Newsletter

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The need for transparency in climate services

by Thomas Mortlock, Stuart Browning, Andrew Gissing, Ryan Crompton & John McAneney

Figure 1. Bushfires in Tasmania during the January 2019 heatwave. Source: Sky News

The rapidly expanding market of climate change service providers spawns from developments both internationally and in Australia focused on the disclosure of climate-change related financial risks and regulatory changes (more detail in our previous Briefing Note 386).

Private sector companies are increasingly aware of the need to understand their exposure to extreme weather in a climate-changed future, and in doing so require granular, short-term and accurate climate data to incorporate into business risk models. They also require knowledge brokers to translate this information and understand its inherent uncertainty. A growing number of products now offer this service. However, the use of global climate model output to project climate change impacts from extreme weather at a business-level is not a simple task.

Recent research highlights both the appetite for consuming climate model data (Goldstein et al., 2018; Meah, 2019) and, in some cases, the misapplication of what is available (Nissan et al., 2019). This briefing note attempts to explain – in simple terms – what climate models do and do not tell us.

Climate change is happening, now

Recent advances in model-based climate attribution studies and an a priori conceptual understanding of the climate system both indicate that the rise in the mean global temperature over the past several decades (IPCC, 2013), and some extreme weather events (e.g. Patricola and Wehner, 2018), are driven at least in part, by human-induced greenhouse gas emissions.

Climate attribution studies use high-resolution atmospheric models to replicate historical temperatures and, in some cases, extreme events both with and without anthropogenic greenhouse gas (GHG) emissions (see Figure 2). If the model result without GHG input shows a significant difference from the observed climate state, then the "difference" can be attributed to the effects of GHGs. Since these studies focus on the past, the models can be calibrated to available observations, giving a much higher confidence in their results than projections of future changes.

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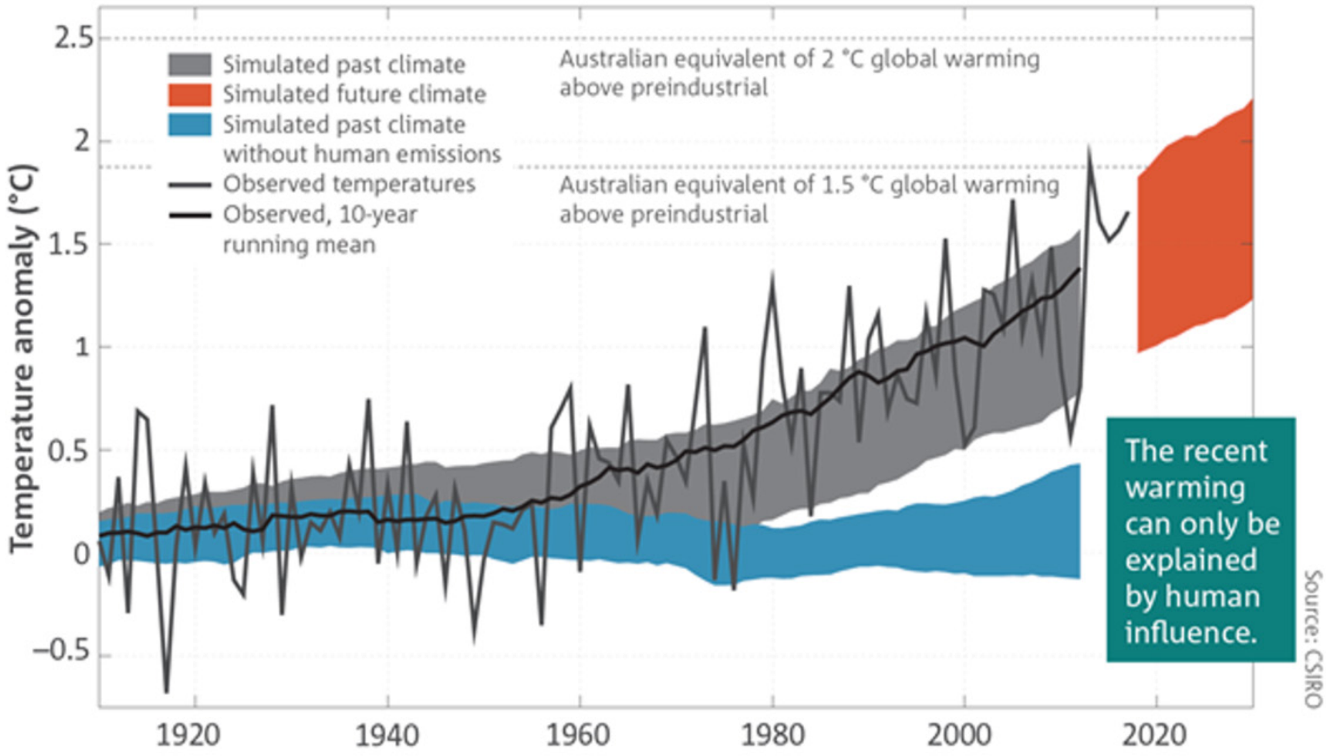

Figure 2. Australia's average annual temperature relative to the 1861–1900 period. The grey line represents Australian temperature observations since 1910, with the black line the ten-year running mean. The shaded bands are the 10–90% range of the 20-year running mean temperatures simulated from the latest generation of Global Climate Models. The grey band shows simulations that include 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 (all emissions scenarios are included). Warming over Australia is expected to be slightly higher than the global average. The dotted lines represent the Australian equivalent of the global warming thresholds of 1.5 °C and 2 °C above preindustrial levels, which are used to inform possible risks and responses for coming decades Source: BoM (2019).

Climate Change impacts are inevitable for decades to come

The anthropogenic component of climate changes we are experiencing today is the result of accumulated carbon emissions over past decades.

Given the thermal retention of global oceans, we are inexorably bound to undergo anthropogenic climate change impacts for decades to come, even if we transition to a carbon-neutral economy tomorrow. Consequently, we are going to be living with, and adapting to changes in the distribution of extreme weather events, for decades to come.

The problems of temporal and spatial scales

A relevant risk time horizon for most business applications lies between one year and several decades. At these timescales, internal climate variability (such as ENSO) remains a strong influencer of extreme weather. This is especially so for the Australian region.

Internal variability is difficult to forecast, with or without a climate change influence. In addition, the spatial scale and some physical restrictions of GCMs mean there is a general underrepresentation of the frequency of extreme weather events in the projections. For these reasons, projections of near-future changes in extreme weather are uncertain.

Assigning probability

Climate change projections are expressed via the IPCC's four Representative Concentration Pathways (RCPs). RCPs represent plausible scenarios of how carbon emissions will be mitigated in the future. Although intended as scenarios of the future, RCPs are often interpreted as quantitatively meaningful forecasts. However, probabilities assigned to RCPs represent the relative frequencies with which different outcomes occur within an ensemble of several models and simulations – not the probability of future occurrence, which cannot be known with any certainty.

It is also difficult to assign probabilities to scenarios that occur outside the range of modelled futures - for example, extreme sea level rise resulting from non-linear ice sheet dynamics. This problem is known as "deep uncertainty" and is a relatively young area of climate research (e.g. Bakker et al., 2017; Bamber et al., 2019).

The solution?

Despite their limitations, GCM simulations for multiple scenarios are the best we have. When interpreted together with a sound understanding of atmospheric dynamics and a clear appreciation of model limitations, GCM projections can provide valuable information. The upcoming CMIP6 suite of experiments promises to address some of the previous limitations.

However, there needs to be much more transparency over how climate data are being applied in the ever-expanding market of climate service tools. A suitable approach for assessing business-scale exposure to extreme weather events in a climate-changed future is a key challenge for climate service providers in Australia and worldwide. The UN Environment Finance Initiative, for example, is currently looking into new methodologies that address this issue. Increased transparency in the market for climate services will limit maladaptation, the future cost of which is unknown.

Risk Frontiers, in consultation with business and climate experts at the ARC Centre of Excellence for Climate Extremes, is applying their suite of catastrophe loss models and associated 25 years of research in this field, to develop a robust way of assessing financial risks associated with climate-changed weather extremes and exploring adaptation pathways. For more information on how we are approaching this, get in touch.

References

Bakker, A.M.R., Wong, T.E. et al. (2017). Sea-level projections representing the deeply uncertain contribution of the West Antarctic ice sheet. Scientific Reports, 3880.

Bamber, J.L., Oppenheimer, M. et al. (2019). Ice sheet contribution to future sea-level rise from structured expert judgement. PNAS.

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RISK FRONTIERS SEMINAR SERIES 2019

SAVE THE DATE

Wednesday, 11th September 2019

at the Museum of Sydney

cnr Bridge and Phillip Streets, Sydney

2pm until 4.30pm followed by light refreshments in the foyer.

Provisional Programme:

- Prof Andy Pitman - GCMs and their limitations (including in modelling climate extremes)
- A/Prof Lisa Alexander - how climate observations are now being used in actuarial assessments of risk
- Dr Greg Holland - Projecting changes in tropical cyclone activity in a warmer world
- Prof Seth Westra - Quantifying the impacts of climate change and variability on Australian and international water resources, including on floods and drought
- Dr Ryan Crompton - Assessing future risk assuming projected changes in hazard activity, exposure and vulnerability using NAT CAT models

At the conclusion of the presentations, we plan to run an unscripted panel session (30-40 mins) including all of the above speakers.

RYAN SPRINGALL

Ryan is the latest addition to the Risk Frontiers team and will take on a role as General Manager. He brings to this role extensive experience working at senior levels of Aon, both within Australia and abroad, and formerly as a senior analyst within the Australian Defence Intelligence Organisation. A physicist by background, Ryan blends analytical disciplines and a scientific mindset with a passion for engagement and development of relationships across the insurance and reinsurance sectors.

Ryan's current professional focus / interests include:

- Identifying strategies to quantify risk / reward strategies and capital allocation / optimisation
- Directing company and public sector financial resilience to large scale natural and man-made shocks, and long-term risk planning
- Business partnerships and innovation capital

Career overview

Prior to joining Risk Frontiers, Ryan was a Senior Broker and manager at Aon Japan in Tokyo. In his capacity as a Senior Client Executive for Global Japanese non-life insurance firms, his primary professional focus was directing risk capital strategies, transacting reinsurance and client advocacy. This included managing a team of brokers responsible for delivering the full capability of the firm to (re) insurance clients; insurance product development across property, casualty and cyber lines; identification of risk capital mitigation and transfer solutions, directing risk and concentration analysis, portfolio optimization, catastrophe modelling, pricing and cost recovery, and economic capital modelling. In Australia, Ryan was responsible for the firm's reinsurance treaty operations in Melbourne.

Ryan has extensive experience in strategic and quantitative disciplines in government, industry and academic sectors, where he has led the production and coordination of complex analysis for government and industry stakeholders. He previously worked for the Australian Department of Defence on counter proliferation and global security issues. At the Department of Defence, Ryan held a Top Secret security clearance and represented the Australian Government at International Conferences and classified information exchanges.

Prior to joining the Government sector, Ryan was a Senior Research fellow in Geophysics at RMIT University in Melbourne. He was the lead theorist on an airborne EM research project looking to develop green field exploration techniques for mining and ground water applications. He holds a PhD in Physics and his research focused on the mathematical understanding of quantum systems, for which he developed a mathematical theory that has been published in international journals. As part of this research, Ryan developed a path integral Monte Carlo simulation code and was a visiting student at Cambridge University UK.

In his spare time, Ryan enjoys hiking, sailing and playing guitar. He looks forward to returning to Sydney to enjoy the beach and outdoor culture. While in Japan he travelled extensively and conquered many of the sacred mountains – including Fuji-san. He has also completed an ultra-marathon across the Simpson desert in Australia, raising money to support research into type 1 diabetes. He is expected to raise the average fitness level at Risk Frontiers.

Cracks in Strata Building Integrity

In an article in the Sydney Morning Herald on 18 June 2019, Stephen Goddard, chair of Owners Corporation Network, describes how, for 20 years, new residential strata schemes have been plagued with building defects. According to one estimate, 80% of all new residential strata schemes are constructed with defects. The most common defects are those that allow water penetration and that lack fire safety requirements. Facades falling into the street come in at third place. Typically, building defects take years to be identified by which time the statutory warranty period of 6 years has expired. Even if the fault is discovered within the warranty period, the builder/developer can be hard to find. Consequently, most buildings have hidden their problem to protect their capital worth. Special levies are raised for the millions of dollars required to remediate the common property. People are forced to live within the building while the remediation work happens around them. Keeping silent and fixing the defects with special levies has had the benefit of enabling owners to resell without a capital loss, and ever-increasing property prices have masked the strata building defects problem. But now, prudent purchasers would not buy strata "off the plan" or newer than 10 years of age. Goddard asserts that "No longer can bad building practices be hidden by increased capital values. Preserving whatever is left of public confidence in strata living requires action now in this and all our states and territories to adopt the measures NSW took to COAG earlier this year."