21st Century Weather
ARC Centre of Excellence

ARC Centre of Excellence for the Weather of the 21st Century
School of Earth, Atmosphere, and Environment
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Wellington Road, Clayton VIC 3800, Australia

Melbourne, Thursday 26 March 2026

Subject: Inquiry into the 2026 summer fires across Victoria

Dear Legislative Council Environment and Planning Committee,

The Australian Research Council Centre of Excellence for the Weather of the 21st Century welcomes the opportunity to contribute to the inquiry into the 2026 summer fires across Victoria.

Heatwaves, droughts and bushfires interact in complex, compounding and cascading ways, increasing the risk of catastrophic impacts across time and space. Their non-linear behaviours make it challenging to predict and manage. Nonetheless, conclusive evidence has demonstrated that even the smallest levels of CO_2 emissions matter[i] in reducing climate change impacts.

Our submission addresses two of the 11 Terms of Reference and emphasises the urgent need for climate action to achieve immediate and sustained reductions in emissions. We outline the risks of delayed action, including global cascading effects and the persistence of climate impacts beyond reaching net zero.

(2) the causes and circumstances of the bushfires, including climate change and the adequacy of the Government's climate policies and actions, forecasts, warnings and public education on bushfire threats

Climate change influences

Climate change is increasing the risk of extreme fire danger by making hot days hotter and heatwaves longer and more frequent. Heatwaves, droughts and bushfires are interconnected; drought increases the likelihood of extreme heat, which in turn heightens fire risk when there are coincident days of strong winds. As the world warms, bushfires are becoming more frequent.

Southeast Australia faces longer fire seasons and more extreme fire weather as heatwaves intensify, with additional influences from very dry conditions. In the lead-up to the Black Summer of 2019-2020, for example, vapour pressure deficits (a measure of humidity) were 25–50% above average[ii], drying vegetation far beyond normal levels and making a catastrophic fire season near-inevitable.

Long-term impacts of global warming

Global temperature levels mean that we are already locked into climate change impacts. Slow ocean processes mean it will take a long time for reductions in atmospheric carbon dioxide to significantly cool our planet. In fact, projections show that the deeper ocean will continue to warm for centuries even after we halt emissions. Furthermore, recent research has highlighted that an ice loss tipping point in Antarctica "could be exceeded even under best-case CO_2 emission reduction pathways, potentially initiating global tipping cascades"[iii].

Challenges in our response capacity

An increased overlap in the fire seasons of North America and Australia, with whom we share aerial firefighting resources, heightens our vulnerability to fires.

Government actions

Without reducing greenhouse gas emissions, these trends are virtually certain to continue. Taking decisive action now to cut emissions and move towards a net-zero future will lessen the climate challenges that next generations face in the decades and centuries to come.

The Government could be working harder to phase out fossil fuels. IPCC's finding that "every tonne of CO_2 emissions adds to global warming"[iv] means that even the smallest levels of CO_2 emissions matter in reducing climate change impacts. We are at a point where we need to achieve large-scale 'net-negative' emissions–removing carbon from the atmosphere at a greater rate than it is emitted–to limit catastrophic climate change. Further emissions now increase the risk of catastrophic changes that cannot be reversed even with carbon dioxide removal technology, while reaching net zero faster has benefits for many generations to come.

National and international commitments

Australia's land-carbon flux is volatile from year-to-year and is susceptible to catastrophic events. For example, the carbon dioxide emissions from the megafires[v] during the Black Summer in NSW in December 2019 alone accounted for around 64% of Australia's annual average emissions (2001-2018). Climate extremes, like droughts and heatwaves, can also trigger reversals[vi] in the land's ability to take up carbon. These climatic factors must be considered when assessing the contribution of carbon uptake projects to Australia's net zero ambitions to estimate net emissions accurately.

(8) the impacts of climate change on the natural environment, which has resulted in more frequent and intense bushfires occurring in Victoria

Environmental fire switches

Climate change exacerbates hot and dry conditions that dry organic matter. The length of these conditions can lead to exceptionally dry landscapes and make them more prone to burning when exposed to dangerous fire weather and ignition sources.

Fire weather refers to weather conditions that make wildfires more likely to start and spread, including:

- High temperatures combined with low humidity increase the rate of evaporation, removing moisture from plants and soils. Dried vegetation becomes highly flammable.
- Strong winds push flames across the landscape and carry burning embers that can start new fires ahead of the main fire front. Sudden wind changes can alter the direction and intensity of a fire.

Once a fire has started, winds transport smoke and spread haze, which affects air quality.

When vegetation is removed, the land loses its natural cooling system. Using AI-assisted climate modelling, researchers discovered that deforestation and unplanned land-use change act as a "silent amplifier" of heat, often worsening heatwaves beyond what greenhouse-gas emissions alone would produce.

We are happy to discuss any subject raised in this submission.

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ARC Centre of Excellence for the Weather of the 21st Century

The **ARC Centre of Excellence for the Weather of the 21st Century** is a consortium of world-leading climate and weather researchers based across five Australian universities, together with major domestic and international partner organisations, including the Bureau of Meteorology and CSIRO.

21st Century Weather aims to address these challenges by answering a vital question: **How will Australia's weather transform as our climate changes?**

We will advance our understanding of atmospheric circulation and weather systems, and develop ultra-high-resolution climate models to enhance our understanding of Australia's weather and climate.

The foundational knowledge we create will enable policymakers, industry and communities to make better decisions, harness weather resources and help us prepare for high-impact weather.

[i] https://www.ipcc.ch/report/ar6/wg1/figures/summary-for-policymakers/figure-spm-10
[ii] https://www.science.org/doi/10.1126/sciadv.adj3460
[iii] https://doi.org/10.1038/s41586-025-09349-5
[iv] https://www.ipcc.ch/report/ar6/wg1/figures/summary-for-policymakers/figure-spm-10
[v] https://www.nature.com/articles/s41598-021-87721-x
[vi] https://www.nature.com/articles/s41467-023-41854-x