percent of the 2000 level. Both Garnaut and the Green Paper emphasize Australia's high per capital emissions of CO_2, to support their insistence that Australia needs to make a greater effort than the rest of the world to reduce its emissions. Thus the G8 has mentioned reduction of only 50 percent by 2050, and then more as an aspiration than as a fixed target like Australia's 60 percent. Curiously, neither the Australian Government nor Garnaut is aware that Australia's annual per capital NET emissions are far from being the world's highest. As we have seen, the Garnaut Report only discusses gross emissions, and not the much smaller increase in the atmospheric concentration that arises after net biospheric uptakes have removed (on average) 57 percent of gross emissions. Yet in practice Australia despite its alleged endemic droughts is one of the world's largest per capita cereal producers, at 2,000 tonnes per capita in 2004 (FAO 2006), against a world average of 500 tonnes. All cereals absorb carbon dioxide, of which only part is taken up by animal life, with some of the balance remaining in the soil, and the rest being respired. Animal life also respires, but not as much as it uses as energy in the ordinary business of life until death. At the very least, it is curious that Garnaut's Report's science adviser (Pearman) seemingly made no mention of this important variable in the global carbon budget – nor of its contribution to a better appreciation of Australia's NET contribution to atmospheric carbon dioxide.

Like Ross Garnaut, I am freely able to make predictions for 2100 knowing I will suffer no redress if I am proved wrong. My prediction is that by 2100 the Garnaut Report will have taken its place alongside Malthus (1799) and the Club of Rome (1972) for being spectacularly wrong with all of his equally fanciful predictions. There is no likelihood either that the drastic global emission reductions sought by Garnaut will be implemented, or that if they are not, there will then be any of his predicted adverse effects on economic growth. The Australian Government's disregard of some of Garnaut's key recommendations indicates that my prediction is already on track.

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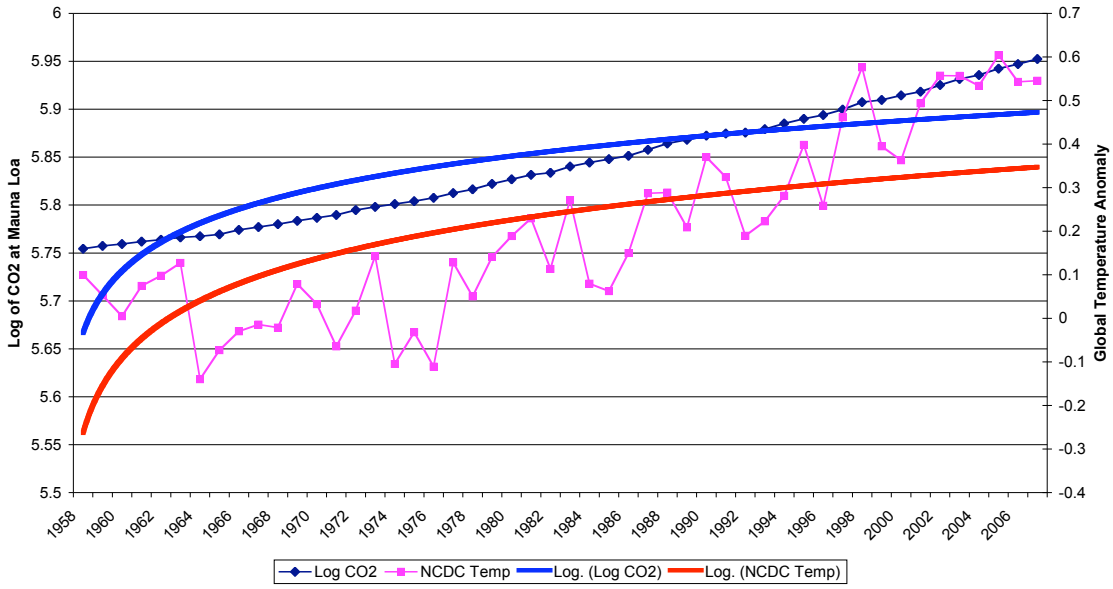
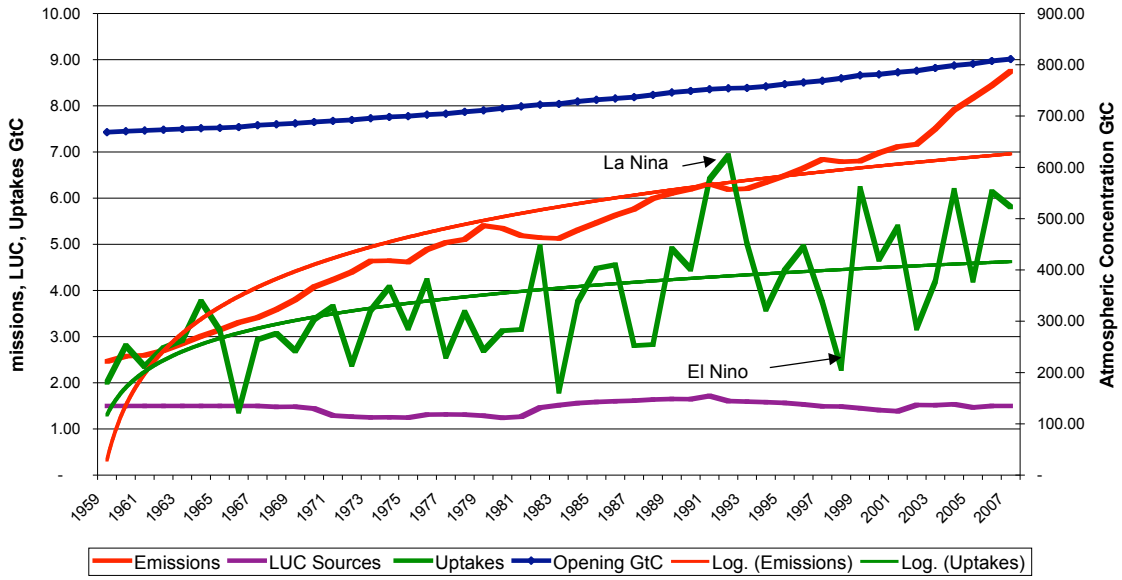
Fig.1 Logarithmic growth rates of atmospheric CO2 and global temperature 1958-2007



Note: This Figure plots the log of the annual (December) level of atmospheric carbon dioxide at Mauna Loa against the NCDC/NOAA global temperature anomalies (from 1958 to 2007, Marland *et al.* 2007). The reference period for the anomalies is 1900-1999.

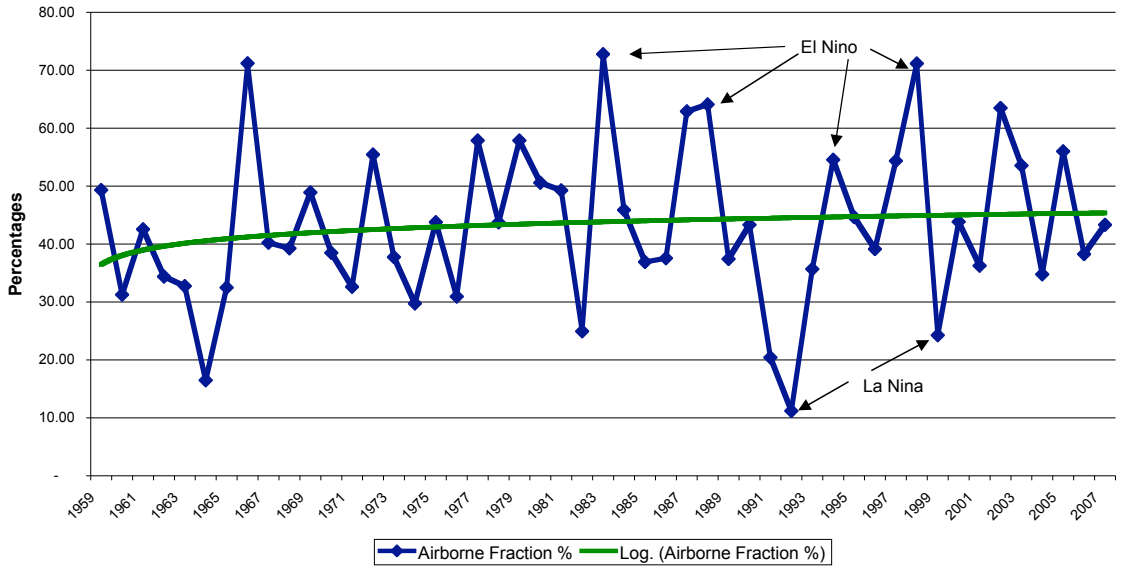
Source: NOAA, July 2008.

Fig.2 Trends in growth of atmospheric concentration, fuel emissions, land use changes (source), biospheric uptakes (sinks), in GtC



Source: Marland *et al.* 2007; Canadell *et al.* 2007, Table 1

Fig.3 The Airborne Fraction of CO2 Emissions



Sources: Canadell *et al.* 2007, Table 1; Marland *et al.* 2007, 2008

Notes: 1. The evident (and seemingly never before noticed) coincidence of years with high airborne fractions and El Nino events is due to the droughts associated with El Nino years, leading to lesser uptakes of carbon dioxide by terrestrial plant life, and thence to more atmospheric carbon dioxide. Clearly the balance is largely redressed in La Nina years.

2. The Airborne Fraction is defined by Canadell *et al*. (2007:2) as "the ratio of the atmospheric CO_2 increase in a given year to that year's total emissions" (from both fossil fuel emissions and land use change) (see Fig.2 and Table 1).

Table 1
The Atmospheric Carbon Budget

	Opening GtC	Emissions Emissions	LUC Sources	Total Uptakes	Closing GtC	Airborne Fraction
1959	668.47	2.46	1.50	2.01	670.42	0.49
1960	670.42	2.58	1.50	2.80	671.70	0.31
1961	671.70	2.59	1.50	2.35	673.44	0.43
1962	673.44	2.70	1.50	2.76	674.89	0.34
1963	674.89	2.85	1.50	2.92	676.31	0.33
1964	676.31	3.01	1.50	3.76	677.05	0.16
1965	677.05	3.15	1.50	3.14	678.56	0.32
1966	678.56	3.31	1.50	1.38	681.98	0.71
1967	681.98	3.41	1.50	2.94	683.96	0.40
1968	683.96	3.59	1.48	3.07	685.95	0.39
1969	685.95	3.80	1.48	2.69	688.55	0.49
1970	688.55	4.08	1.44	3.37	690.69	0.39
1971	690.69	4.23	1.29	3.65	692.56	0.34
1972	692.56	4.40	1.26	2.39	695.83	0.58
1973	695.83	4.64	1.25	3.57	698.15	0.39
1974	698.15	4.64	1.25	4.07	699.97	0.31
1975	699.97	4.62	1.25	3.18	702.65	0.46
1976	702.65	4.88	1.31	4.22	704.63	0.32
1977	704.63	5.04	1.32	2.57	708.41	0.60
1978	708.41	5.11	1.31	3.53	711.30	0.45
1979	711.30	5.40	1.28	2.69	715.29	0.60
1980	715.29	5.35	1.24	3.13	718.75	0.53
1981	718.75	5.19	1.26	3.16	722.05	0.51
1982	722.05	5.14	1.46	4.95	723.70	0.25
1983	723.70	5.13	1.51	1.82	728.53	0.73
1984	728.53	5.31	1.56	3.75	731.65	0.45
1985	731.65	5.46	1.58	4.48	734.22	0.36
1986	734.22	5.63	1.60	4.55	736.90	0.37
1987	736.90	5.76	1.61	2.81	741.46	0.62
1988	741.46	5.99	1.64	2.83	746.26	0.63
1989	746.26	6.11	1.65	4.91	749.11	0.37
1990	749.11	6.20	1.64	4.46	752.49	0.43
1991	752.49	6.31	1.71	6.41	754.10	0.20
1992	754.10	6.19	1.61	6.92	754.97	0.11
1993	754.97	6.20	1.59	5.01	757.76	0.36
1994	757.76	6.34	1.58	3.59	762.09	0.55
1995	762.09	6.49	1.56	4.44	765.70	0.45
1996	765.70	6.65	1.53	4.95	768.93	0.39
1997	768.93	6.84	1.49	3.74	773.52	0.55
1998	773.52	6.79	1.49	2.31	779.49	0.72
1999	779.49	6.80	1.45	6.21	781.53	0.25
2000	781.53	6.98	1.41	4.67	785.25	0.44
2001	785.25	7.12	1.39	5.38	788.37	0.37
2002	788.37	7.17	1.52	3.18	793.87	0.63
2003	793.87	7.50	1.51	4.19	798.69	0.53
2004	798.69	7.91	1.53	6.17	801.96	0.35
2005	801.96	8.17	1.47	4.22	807.38	0.56
2006	807.38	8.44	1.50	6.14	811.18	0.38
2007	811.18	8.72	1.50	5.78	815.62	0.43