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The need for transparency in climate services

By Thomas Mortlock, Stuart Browning, Andrew Gissing, Ryan Crompton

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 historic climate conditions both with and without anthropogenic greenhouse gas (GHG) emissions. If the model result without GHG input shows a significant difference to 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.

We are committed to climate change impacts for decades to come

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

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

The problem of scale

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. 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.

Instead, 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 a probability 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 suit of experiments promises to address some of the previous limitations.

However, there needs to be much more transparency over how climate data is 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, are 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

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