Submission to the Senate Inquiry on recent trends in, and preparedness for, extreme weather events

By

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1. Summary

Genuine environmental stewardship ideals should guide efforts to identify and successfully address the real threats to the environment, energy sufficiency and ultimately, humanity itself. There needs to be abundantly, serious work crucial to address these serious issues and we are afraid we are moving sidewards.

2. Understanding the gravity and prioritizing the threats

While nobody doubts the fact we humans are responsible for dramatic changes to our environment, it is still controversial which effect the traded anthropogenic carbon dioxide emission actually has on the climate in general and on rising temperatures, accelerating sea levels and occurrence of extreme events. For what concerns the sea levels for example, even if it is claimed (IPCC, 2012) that significant changes are presently occurring over a broad range of temporal and spatial scales, the proof the sea levels are accelerating are often inferred from the use of poor quality incomplete or short records arbitrarily extended or reconstructed (for example Becker et al., 2012), the focus on the small windows that are instrumental to the claim neglecting all the other information that could bring to a different conclusion (for example Sallenger, Doran and Howd, 2012) or simply by arguing that modelling sea level as a function of predicted temperature is superior to the standard approach of analysing sea-level rise as a function of time (for example Rahmstorf and Vermeer, 2011). Different conclusions may be inferred adopting different approaches, for example trying to understand what is actually the rate of rise and the acceleration in a naturally oscillating record as the sea levels from tide gauge and determining which are the requirements of the data to be analysed and which is the procedure to infer the pattern. If for example we analyse the 10 century-long sea level rate of rise records available for the Pacific Ocean, with Sydney NSW 1 of the 10, all these records present strong multi-decadal oscillating patterns, which even if ignored by the most part of the present literature forgetting the importance of natural oscillations in geophysical climatic systems, is not surprising because of the well-known multi-decadal ocean and temperature oscillations such as the Pacific Decadal Oscillation and many others that present a major quasi 60- year cycle and other shorter cycles.

The influence of the multi-decadal oscillations on the sea levels and other climate parameters is discussed in Chambers; Merrifield and Nerem, 2012; Jevrejava, Moore, Grinsted and Woodworth, 2008; Parker, 2012a,b; Mazzarella, Giuliacci and Scafetta, 2012; Scafetta N, 2012a,b,c; Mazzarella and Scafetta, 2012.

It is found in these tide gauge results that only using records longer than 60-70 years it is possible to bypass these natural multi-decadal oscillations and to determine how much has changed and whether the sea level rate of rise presents a background long range acceleration. In fact, if periods shorter than 60 years are analysed (e.g. 30 years), the severe risk is to mistake the bending of a natural multi decadal oscillation as a long-range acceleration. This will yield serious erroneous forecasts about future sea level rate of rise trending. Once records longer than 60-70 years are used, no significant positive acceleration emerges in these records. This result is consistent with many other analyses published in the peer-review literature; (e.g. Boretti and Watson, 2012; Boretti, 2012a,b,c,d,e; Holgate, 2007; Houston and Dean, 2011; Morner, 2004, 2007, 2010a,b; Parker, 2012a,b,c,d; Unnikrishnan and Shankar, 2007; Watson, 2011; Wenzel and Schröter, 2010; Wunsch, Ponte and Heimbach, 2007) and simply ignored in all the governments' sponsored assessments.

Figure 1 presents for the specific of Sydney, NSW the sea level rate of rise and the sea level acceleration. The least squares method is used here to calculate a straight line that best fits the data within a time window and return the window's sea level rate of rise (*SLR*). The dependent *y*-values are the monthly average sea levels and the independent *x*-values are the time in years. The calculations for $SLR_{j,k}$ is based on the formula:

$$SLR_{j,k} = \frac{\sum_{i=j}^{k}(x_i - \bar{x})\cdot(y_i - \bar{y})}{\sum_{i=j}^{k}(x_i - \bar{x})^2} \quad (1)$$

In this equation $\bar{x}$ and $\bar{y}$ are the sample means and *j* and *k* are the indices of the first and last record of the measured distribution considered for the *SLR* estimation. At a certain time x_k, x_j is taken as (x_k-30) to compute the SLR_{30}, (x_k-60) when computing the SLR_{60}, or as x_1 when computing the SLR_A over all years of the record. This way, from a measured distribution x_i, y_i for i=1,N, it is possible to estimate the time histories of SLR_{30}, SLR_{60}, and SLR_A.

Providing that more than 60–70 years of continuously recorded data, without any quality issues, are available in a given location, the $SLR_{A,k}$ usually returns a reasonable estimation of the velocity of sea level change at the present time x_k and the acceleration may then be computed as follows:

$$SLA_k = \frac{SLR_{A,k} - SLR_{A,k-1}}{x_k - x_{k-1}} \quad (2)$$

This conventional velocity and acceleration might clearly oscillate, and their time history, rather than a single value, is of interest.

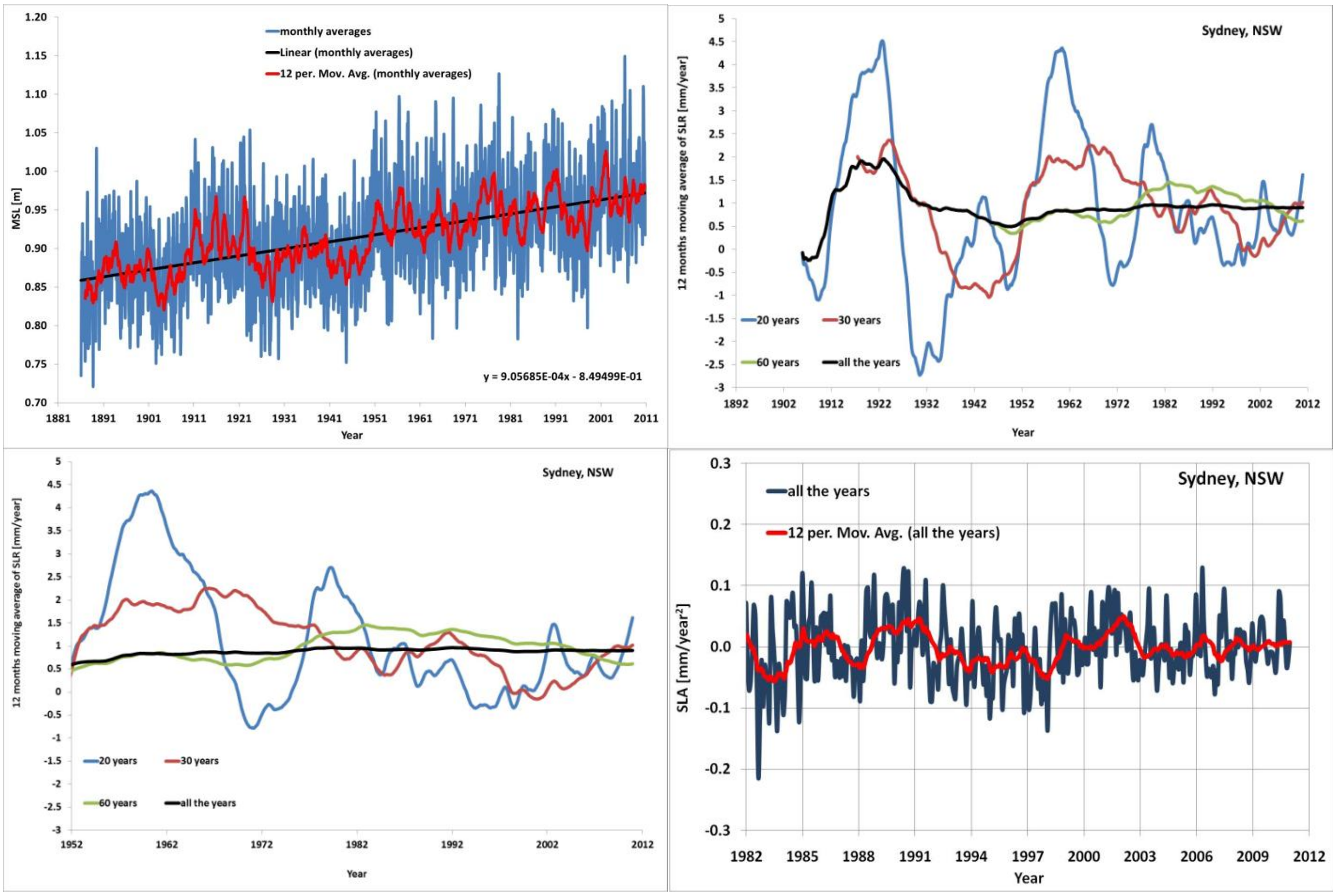

Figure 1 – Monthly average sea levels, sea level rate of rise with 20, 30, 60 years or all the data and sea level acceleration for Sydney, NSW (data from PSMSL, 2012).

In a case with non-accelerating tide gauge records as the norm so far, $SLR_{1,N}$ returns the present sea level rise, and the graphs of $SLR_{j,k}$ and SLA_k are only helpful to confirm the lack of any acceleration. In a case of accelerating tide gauge records as sometimes reconstructed but so far never measured, this approach would confirm the presence of acceleration in the form of a constantly increasing $SLR_{j,k}$ and a constantly positive SLA_k rather than oscillating values about the longer term trend and the zero. At this stage, different mathematics would be needed to compute the present velocity and acceleration.

Now, all the other long term tide gauges of the Pacific present a similar behaviour to the one shown in Sydney. And all the other tide gauges of enough quality and length of the world similarly confirm the lack of any acceleration when properly analysed.

The actual effect of the traded carbon dioxide emission of our 8 billion people world on the acceleration of sea levels has been therefore so far quite small, and we avoid commenting the relevance of a tax on the regulated carbon dioxide emissions of the 20 million Australian on the sea behaviour. Reasonably, the “most likely” or at least the “lower bound of future sea level scenarios” is the prosecution of what has been measured so far location by location and coastal planning should work on these data rather than the prediction of simplistic climate models still failing validation or the claims based on wrong analyses or biased data sets.

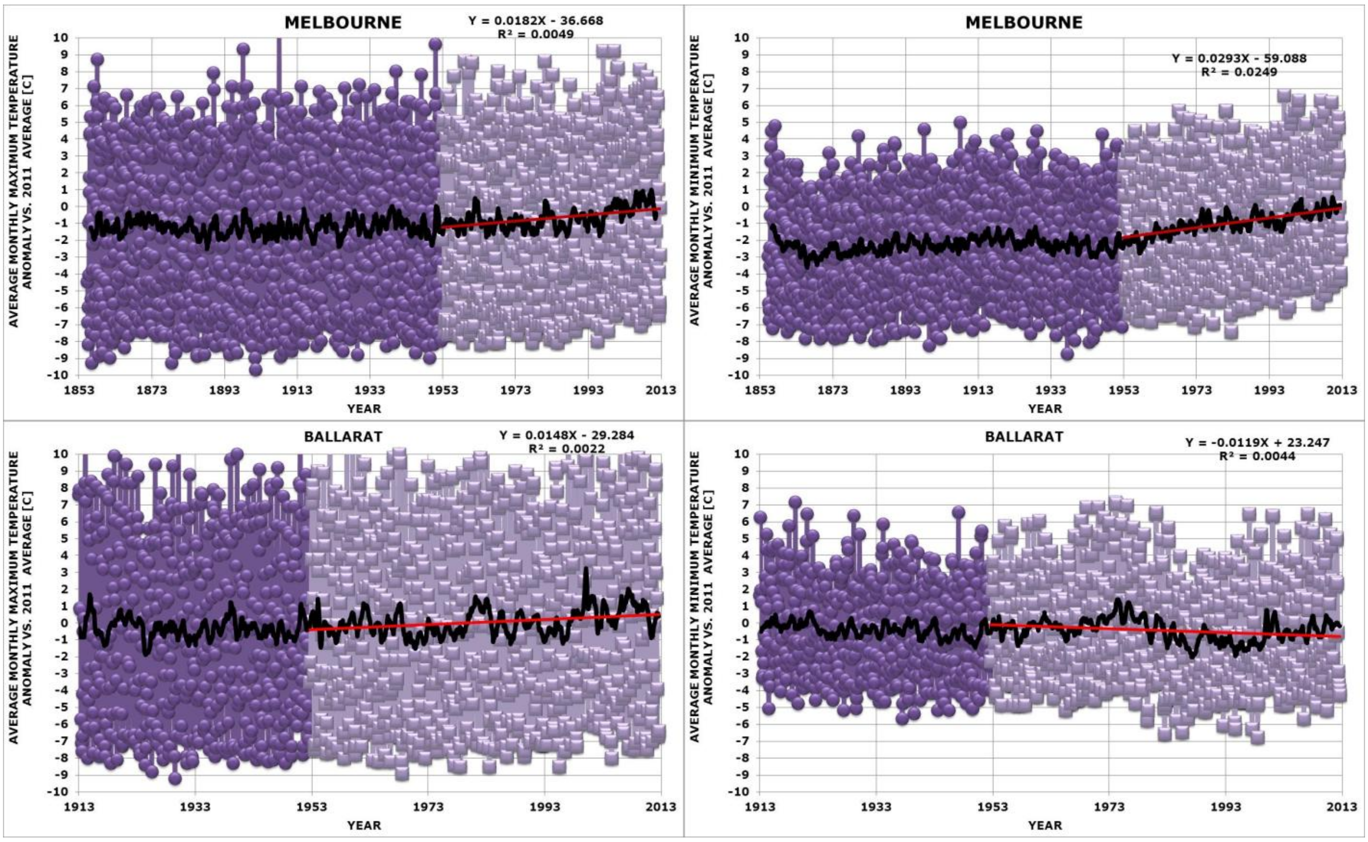

Figure 2 – Monthly average maximum and minimum temperatures in Melbourne and Ballarat and linear fitting of the last 60 years of data (data from Australian Government Bureau of Meteorology, 2012).

Unfortunately (for the reputation of the scientific community) similar lack of experimental evidence for dramatic changes is shown in many other climate change parameters, for example the global warming of Melbourne rated at 5°C by 2100 with much smaller temperature gradients mostly due to the formation of an heat island that disappear moving to Ballarat and other neighbouring rural cities. Figure 2 presents the monthly average maximum and minimum temperatures in Melbourne and Ballarat and linear fitting of the last 60 years of data. Over the last 60 years the minimum temperature has grown at a rate of 0.029 C/year, but the maximum temperature has grown of 0.0182 C/year. In Ballarat, over the same time frame, the minimum temperature has decreased at a rate of -0.011 C/year and the maximum temperature has grown of 0.0148 C/year. Similar to

Ballarat mixed trends are found in the other measuring stations of Victoria not affected by the huge heat island formation of Melbourne. Worth of mention all the above temperatures may suffer of an upwards bias and not certainly of a downward bias because of other human activities different from the carbon dioxide emissions.

Similarly for the claim of "exceptional circumstances" that only proves the lack of memory to remember occurrences of the past and the use of a very narrow "perspective" in addressing wide range, complex problems There have been many theories about who first discovered Australia. Aborigines had already been there for tens of thousands of years before that discovery. Everything in life is just a question of "perspective".

Unfortunately, these days the tax payers moneys are only wasted to support the claim that global warming is dramatic and the traded anthropogenic carbon dioxide emission is the cause and there is a serious lack of good scientific activities on politically sensitive matters.

3. Understanding the effectiveness and efficiency of the mitigation

There is around a clear catastrophism misrepresenting the past and exaggerating the present that prevent to fully understand the real threats and in addition a mystification of the measures to cope with these threats. Apart from the still open debate how relevant are the regulated anthropogenic carbon dioxide emissions to the behaviour of our climate, and how strong are the changes presently occurring, some proposed mitigation strategies actually translate in much worse consequences for the economy and the environment - anthropogenic carbon dioxide emissions included - that just doing nothing.

Anthropogenic energy-related CO_2 emissions are higher than ever and further emissions increase seems inevitable. The latest year to date percentages of the consumed electric energy produced by different sources, combustible fuels, nuclear, hydro and finally geothermal/wind/solar/other, clearly show combustible fuels account for more than 60% of the total with nuclear accounting for another 20% as an average in the Organisation for Economic Co-operation and Development (OECD) countries (IEA, 2012). For the specific of Australia, this non-renewable 80% increases to a record high about 90% combustible fuels almost entirely coal. Fossil fuels are similarly relevant as other energy sources as transportation. The rapid application of carbon capture and storage (CCS) is a much heralded means to tackle emissions from both existing and future sources that simply may not deliver the expected benefits. The stall in deploying carbon capture and storage (no fossil-fuel power plants, the greatest source of CO_2 emissions, are presently using carbon capture and storage, and publicly supported demonstration programmes are struggling to deliver actual projects) is due to the simple fact that the move to carbon capture and storage would have considerable additional costs to the economy and the environment that would very likely offset all of the benefits. Considering most parts of the present energy needs are covered by burning fossil fuels, the uptake of carbon capture and storage would translate with a sharp increase to the mining of fossil fuels with a much earlier depletion of the natural resources and a much worse environment under all the criteria including the traded and non-traded carbon dioxide emissions.

A much clever option that could work in a political world not hysterically focused on the small picture of making moneys of the traded carbon dioxide emissions may certainly be the production of alkane transportation fuels from coal or methane and the captured CO_2 in new coal fired power plants built with carbon capture technologies to replace the existing ones at the end of their lives or to supply additional electricity. Coal-to-liquid (CTL) and gas-to-liquid (GTL) technologies following the Fisher-Tropsch mechanism are well established. Methanol based approaches are also promising. Oxy-coal combustion with carbon capture is also quite advanced. Other pollutants would also be reduced when very old, polluting and inefficient power plants could be replaced by new ones. For the specific of Australia where coal and natural gas are abundant but oil is scarce and the coal fired power plants are much older, more polluting and less efficient than the OECD average, there is possibly the opportunity to produce hydrocarbon transportation fuels by methane and the captured CO_2 in coal fired power stations improving the energy security, the economy and the environment of Australia but without targeting the impossible cancelling of the carbon footprint or the fossil fuel dependence. But this is another story from the subject of the submission, talking about the small improvements in energy security, the environment and the economy that are in the history of engineering.

If carbon dioxide capture at the source has some chances to become of interest in the near future, with better perspectives for the recycle rather than the storage option, conversely the carbon dioxide capture in the atmospheric air is an outrageous idea with no real chances of uptake in the near future because of the huge environmental, economic and energetic costs, this latter ultimately also translates to a much larger upstream emission of a new carbon dioxide than the captured, a solution to increase the amount of carbon dioxide will be at huge costs to our future production.

What has to be kept in mind is that a better solution has to produce better results properly covering all the relevant aspects. All inclusive life cycle analyses may provide correct answers, focus on the small picture is a short cut that does not produce any benefit for the environment and the economy.

4. Something can be done to help the environment and the economy, but this is not sexy

If Australia is at the forefront in the most impractical, exotic solutions will not be those clear threats; it is worth to mention the lack of any uptake of very good practices as the use of the waste biomass.

For Australia, the very conservative estimate can be made that there are 50 million tonnes a year of economically-available biomass generated annually (not including many million more tonnes available from sustainable management of native forest), plus about 20 million m^3 of putrescible wastes. This is enough to potentially provide over 20% of Australia's primary energy (the combined heat, electricity and transport fuels) (Lang, Heinz and Parker, 2012).

By comparison Austria, with only about 1% of Australia's land area, and a significant part of it being urban areas and alpine reserves, produces over 20 million tonnes of biomass (as wastes and residues) used for production of energy. In 2009 this was the source of over half of the 30% of the primary energy in Austria provided from renewable sources (with almost all the balance being hydro power). The most conservative estimate of combustible biomass amount available of about 40 million tonnes is enough to produce about 4000 MW-e. This is about 14% of Australia's present base requirement. When the heat produced is fully utilised, modern biomass-fuelled plants have a fuel-energy conversion efficiency of over 85%. This compares favourably with Australia's present coal-fired condensing plants and gas-fired gas turbine systems. In addition to the potential for on-demand production of about 25% of Australia's current electricity supply and production of significant fractions of our heat energy and transport fuels, the use of sustainably produced biomass would mean a reduction in current Greenhouse Gas emissions from use of fossil fuels by an equivalent or greater amount (due to the effective use of heat produced, and by net carbon sequestration), and a reduction in use of potable water in the cooling towers of coal-fired condensing power plants or closed-cycle gas-fired plants. The sequestration of atmospheric carbon in greatly expanded plantings of farm forestry, and of woody energy crops like oil melee will be significant. The potential for production of enormous amounts of biochar to allow stable long-term carbon sequestration in farm soils is another aspect of the potential of bioenergy.

Using the mature bioenergy technologies is in widespread use elsewhere in the world to produce up to 30% of Australia's present electricity needs, plus equivalent percentages of fuels and thermal energy, would require an increased biomass supply through development of integrated farm forestry plantations and woody energy crops within the current farming areas, without reducing production of food or fibre, or water runoff.

While Australia's state and federal governments have strategies and policies to support solar hot water and solar photovoltaic electricity, and electricity from wind farms and geothermal power stations, puzzlingly there is no corresponding coherent planning for development of the range of bioenergy technologies, despite the fact that it is our most cost-competitive renewable source and comes with broader economic, environmental and social benefits.

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