Submission No 18

INQUIRY INTO CLIMATE CHANGE (NET ZERO FUTURE) BILL 2023

Organisation: ARC Centre of Excellence for Climate Extremes

Date Received: 23 October 2023

clex@unsw.edu.au
The ARC Centre of Excellence for Climate Extremes

23rd October 2023

Ms Sue Higginson MLC (Chair),
NSW Legislative Council,
Portfolio Committee No. 7 - Planning and Environment
Parliament House, Macquarie Street,
Sydney NSW 2000.

Dear Committee Chair,

Submission to Inquiry on Climate Change (Net Zero Future Bill) 2023

The ARC Centre of Excellence for Climate Extremes (the Centre) welcomes the opportunity to make a submission to the Inquiry on Climate Change (Net Zero Future Bill) 2023. As Australia's leading climate science centre, we recognise the risks of climate change for all Australians.

The Centre comprises five partner universities - The University of New South Wales, Monash University, The Australian National University, The University of Melbourne and The University of Tasmania as well as multiple international partner organisations. We work to understand and reduce Australia's economic, social and environmental vulnerability to climate extremes through leading the development of fundamental climate science and improving models which analyse the extremes of the past and predict the extremes of the future.

We collaborate with the New South Wales (NSW) government through ongoing scientific engagement across government portfolios and specifically on regional projections of future climate change. We support all NSW government efforts to understand, consider and incorporate the best available climate science in policy and legislation.

We are pleased to support the proposed Bill and recognise that the NSW government has already made significant advances in climate change action. The introduction of a Climate Change (Net Zero Future Bill) will signal nationally the NSW government's commitment to combatting climate change. Importantly it provides recognition of Australia's engagement in urgent climate action. This is a vital step, and we support the Bill's intent to legislate greenhouse gas emissions reduction targets.

This submission will comment on two aspects of the legislation: the emissions reduction target and the guiding principles for action.

Emissions of greenhouse gases and emissions reduction targets

The link between greenhouse gas emissions and global warming is unequivocal. The Earth's climate is warming, primarily due to the increase in carbon dioxide (CO_2) emitted into the atmosphere by human-driven activities including burning fossil fuels, (coal, oil, and natural gas) land use and land cover change.

The United Nations warned earlier this year, that 'Climate breakdown has begun'[1] while the World Meteorological Organisation confirmed that July 2023 was Earth's hottest month on record[2]. The latest report from the UN's Intergovernmental Panel on Climate Change (IPCC)[3] states climate change is causing greater impacts than anticipated, and these impacts are emerging at lower amounts of warming than expected. The report underlined the urgent need for emissions reductions to limit warming.

Every additional fraction of a degree of warming increases the risk of extreme weather events.

Australia's climate has warmed by 1.47 ± 0.24°C since 1910[4], slightly faster than global average warming. The first two decades of the 21st century were both warmer than any decade in the 20th century. Australian surface temperatures will continue to rise until at least 2050 under all emission scenarios and further increases in climate extremes are inevitable[5].

The Australian federal government has outlined in its Intergenerational report 2023[6] that climate change is one of the five major forces that will shape the whole Australian economy over the coming decades.

With the return of the El Nino phenomenon to Australia, which is likely to drive up temperatures further, the immediate conditions continue to break records. Sydney's Observatory Hill weather station recently gave a reading of 34.6°C, equalling its hottest September day on record[7]. Every day brings news of recording breaking, dramatic and exceptional weather phenomena not just in Australia but from around the world with global temperatures for September described as 'absolutely gobsmacking bananas'[8].

The amount of global warming depends on the amount of future global greenhouse gas emissions and the ability to deploy rapid and sustained actions to reduce atmospheric carbon dioxide.

Figure 1 demonstrates this dependency for Australia. Future changes to Australia's climate depend on the cumulative total of greenhouse gases emitted over time. The more we emit now, the worse climate change will be in the future. A clear upward trend in average annual temperature in observations and models foreshadow challenging future conditions for our

[1] https://www.aljazeera.com/news/2023/9/6/un-announces-climate-breakdown-after-record-summer-heat
[2] It's official: July was Earth's hottest month on record | National Oceanic and Atmospheric Administration (noaa.gov)
[3] IPCC, 2021, Summary for Policymakers. In: Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change, https://www.ipcc.ch/report/ar6/wg1/chapter/summary-for-policymakers/
[4] Bureau of Meteorology and CSIRO, 2022, State of the Climate 2022, http://www.bom.gov.au/state-of-the-climate/
[5] Herold et al., 2021, Projected changes in the frequency of climate extremes over southeast Australia, Environmental Research Communications, https://doi.org/10.1088/2515-7620/abe6b1
[6] 2023 Intergenerational Report | Treasury.gov.au
[7] Australia's southern states bake as September heat records tumble - ABC News
[8] https://www.theguardian.com/environment/2023/oct/05/gobsmackingly-bananas-scientists-stunned-by-planets-record-september-heat

children and future generations. Any increase in emissions will diminish the effectiveness of achieving a net zero ambition and significantly burden future generations.

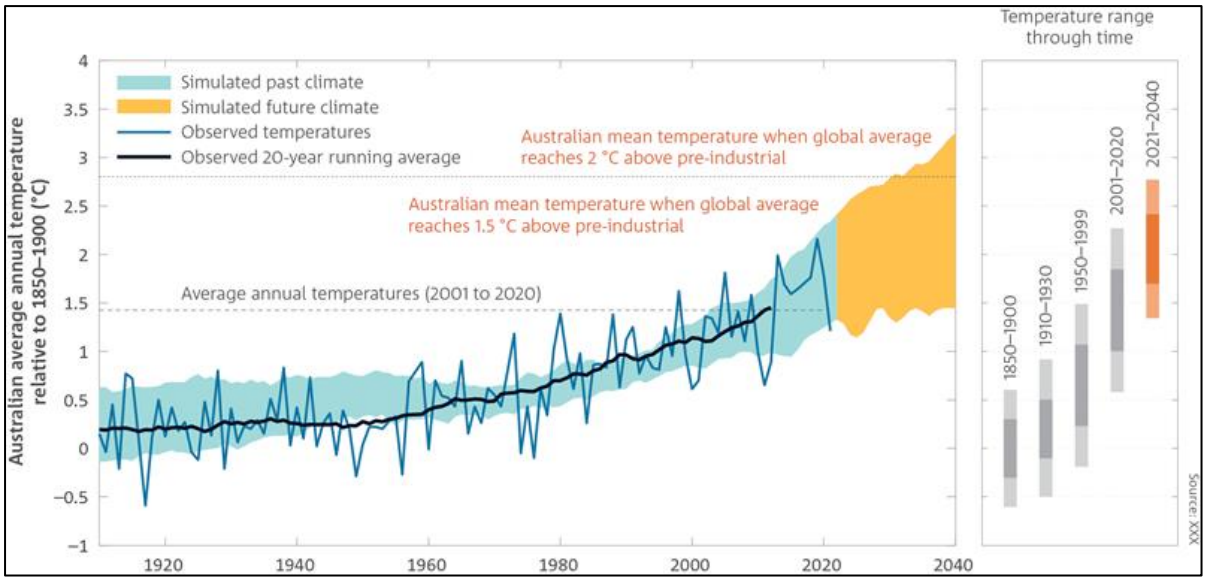

Figure 1: Australian average annual temperature in observations and global climate models shown relative to the 1850–1900 baseline approximating the pre-industrial era. Past and future-coloured bands show the 20-year running average from models for historical conditions and all plausible future scenarios to 2040. Black dashed lines show the approximate average warming expected for Australia when the global average temperature reaches 1.5 and 2.0 °C above the pre-industrial era. The panel to the right shows the range of temperatures (one and two standard deviations) in various epochs from observations and the 2021–40 period as simulated by one climate model (the results from which broadly reflect the mean of all models). Source: CSIRO.

NSW's emissions reduction target of 50% below 2005 levels by 2030 and reaching net zero emissions by 2050 is a positive signal on climate action. It is pleasing to see the government's policy priorities working towards tangible positive efforts to address climate change across government portfolios including public health measures, disaster risk reduction and water resources management. The commitment to legislate an independent state Net Zero Commission indicates the government is working towards and prioritising net zero. However, we urge the committee to make every effort to strengthen these cuts in emissions urgently both in terms of their timing and depth. The earlier we cut emissions towards the net-zero target, and the earlier we reach that target, the greater the chance we have of maintaining a safe and habitable Earth for all of us.

A specific concern we have is the use of carbon offsets to meet emission reductions targets. The carbon emitted by burning of fossil fuels is ancient – it is the activation of carbon from stores that were otherwise permanently removed from the atmosphere. However, carbon offsets achieved via reforestation, for example, have short lifetimes of 50-100 years before their decay likely returns the carbon to the atmosphere. Offsets represent a temporary storage of carbon compared to the permanent ancient storage held within fossil fuel sources. Further, every single climate projection points to an increased risk of fire and forests that burn immediately release stored carbon into the atmosphere. The increased fire risk makes

the storage of carbon in offsets even more temporary. That is, using offsets to achieve a net zero target is misleading, volatile and extremely dangerous; the emission reduction targets need to be achieved *without* the use of offsets.

We also note emerging changes in the recognition of Scope 3 emissions. At present, Scope 3 emissions associated with export of coal and gas are not charged against the New South Wales emissions inventory. It should be clear that atmosphere does not respect the source of emissions; that is coal mined and burned in NSW has precisely the same climate impact as coal mined in NSW and burned overseas. We suggest that NSW needs to be planning for Net Zero *including* its Scope 3 emissions.

Guiding Principles – (b) best available science

Climate science is highly complex, with a wide range of physical processes acting together, making each event unique. Consulting with climate scientists to understand specific climate risks to different sectors will ensure that the various drivers of climate risk are considered. For example, the 2022 east Australian flooding events resulted from multiple factors including:

1. a combination of meteorological phenomena which brought persistent, heavy rain,
2. sodden catchments that were primed for flooding due to preceding months of heavy rainfall and
3. the interaction of climate drivers including La Niña, the Indian Ocean Dipole and the Southern Annular Mode which promoted wetter weather[9].

Understanding the future risk of high impact events requires understanding how each of these elements will change as well as their interactions. Research into the climate has provided a robust basis for action so far, however further research is needed to improve climate information and reduce uncertainties.

Our research on compounding climate hazards, known as compound events, is of particular relevance for understanding climate risk to health[10],[11]. This research investigates how multiple elements of weather and climate come together to produce high impact events on socioeconomic or ecological systems. There are several ways compound events arise: they can involve multiple hazards occurring at the same time, a succession of hazards, hazards in multiple connected locations, or simply a more severe event as the result of preconditioning.

The east coast floods in 2022 were the costliest in Australia's history totalling $5.45 billion in insured losses across New South Wales and Queensland[12]. Events like these have lasting health effects with disadvantaged populations being particularly vulnerable. Notably, in the

[9] Gillett, Z. et al. 2023. The State of Weather and Climate Extremes 2022, ARC Centre of Excellence for Climate Extremes. http://doi.org/10.26190/b0az-0920

[10] ARC Centre of Excellence for Climate Extremes. 2022. Why research on compounding weather and climate hazards is important. https://climateextremes.org.au/wp-content/uploads/why-research-on-compounding-weather-and-climate-hazards-is-important.pdf

[11] ARC Centre of Excellence for Climate Extremes. 2022. A new global picture of compounding weather and climate hazards. https://climateextremes.org.au/wp-content/uploads/A-new-global-picture-of-compounding-weather-and-climate-hazards.pdf

[12] Insurance Council, 2022, Updated data shows 2022 flood was Australia's costliest, https://insurancecouncil.com.au/resource/updated-data-shows-2022-flood-was-australias-costliest/

2017 Lismore flood, more than 80% of the residents lived in the lowest socio-economic neighbourhoods[13]. Lismore, additionally, has a history of flooding, highlighting how compounding impacts of multiple disasters require on-going support.

Current weather events already pose threats to our infrastructure. Centre researchers have demonstrated that short-duration, high intensity rainfall events, or rapid rain bursts, have increased by 40% over the past 20 years in the Sydney region[14]. This intensification increases the risk of severe and more frequent flash flooding with impacts to infrastructure, local ecological values, and economic loss from damage. Response to similar events include design updates for flood control standards, drainage infrastructure as well as town planning and run-off analysis.

(g) the need to reduce the risk climate change poses to human health

Heatwaves are prolonged periods of extreme temperature which can impact a wide range of sectors including public health. Heatwaves in Australia are becoming more frequent and lasting longer as shown by the Centre's researchers[15]. Heatwaves will continue to increase with climate change and may be 85% more frequent in Australia with global warming of 1.5-2°C [16]. Global warming also makes higher heat extremes possible. Importantly, local scale temperature extremes can increase at a significantly higher rate than the global average temperature increase rate[17].

High temperatures during heatwaves can lead to heat-related illnesses such as heat exhaustion and heatstroke, particularly affecting vulnerable groups including the elderly, children, indigenous populations and individuals with pre-existing health conditions. Moreover, heatwaves can exacerbate respiratory and cardiovascular diseases, trigger dehydration, and increase the risk of heat-related fatalities[18]. In addition to high temperatures, the combination of heat and humidity during heatwaves can further intensify the health risks. High humidity reduces the body's ability to cool itself through perspiration, leading to increased heat stress and discomfort. Research on heat stress and hospital admissions emphasises the need to choose suitable heat stress indices for modelling purposes[19].

Research led by our Centre has shown that high heat stress in urban areas pose a serious threat to human health[20]. Centre research has investigated the impact of urban land cover on

[13] Rolfe, M.I. et al., 2020. Social vulnerability in a high-risk flood-affected rural region of NSW, Australia. Nat Hazards 101, 631–650. https://doi.org/10.1007/s11069-020-03887-z
[14] Ayat, H et al., 2022. Intensification of subhourly heavy rainfall. Science, 378(6620), pp.655-659.
[15] Jyoteeshkumar, R.P, Perkins-Kirkpatrick, S.E. and Sharples, J.J., 2021. Intensifying Australian heatwave trends and their sensitivity to observational data. Earth's Future, 9(4), p.e2020EF001924.
[16] Trancoso et al., 2020, Heatwaves intensification in Australia: A consistent trajectory across past, present and future. https://doi.org/10.1016/j.scitotenv.2020.140521
[17] Lewis et al., 2019, Regional hotspots of temperature extremes under 1.5 °C and 2 °C of global mean warming. https://doi.org/10.1016/j.wace.2019.100233
[18] Gasparrini, A. et al., 2017. Projections of temperature-related excess mortality under climate change scenarios. The Lancet Planetary Health, 1(9), pp.e360-e367.
[19] Goldie, J et al., 2017. Comparative evaluation of human heat stress indices on selected hospital admissions in Sydney, Australia. Australian and New Zealand journal of public health, 41(4), pp.381-387.
[20] Nazarian, N. et al., 2022. Integrated assessment of urban overheating impacts on human life. Earth's Future, 10(8), p.e2022EF002682.

thermal comfort, finding that increased grass and tree cover can reduce temperatures by 5°C [21] . Currently Centre research is assessing the risk of heat stress as a function of socio-economic status and population density in Australia. This will provide insight into the vulnerability of different socio-economic groups and densely populated areas to heat stress in Australia.

From 1 July 2019 to the end of the bushfire season on 31 March 2020, there were more than 11,400 bush and grass fires across NSW. The fires burnt 6.2 per cent of the state – the largest burnt area recorded in a single fire season in eastern Australia[22]. There were wide ranging health impacts including eye and throat irritation, headaches, anxiety, respiratory issues, and cardiovascular problems[23].

Summation

With the impacts from climate extremes likely to increase with the additional warming that is already locked in, action towards future prevention is a national responsibility and a moral obligation to future generations.

This inquiry is of particular interest to us as an organisation leading research in climate and climate extremes in Australia. Our research is focussed on helping manage climate risk across government and business. The Centre is therefore well placed to provide advice on cutting edge and world-leading climate science. We would therefore like to offer our expertise and support to the committee in the context of this inquiry. Should additional evidence be required, or should advice be needed on our submission or any other aspect of the inquiry we are happy to help.

We thank the NSW government for the opportunity to make a submission on this topic and offer the expertise of the Centre on Australia's climate extremes. We are happy to provide further information on any matters arising from this submission.

Yours sincerely,

Professor Andrew Pitman, AO, FAA, Centre Director	A/Professor Gabriel Abramowitz, Chief Investigator	Angela Kaplish, Lead Knowledge Broker

[21] Nice, K.A. et al., 2022. Isolating the impacts of urban form and fabric from geography on urban heat and human thermal comfort. Building and Environment, 224, p.109502.
[22] Black Summer bushfires, NSW, 2019-20 (aidr.org.au)
[23] Grattan Institute. 2020. The health effects of the 2019-20 bushfires Submission to the Royal Commission into National Natural Disaster Arrangements. https://grattan.edu.au/wp-content/uploads/2020/04/Grattan-Institute-submission-to-Royal-Commission.pdf