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Why are we not taking climate change more seriously?

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Figure 1. Robert FitzRoy. Source: Wikipedia (2019a)

Robert FitzRoy was an English Officer of the Royal Navy, most famously known for captaining HMS Beagle during Darwin's voyage around the world, and being the 2nd Governor of New Zealand. He was also perhaps the world's first modern-recognised weather forecaster (even coining the word "forecast" and setting up what is now known as the UK Met Office).

FitzRoy recognised the need for weather prediction after a series of storms on the English coast shipwrecked passenger ships with the loss of many lives. He petitioned the Government of the day and received funding to operationalise his daily weather forecasts. However, there was widespread lack of public acceptance of his forecasts and FitzRoy was ridiculed at the apparent lack of accuracy.

The fascinating life story of Robert FitzRoy culminated in a tragic end when, in April 1865, he took his own life after suffering from depression believed to be associated with having to defend himself against the public's attacks of his weather forecasts.

While FitzRoy left an important legacy for weather forecasting in the UK, his story rings true of the (still) sizeable lack of public acceptance of climate change today. Why are we not taking climate change more seriously? There is certainly sufficient empirical evidence to suggest anthropogenic climate warming is occurring. A recent study by Frances Moore et al. in the journal PNAS tries to explain why this might be.

The boiling frog effect

Moore et al. (2019) used a sample of over 2 billion social media posts from Twitter in the US to investigate the drivers behind public perception of climate change. The research suggests that experience of weather in recent years – rather than longer historical periods – determines the climatic baseline against which current weather is evaluated, potentially obscuring public recognition of anthropogenic climate change.

The metaphor of a "boiling frog"[1] describes the phenomenon whereby the negative effects of a gradually changing environment become normalised so that corrective measures are never adopted. In this instance, the declining noteworthiness of historically extreme temperatures is not accompanied by a decline in the negative sentiment that they induce, indicating the social normalization of extreme weather conditions.

The study shows that, despite large increases in absolute temperature, anomalies relative to a shifting baseline are small and not clearly distinguishable from zero through the 21st century (Figure 2).

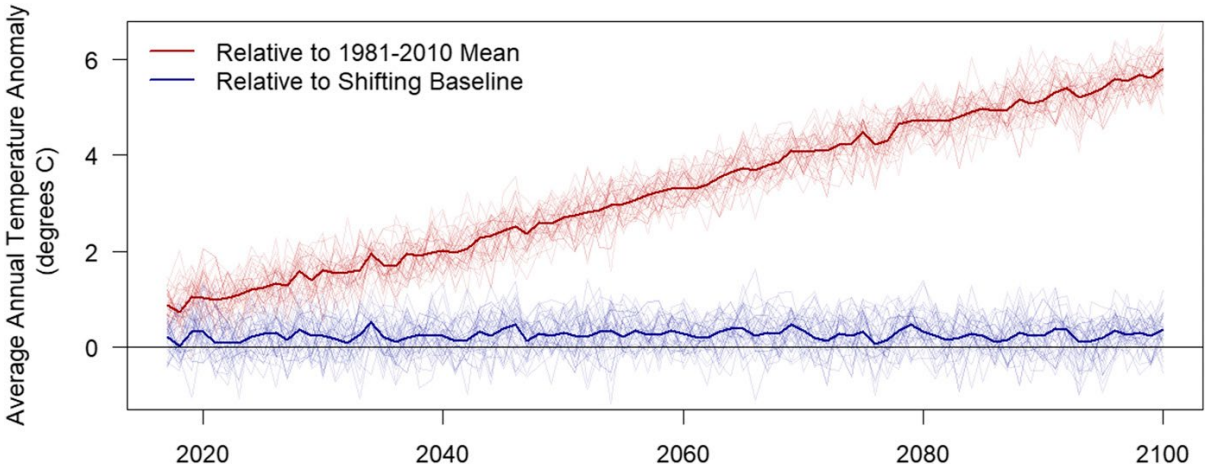

Figure 2. Effect of shifting baselines on the remarkability of temperature anomalies. Population-weighted annual average temperature anomalies over the US under the IPCC's (most extreme case) RCP 8.5 with 40 realizations of internal variability. Anomalies are defined relative to a fixed 30-yr period (1981-2010, red line) and relative to a shifting baseline (blue line). A shifting baseline reduces the remarkability of increased temperatures to near zero. Source: Moore et al. (2019).

This is a hugely important notion for government, as public policy tends to advance during windows of opportunity provided by focused public attention. Without public perception of a problem, the ability of policy-makers to advance an agenda is limited.

Moore et al. conclude that it is unlikely that rising temperatures alone will be sufficient to produce widespread support for mitigation policies.

It is important to highlight that this is a US-based study, biasing the results toward domestic sentiment (and overt political denial) of climate change in the US. However, there are certainly similarities between the public discourse of climate change in the US and Australia. The problem of a 'shifting baseline' is also potentially exacerbated in Australia, where interannual climate variability such as El Nino-Southern Oscillation (ENSO) plays an important role in modulating the behaviour of extreme weather events. Unfortunately, it seems, the reference

[1] The boiling frog is a fable describing a frog being slowly boiled alive. The premise is that if a frog is put suddenly into boiling water, it will jump out, but if the frog is put in tepid water which is then brought to a boil slowly, it will not perceive the danger and will be cooked to death. Source: Wikipedia (2019b).

point for socialised 'normal' conditions appears to be based on weather experienced between two to eight years ago, which coincides with the timeframe on which ENSO fluctuates.

The authors also point out that their results relate to ambient average temperatures only. It may well be that more acute extreme events are both more consequential and more salient and therefore less prone to normalisation.

Taking a longer-term view

So, what could the answer be to communicating climate change risk to a public with a constantly shifting baseline? A powerful approach to overcoming short-termism is presenting the long-term picture and contextualising the present-day climate within this.

The recently-published State of the Climate 2018 report by CSIRO/BoM (2019) is unequivocal about the unprecedented nature of today's current levels of atmospheric CO_2, the anthropogenic cause of this and the trajectory that we are locked into for the coming decades.

Two well-known figures are particularly useful in this regard. The first (Figure 3) combines a paleo-reconstruction of atmospheric CO_2 concentrations from measurements of oxygen isotopes in Antarctic ice for the past 800,000 years (left panel) with historical observations of CO_2 levels measured at the Bureau's observation station at Cape Grim in Tasmania for almost the past 200 years.

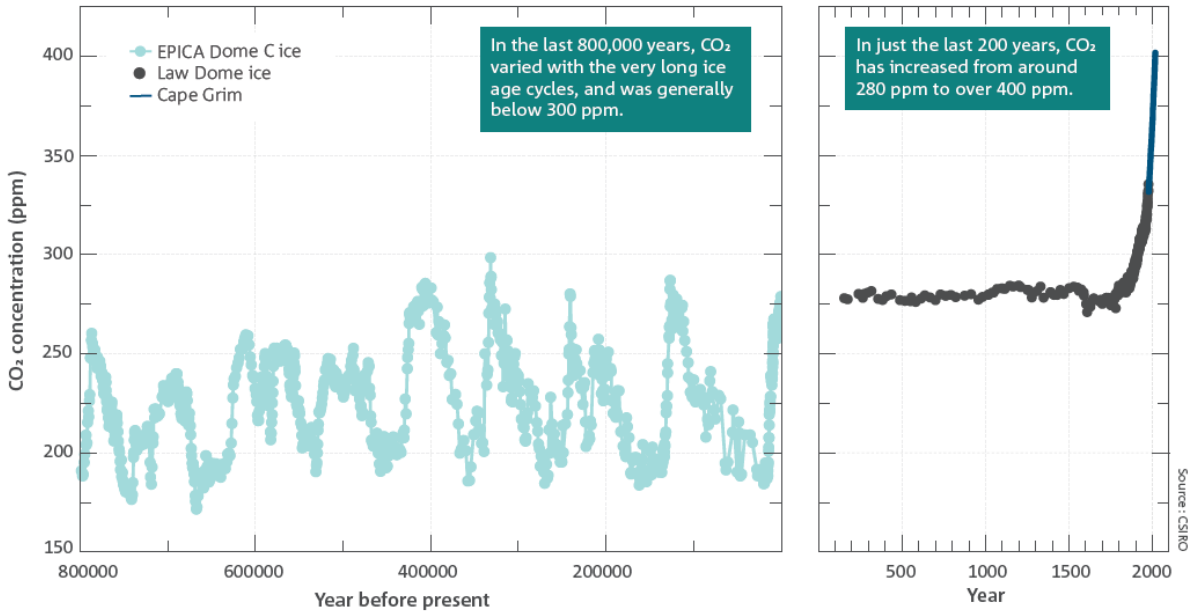

Figure 3. Long-term variability in atmospheric CO_2 from Antarctic ice core records (green line, left panel and black line, right panel), and historical observations of CO_2 in Tasmania to present day (blue line, right panel).

As can be seen, in the last 800,000 years CO_2 varied with the very long glacial-interglacial cycles (a periodicity of around 100,000 years) and was generally between 170 and 300 ppm (parts per million). In just the last 200 years, CO_2 as measured in Tasmania has increased from around 280 ppm (largely typical of an interglacial) to 400 ppm.

In other words, ***we are about 75 % above the natural variability of CO_2 in the atmosphere relative to almost the last one million years***. This is hugely significant because there is a high correlation between atmospheric CO_2 concentrations and temperature. We may not be seeing the full effects of high atmospheric CO_2 just yet because of inertia and retention in the climate / ocean system – but for this reason we are locked into a warming trend for decades to come.

Some may note that from Figure 3 we are 'due' for another glacial period – but how this will play out with now unprecedented levels of atmospheric Co_2 relative to the last million years is unknown. This introduces the realm of feedback loops and 'abrupt climate change' – a topic we touched on in Briefing Note No. 374.

The next question, if it still needs asking, is: how do we know the recent exceedance of CO_2 levels above the long-term natural envelope is anthropogenic, i.e., human-induced?

Figure 4 illustrates an Australian-based modelling study which addresses this question. The grey line represents Australian temperature observations since 1910, with the black line the ten-year running mean. The shaded grey and blue bands are the 10-90% range of the 20-year running mean temperatures simulated from the latest generation of Global Climate Models (CMIP5). The grey band shows simulations that include the observed conditions of greenhouse gases, aerosols, solar input and volcanoes. The blue band shows simulations of observed conditions but not including human emissions of greenhouse gases or aerosols. The red band shows simulations projecting forward into the future (including all IPCC emissions scenarios).

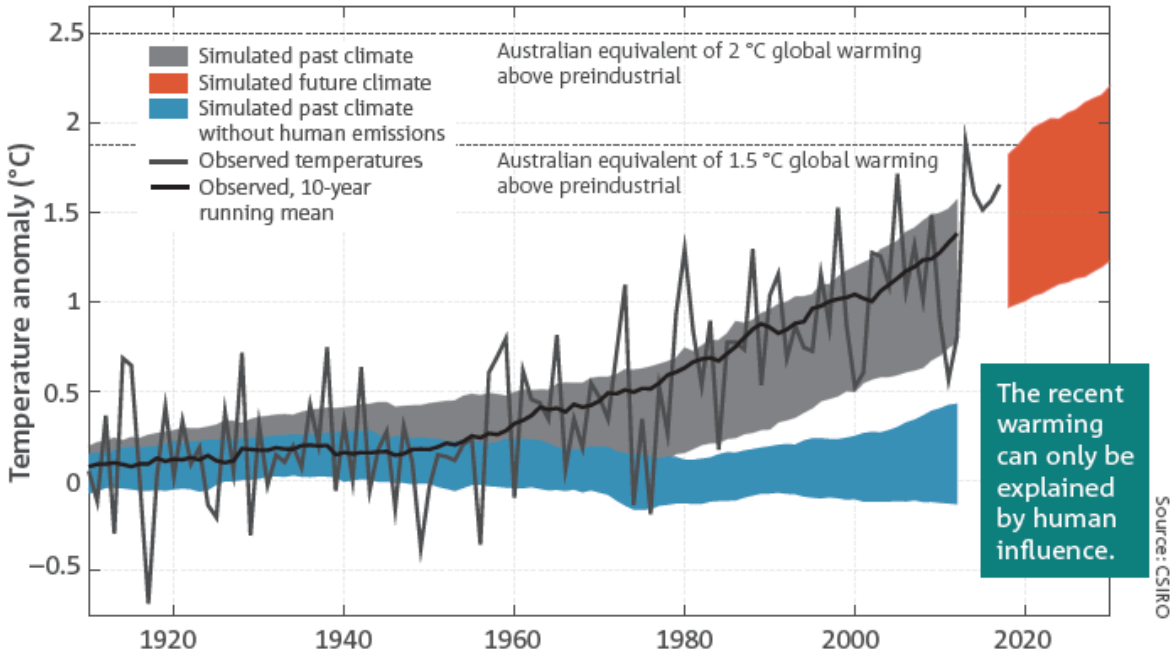

Figure 4. Observations and modelled reconstruction of temperature anomalies in Australia over the past 100 years both with (grey band) and without (blue band) human emissions included.

The grey band shows that global climate models that include human emissions of greenhouse gases or aerosols provide a reasonable reconstruction of temperature changes over the last 100 years. The blue band demonstrates that, without these human effects included, temperature change is insignificant over this period.

By inference, this suggests that **the recent warming in Australia can only be explained by human influence**. The future trajectory of warming over the next two decades continues this trend – however much we mitigate global carbon emissions – because of the slow response of the climate-ocean system to elevated greenhouse gases.

The past repeating; the future uncertain

Notwithstanding the passage of 150 years since Robert FitzRoy's time, forecasts of future weather conditions are still not wholly accurate and the lack of public acceptance of climate change today in some quarters is reminiscent of the public's reaction to FitzRoy's pioneering forecasts in the mid-1800s. Recent research suggests this response may be related in part to an ever-changing perception of what environmental conditions are 'normal' and hence the metaphor of a boiling frog. The scientific evidence, however, that today's levels of CO_2 in the atmosphere are well outside the envelope of natural variability experienced for almost the past one million years, is irrefutable.

References

Commonwealth Scientific and Industrial Research Organisation and Bureau of Meteorology [CSIRO and BoM] (2019). State of the Climate 2018. A report prepared by CSIRO and Bureau of Meteorology, Commonwealth of Australia, 2018, pp 24.

Moore, F.C., Obradovitch, N., Lehner, F., Baylis, P. (2019). Rapidly declining remarkability of temperature anomalies may obscure public perception of climate change. Proceedings of the National Academy of Sciences of the United States of America (PNAS), 116(11), 4905-4910.

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