Environmental Defenders Office

Submission to the Royal Commission into National Natural Disaster Arrangements

28 April 2020

About EDO

EDO is a community legal centre specialising in public interest environmental law. We help people who want to protect the environment through law. Our reputation is built on:

Successful environmental outcomes using the law. With over 30 years' experience in environmental law, EDO has a proven track record in achieving positive environmental outcomes for the community.

Broad environmental expertise. EDO is the acknowledged expert when it comes to the law and how it applies to the environment. We help the community to solve environmental issues by providing legal and scientific advice, community legal education and proposals for better laws.

Independent and accessible services. As a non-government and not-for-profit legal centre, our services are provided without fear or favour. Anyone can contact us to get free initial legal advice about an environmental problem, with many of our services targeted at rural and regional communities.

Environmental Defenders Office is a legal centre dedicated to protecting the environment.

www.edo.org.au

Submitted to:
Royal Commission into National Natural Disaster Arrangements

Lodged online: https://rcndasubmissions.lawinorder.com.au/

For further information on this submission, please contact:

Rachel Walmsley
Director Policy and Law Reform (Sydney)
T: 02 9262 6989
E: rachel.walmsley@edo.org.au

Cerin Loane
Senior Policy and Law Reform Solicitor (Sydney)
T: 02 9262 6989
E: cerin.loane@edo.org.au

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1. Introduction

Environmental Defenders Office (**EDO**) welcomes the opportunity to make a submission to the Royal Commission into National Natural Disaster Arrangements (**Royal Commission**).

While the catalyst for establishing the Royal Commission was the devastating summer bushfire season of 2019-20, we are pleased that the Royal Commission will be looking not only at bushfires, but also other natural disasters. Clearly it was not only bushfires that affected communities across Australia over the past summer - storms and flooding, hailstorms, cyclones and monsoonal flooding were experienced, and a major drought event persisted.

As a community legal centre specialising in public interest environmental and planning law, EDO's submission addresses the terms of reference (**ToRs**) through an environmental law lens. We focus specifically on the key environmental drivers influencing the scale and intensity of bushfires and other natural disasters across Australia, principally climate change and its associated impacts.

In this context, we consider our national climate and environment legal frameworks, and make recommendations for strengthened, ecologically sustainable, science-based laws, regulations and strategies to protect life and property and the environment from the impacts of bushfires and other natural disasters.

We also briefly look at the legal frameworks for bushfire, emergency and disaster management, including how these may address natural disaster risk management, preparedness, resilience and recovery in a changing climate. While we identify a gap in the legal framework, namely the lack of Commonwealth emergency management legislation, the focus of our submission is more broadly on the role of legislation in addressing climate change mitigation and adaptation, and resilience and recovery. Beyond that, we do not address aspects of the ToRs that relate specifically to emergency response coordination and the allocation of resource, as these issues are better addressed by other experts.

Natural disasters, and the key environmental drivers influencing them, are of national interest. We hope that this Royal Commission will investigate and make recommendations for how Australia could achieve greater national coordination and accountability — through common national standards, rule-making, reporting and data-sharing — with respect to key preparedness and resilience responsibilities, including in relation to mitigating and adapting to the impacts of climate change.

2. Summary of Recommendations

Recommendation1: Recognise the role of climate change and its impacts in contributing to the frequency, intensity, timing and location of bushfires and other natural disasters, and the predicted contribution of climate change and associated impacts to future bushfires and other natural disasters.

Recommendation 2: The Commonwealth Government should adopt a whole-of-government approach to climate change by enacting a new national Climate Change Act that addresses both climate change mitigation and adaptation in a clear and coordinated way.

Recommendation 3: Climate change considerations must be embedded into national environmental laws, including a new climate-change trigger for project assessment and requirements for decision-makers to consider climate change mitigation and adaptation opportunities in strategic assessments and bioregional, recovery and threat abatement planning processes.

Recommendation 4: Review and amend water management laws across all jurisdictions to ensure they are climate-ready.

Recommendation 5: All states and territories must review relevant existing legislation with a view to incorporating clear requirements for climate change mitigation and adaptation.

Recommendation 6: The Commonwealth government should develop national standards on climate change mitigation and adaptation to assist states, territories and local governments, and to ensure a strengthened, consistent approach to climate change mitigation and adaptation across the country, based on best available science.

Recommendation 7: Ensure that the powers and responsibilities of the Commonwealth government, including in relation to coordinating, preparing for, responding to, and recovering from natural disasters, and providing funding and coordinating long-term action to build resilience, are clearly set out in legislation and/or intergovernmental agreement/s ahead of the next bushfire season.

Recommendation 8: Ensure that any recommendations to establish Commonwealth emergency and natural disaster legislation include a requirement to mitigate greenhouse gas emissions and adapt to the impacts of climate change.

Recommendation 9: Include provisions in state and territory emergency legislation that explicitly require plans developed under emergency legislation to factor climate change into decision-making, risk assessment and management, or disaster preparedness, and be addressed consistent with the principles of Ecologically Sustainable Development (ESD).

Recommendation 10: Undertake research to quantify resources needed to enable more fires to be contained at a small size and minimise the need for backburning, and based on the findings of that research allocate resources accordingly.

Recommendation 11: Recognise the value of long-undisturbed forest in mitigating landscape fire risk in fire management planning.

Recommendation 12: Ensure that prescribed burning and other methods of reducing risk via

disturbance are primarily applied close to assets where they may provide material benefit.

Recommendation 13: Reject environmentally destructive, unsubstantiated bushfire management practices such as grazing in national parks and selective logging.

Recommendation 14: *Land management practices*, including in relation to hazard reduction, must be based on the best available science, including in relation to climate change, and include Indigenous input.

Recommendation 15: Strengthen Australia's environmental laws to ensure species conservation, including to effectively plan for, mitigate (where possible), and respond to extreme weather events related to climate change, and ensure recovery of affected species.

Recommendation 16: Take immediate steps using existing powers under the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) to ensure the protection and restoration of threatened species and ecological communities that have been affected by the summer bushfires of 2019-20.

Recommendation 17: Take immediate steps to prevent forestry operations being undertaken in recovering areas of burnt forest.

Recommendation 18: The Commonwealth Government should continue to support the work of the Wildlife and Threatened Species Bushfire Recovery Expert Panel and Threatened Species Scientific Committee, and urgently prioritise actions recommended by those bodies to assist native species, ecological communities and natural assets to recover from the 2019-20 bushfires and to reduce impacts of fires in the future.

Recommendation 19: Any findings coming out of this Royal Commission on *land-use planning* and the incorporation of natural disaster considerations should be based on the best available science, require the consideration of climate change impacts, and include Indigenous input.

Recommendation 20: Recognise Indigenous traditional land and fire management practices and cultural burning, and facilitate its incorporation into bushfire and natural disaster management, where appropriate.

3. Supplementary EDO material

To assist the Royal Commission, and to avoid duplication, we direct the Royal Commission to recent work that EDO has done, specifically in relation to:

- Directly responding to the 2019-20 bushfire season, including:
    - EDO Submission to the NSW Independent Bushfire Inquiry;[1]
    - Joint EDO and Humane Society International Australia (**HSI**) letter to the Commonwealth Environment Minister outlining options available under the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (**EPBC Act**) to protect threatened species and communities;[2]
    - Joint EDO and HSI letter to the Premier of Queensland outlining urgent interim actions and further steps under state legislation to protect threatened species;[3] and
    - Joint EDO and HSI letter to the Premier of New South Wales outlining options to protect threatened species and communities.[4]
- More generally, our analysis of national and state and territory environment and planning laws, that include consideration of whether our laws are climate-ready, including in the context of preparedness for, response to, resilience to, and recovery from natural disasters. This work includes:
    - EDO's submission to the 10 year review of the EPBC Act;[5]
    - EDO's 2019 report, *Climate-ready planning laws for NSW – Rocky Hill and beyond*;[6] and
    - Analysis of whether water management laws and policies are climate-ready.[7]

While the focus of the Royal Commission is on national coordination, our analysis of state and territory legislation highlights deficiencies in the legal frameworks that contribute to preparedness for, response

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[1] Environmental Defenders Office, *Submission to the NSW Independent Bushfire Inquiry*, 16 April 2020, available at https://www.edo.org.au/publication/nsw-bushfire-inquiry/

[2] Environmental Defenders Office and Humane Society International Australia, Letter to The Hon. Susan Ley MP, Minister for the Environment, 14 February 2020, available at https://www.edo.org.au/wp-content/uploads/2020/02/20-02-14-Joint-HSI-EDO-Letter-to-Minister-Ley-re-EPBCA-decisions-post-bushfires.pdf

[3] Environmental Defenders Office and Humane Society International Australia, Letter to The Hon Annastacia Palaszczuk, Premier and Minister for Trade, 21 February 2020, available at https://www.edo.org.au/wp-content/uploads/2020/03/EDO-to-QLD-Premier-re-Responding-to-Qld-bushfires.pdf

[4] Environmental Defenders Office and Humane Society International Australia, Letter to The Hon. Gladys Berejiklian MP Premier of NSW, 25 February 2020, available at https://www.edo.org.au/wp-content/uploads/2020/02/HSI-EDO-Letter-to-NSW-Premier-re-Bushfire-Emergency.pdf

[5] Environmental Defenders Office, *Submission to the 10 year review of the EPBC Act,* April 2020, available at https://www.edo.org.au/wp-content/uploads/2020/04/EPBC-Act-10-year-review-Environmental-Defenders-Office-submission-.pdf

[6] Environmental Defenders Office, *Climate-ready planning laws for NSW – Rocky Hill and beyond,* available at: https://www.edonsw.org.au/climate_ready_planning_laws

[7] See Dr Emma Carmody, Environmental Defenders Office, *Climate change is water change: integrating water management, mitigation and adaptation laws and policies*, Australian Environment Review, 2017. Vol 31 No 10; see also Environmental Defenders Office, *Presentation to 10th Water Symposium*, hosted by Legalwise in Sydney on 18 October 2019, available at https://www.edo.org.au/2019/12/19/are-water-laws-climate-ready/

to, resilience to, and recovery from natural disasters. Improved national coordination is therefore one way of overcoming some of the deficiencies in state and territory frameworks.

These documents should be read in conjunction with, and as part of, our submission to the Royal Commission. Links to these documents have been included in the footnotes, and electronic or hard copies are available on request.

4. Background – Natural disasters and changing climatic conditions

4.1 Natural Disasters - Summer 2019-20

Bushfires

The bushfire season of 2019-20 was the most devastating bushfire season on record. Around the country, lives were lost, homes were destroyed, wildlife killed and significant ecosystems and landscapes decimated. Specifically:

- 34 lives were lost between October 2019 and February 2020;[8]
- While it is difficult to estimate the exact numbers of native animals killed, some experts predict more than one billion animals had been killed across Australia;[9]
- In terms of area of land affected:
    - Initial assessment by the NSW Government indicates the fire ground in NSW covers 5.4 million hectares (7% of the state), including 2.7 million hectares in national parks (37% of the NSW park system), and habitat of more than 293 threatened animals and 680 threatened plants have been impacted.[10]
    - In the ACT the Orroral Valley fire was approximately 86,562 hectares in size.[11]
    - As at 24 January 2020, the bushfires had burnt approximately 2.5 million hectares in Queensland and 2.2 million hectares in Western Australia.[12]
    - On 28 February 2020 the Victorian Country Fire Authority declared that 'all significant fires' in Victoria had now been contained, and noted that more than 1.5 million hectares of land had been burned.[13]

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[8] Centre for Disaster Philanthropy, '2019-2020 Australian Bushfires' 17 February 2020, available at https://disasterphilanthropy.org/disaster/2019-australian-wildfires/

[9] Professor Chris Dickman, Faculty of Science, University of Sydney. For an explanation of Professor Dickman's estimates see https://www.sydney.edu.au/news-opinion/news/2020/01/08/australian-bushfires-more-than-one-billion-animals-impacted.html

[10] See NSW Department of Planning, Industry and Environment, *Understanding the effects of the 2019–20 fires*, available at https://www.environment.nsw.gov.au/topics/parks-reserves-and-protected-areas/fire/park-recovery-and-rehabilitation/recovering-from-2019-20-fires/understanding-the-impact-of-the-2019-20-fires

[11] Parliament of Australia, '2019–20 Australian bushfires—frequently asked questions: a quick guide' 12 March 2020, available at https://www.aph.gov.au/About_Parliament/Parliamentary_Departments/Parliamentary_Library/pubs/rp/rp1920/Quick_Guides/AustralianBushfires

[12] Peter Hannam, 'Australia's bushfires to push global emissions to new high: Met Office' 24 January 2020, *The Sydney Morning Herald,* available at https://www.smh.com.au/environment/climate-change/australia-s-bushfires-to-push-global-emissions-to-new-high-met-office-20200124-p53ub2.html

[13] Parliament of Australia, '2019–20 Australian bushfires—frequently asked questions: a quick guide' 12 March 2020, available at https://www.aph.gov.au/About_Parliament/Parliamentary_Departments/Parliamentary_Library/pubs/rp/rp1920/Quick_Guides/AustralianBushfires

- The South Australian Department for Environment and Water stated on 7 February 2020 that over 90,000 hectares of national park in South Australia had been burned.[14]

Storms, hailstorms, cyclones and flooding

While the country was ravaged by catastrophic bushfires leading into and throughout the 2019-20 bushfire season, a series of storms, hailstorms, cyclones and flooding brought their own devastating impacts. For example, the Commonwealth's Department of Home Affairs recognised the following natural disasters through its disaster assistance program between November 2019 and February 2020: Central Victoria Storms - Commencing 21 November 2019, NSW Storms - 26 November 2019 onwards, NSW Storms and Floods - 15 January 2020 onwards, Canberra Hailstorm - 20 January 2020, Tropical Cyclone Blake, associate thunderstorms and flooding off the Western Australia coast - 8-16 January 2020, and Queensland monsoonal flooding - 23 January – 3 February 2020.[15]

Drought

While drought is seen as an enduring, regular feature of the Australian landscape, not a natural disaster,[16] major drought conditions were experienced leading up to the 2019-20 bushfire season, particularly on the east coast of Australia. For example, in January 2020, it was reported that 100% of NSW was in drought[17] and, as at 1 March 2020, drought declarations were in place for 67.4% of the land area of Queensland.[18]

4.2 Environmental causes and factors contributing to the frequency, intensity, timing and location of natural disasters

While this inquiry will examine a range of potential causes and drivers of bushfires and other natural disasters, our submission will focus on the key environmental drivers contributing to more intense bushfire seasons and extreme weather events.

Australia's climate has warmed by just over one degree since 1910 and the best available science tells us that average temperatures are projected to rise further.[19] Australia is already experiencing the impacts of climate change, which include the warming and acidification of oceans, sea level rise, decreased rainfall in southern parts of the country and increased rainfall in the north, and the long-term increase

[14] Parliament of Australia, '2019–20 Australian bushfires—frequently asked questions: a quick guide' 12 March 2020, available at https://www.aph.gov.au/About_Parliament/Parliamentary_Departments/Parliamentary_Library/pubs/rp/rp1920/Quick_Guides/AustralianBushfires

[15] See Commonwealth Government, Disaster Assist, https://www.disasterassist.gov.au/

[16] Australian Government, *Drought in Australia - Coordinator-General for Drought's advice on a Strategy for Drought Preparedness and Resilience,* 2 April 2019, available at https://www.agriculture.gov.au/sites/default/files/documents/advice-long-term-strategy-drought-preparedness-resilience_1.pdf

[17] See ABC News, *Drought declared for the entirety of NSW, but at least there is some rain forecast,* 13 January 2020, https://www.abc.net.au/news/rural/2020-01-13/nsw-now-100-per-cent-drought-declared/11862096

[18] See https://www.longpaddock.qld.gov.au/drought/drought-declarations/

[19] See Commonwealth Scientific and Industrial Research Organisation (CSIRO), *Climate change in Australia - Projections for Australia's NRM regions*, https://www.climatechangeinaustralia.gov.au/en/climate-projections/future-climate/regional-climate-change-explorer/clusters/; see also NSW Office of Environment and Heritage (OEH), *AdaptNSW*, https://climatechange.environment.nsw.gov.au/.

in extreme fire weather. Extreme heat days, longer dry spells, and harsher fire weather will increasingly become the norm, although the severity of impacts will be less if emissions can be reduced.[20]

Future projections anticipate ongoing climate change impacts across Australia including:

- Further increase in temperatures, with more extreme hot days and fewer extreme cool days;
- Ongoing sea level rise;
- Further warming and acidification of the oceans around Australia;
- More frequent, extensive, intense and longer-lasting marine heatwaves, suggesting in turn more frequent and severe bleaching events on the Great Barrier Reef, and potentially the loss of many types of coral throughout the tropical reef systems of Australia and globally;
- A decrease in cool-season rainfall across many regions of southern Australia, with more time spent in drought;
- More intense heavy rainfall throughout Australia, particularly for short-duration extreme rainfall events;
- An increase in the number of high fire weather danger days and a longer fire season for southern and eastern Australia;
- Fewer tropical cyclones, but a greater proportion of high-intensity storms, with ongoing large variations from year to year.[21]

Climate change impacts are already contributing to bushfires and natural disasters, including those experienced this past summer described above. For example:

- The Bureau of Meteorology advised that the high fire dangers in spring 2019 "*were exacerbated by widespread and severe rainfall deficiencies and hydrological drought, with continued low rainfall during spring and much above average temperatures*".[22]
- Similarly, the link between climate change, drought and bushfire led the Climate Council of Australia to advise in November 2019 that "*the catastrophic, unprecedented fire conditions currently affecting NSW and Queensland have been aggravated by climate change. Bushfire risk was exacerbated by record breaking drought, very dry fuels and soils, and record-breaking heat*".[23]
- The Australian Government's *Drought Response, Resilience and Preparedness Plan* recognises that *"(w)hile droughts are normal for Australia, drought conditions are likely to become more frequent, severe and longer in some regions due to climate change*".[24]
- While storm and flooding events, such as those experienced over the past summer are not unusual, the intensity of these types of weather events is influenced by climate change. For example, the Climate Change Council of Australia has advised that climate change is fuelling more intense and damaging storms and will continue to exacerbate storms in Australia,

[20] The impacts of a warming climate on Australia are set out in more detail in Bureau of Meteorology and CSIRO, *State of the Climate 2018* (2018), www.bom.gov.au/state-of-the-climate.
[21] *State of the Climate 2018* (2018), ibid, p22.
[22] Bureau of Meteorology, *Special Climate Statement 72—dangerous bushfire weather in spring 2019,* 18 December 2019, http://www.bom.gov.au/climate/current/statements/scs72.pdf
[23] Climate Council of Australia, *Briefing Note - 'This is Not Normal': Climate change and escalating bushfire risk*, November 2019, available at https://www.climatecouncil.org.au/wp-content/uploads/2019/11/bushfire-briefing-paper_18-november.pdf
[24] Australian Government, *Drought Response, Resilience and Preparedness Plan,* 2019, available at https://www.agriculture.gov.au/sites/default/files/documents/aust-govt-drought-response-plan_0.pdf

increasing the risk of devastating impact, and without strong action on climate change, storms and other extreme weather events will continue to become more intense and more damaging.[25]

There is little doubt that climate change is exacerbating a number of drivers including reduced rainfall, drier conditions and more extreme heat days that are contributing to more intense bushfire seasons, exacerbating drought conditions, and fueling more intense and damaging storms.

Future preparation and planning for natural disasters, including national arrangements, must acknowledge and prepare for the predicted impacts of climate change.

Recommendation 1: Recognise the role of climate change and its impacts in contributing to the frequency, intensity, timing and location of bushfires and other natural disasters, and the predicted contribution of climate change and associated impacts to future bushfires and other natural disasters.

5. ToR (b) - Australia's arrangements for improving resilience and adapting to changing climatic conditions, what actions should be taken to mitigate the impacts of natural disasters, and whether accountability for natural disaster risk management, preparedness, resilience and recovery should be enhanced, including through a nationally consistent accountability and reporting framework and national standards

5.1 Need for climate-ready laws and policy frameworks

In light of the unequivocal scientific evidence of the impacts of anthropogenic climate change, including that changing climatic conditions are increasing the frequency and intensity of bushfires and other natural disasters, the international community agreed in late 2015 to keep the increase in global average temperature to well below 2°C above pre-industrial levels; and to pursue efforts to limit the increase to 1.5 °C.[26]

The Special Report of the IPCC released in 2018 indicates that current actions are not enough to limit warming to 1.5°C, and makes it clear that the consequences of warming beyond 1.5°C are dire.[27] Failing to limit global warming to 1.5 °C will have catastrophic impacts including greater levels of sea-level rise and coastal inundation, extreme heatwaves, severe droughts, the death of coral reefs, and mass extinctions.[28] And the impacts of climate change are not just environmental; there will be significant implications across all sectors, including health, the economy and national security.[29]

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[25] Climate Council of Australia, *Super-charged storms in Australia: The Influence of Climate Change by Professor Will Steffen and Dr David Alexander,* 2016, available at https://www.climatecouncil.org.au/uploads/3ca765b1c65cb52aa74eec2ce3161618.pdf

[26] In December 2015, over 190 nations affirmed a goal to reduce greenhouse gas emissions in order to limit average global warming to well below 2°C above pre-industrial levels and to pursue efforts to limit warming to 1.5°C. United Nations Framework Convention on Climate Change Conference of the Parties 21, *Adoption of the Paris Agreement*, 'Annex - Paris Agreement', Article 2 (FCCC/CP/2015/L.9/Rev.1). The Paris Agreement builds on past international commitments in Cancun, Lima and elsewhere under the 1992 UN Framework Convention on Climate Change.

[27] Intergovernmental Panel on Climate Change, Special Report Global Warming of 1.5oC, An IPCC Special Report on the impacts of global warming of 1.5oC above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty, (2018), https://www.ipcc.ch/sr15/

[28] Ibid.

[29] For example, the World Health Organisation (WHO) advises that climate change affects the social and environmental determinants of health – clean air, safe drinking water, sufficient food and secure shelter, and that between 2030 and 2050,

Despite the urgency, the legal and governance frameworks needed to achieve the global commitment to reduce greenhouse gas emissions and limit global warming are mostly absent. Australia is no exception. Despite Australia's commitments on the international stage (which are criticised as being inadequate)[30] and the fact that everyday Australian's are suffering the impacts of climate change, Australia's national laws are woefully inadequate in requiring action to mitigate greenhouse gas emissions and adapt to the impacts of climate change. For example:

- There is no overarching national legal framework, such as a national Climate Change Act, that would ensure a whole-of-government approach for tackling climate change in Australia.
- Our national environmental laws do not explicitly require decision-makers to consider climate change impacts in environmental decision- making. At present, under the EPBC Act, assessment and conditions related to climate change can only be incidental to protecting listed matters of national environmental significance, such as threatened species or world heritage areas. The Environment Minister cannot definitively review or reject a proposal on the basis that its greenhouse gas emissions are excessive or an unacceptable risk to the environment or the community as a matter of national significance.
- Our national laws do not set out an effective legal framework incorporating adaptation opportunities into strategic assessments and bioregional planning processes.

Until we have effective legal frameworks in place to mitigate greenhouse gas emissions, global temperatures will continue to rise and the impacts of climate change will become more severe, increasing the frequency and intensity of bushfires and other natural disasters.

5.2 Commonwealth role in mitigating greenhouse gas emissions and adapting to the impacts of climate change

Given the global nature of climate change, Australia's international commitments, and the fact that impacts of climate change are influencing bushfires and other natural disasters right across the country, the Commonwealth must take a leading role in mitigating greenhouse gas emissions and adapting to the impacts of climate change.

We outline a number of ways in which the Commonwealth can strengthen its role in mitigating greenhouse gas emissions and adapting to the impacts of climate change, including introducing a new Climate Change Act and ensuring environmental law provisions are climate-ready.

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climate change is expected to cause approximately 250 000 additional deaths per year, from malnutrition, malaria, diarrhoea and heat stress, see https://www.who.int/news-room/fact-sheets/detail/climate-change-and-health. In 2017, the Australian Senate Foreign Affairs, Defence and Trade References committee recognised climate change as a current and existential national security risk, see https://www.aph.gov.au/Parliamentary_Business/Committees/Senate/Foreign_Affairs_Defence_and_Trade/Nationalsecurity/Final_Report. The Reserve Bank of Australia has recently announced that banks, business and investors must think about the economic impacts of climate change, see https://www.abc.net.au/news/2019-03-12/reserve-bank-warns-of-impact-of-climate-change-on-the-economy/10893792.

[30] See for example, Climate Transparency, *Brown to Green Report 2019,* available at https://www.climate-transparency.org/g20-climate-performance/g20report2019

A new national Climate Change Act

Australia should implement a whole-of-government approach to climate change by enacting a new national Climate Change Act that addresses both climate change mitigation and adaptation in a clear and coordinated way.[31]

A new national Climate Change Act would include the elements set out below:

- ***Objects:*** set a clear overarching objective to reduce greenhouse gas emissions and make decisions consistent with limiting the increase in global warming to no more than 1.5 degrees Celsius above pre-industrial levels. The objects should also refer to planning for a rapid and just transition away from fossil fuel production.
- ***Targets:*** set legislative short-term and long-term emissions reduction target, with mechanisms to require review and non-regressive improvements to targets against best available science.[32]
- ***Independent expert advice***: formalise a skills-based independent statutory Climate Change Advisory Council to advise the Government and the Parliament based on the best available science for climate mitigation, and assess and report on progress in relation to meeting targets and implementing adaptation plans, and require decision makers to not act inconsistently with this advice.
- ***Duties***: create an enforceable duty on Ministers and relevant decision-makers to make decisions consistent with relevant climate change legislative objects and targets when exercising prescribed functions under Commonwealth legislation.
- ***Risk assessment:*** adopt a process for a national climate risk assessment, and require specific policies and initiatives for sectors identified as high risk from climate change impacts (e.g. housing, infrastructure, agriculture, energy, insurance).
- ***Adaptation Plans:*** require a national Adaptation Plan to be made, published, and periodically reviewed by the Climate Change Advisory Council; sectoral and regional adaptation plans could also be made consistent with the national adaptation plan.
- ***Monitoring progress:*** Develop national indicators, including for emissions reduction in line with set targets, adaptation planning and climate-readiness of legislation; and annually report against those indicators.
- ***Governance:*** Allocate Ministerial responsibility specifically for climate change,[33] and standalone government Climate Change division within the Department of Prime Minister and Cabinet that administers an overarching Climate Change Act (assisted by advice from the independent Climate Change Advisory Council) and supports interagency collaboration on emissions reduction and adaptation.

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[31] The recently proposed by private members Bill (Climate Change (National Framework for Adaptation and Mitigation) Bill 2020) by the Hon. Zali Steggall MP, provides an example of a possible national Climate Change Act see: https://www.zalisteggall.com.au/climate_change_bill_2020_business_overview

[32] Alternatively, impose duties on Government Ministers to set periodic and long-term emissions reduction targets and carbon budgets, based on expert advice consistent with internationally agreed climate goals, best available science, and the principles of ecologically sustainable development. It is noted that the Commonwealth has already set legislated renewable energy targets, see section 40 of the Renewable Energy (Electricity) Act 2000.

[33] It is noted that there is currently a Commonwealth Minister for Energy and Emissions Reduction (a position currently held by The Hon. Angus Taylor, MP). We would recommend that Ministerial responsibility should encompass emissions reduction and climate adaptation and be responsible for coordinating a whole-of-Government response to climate change and administration of a new Climate Change Act.

Climate-ready national environmental law provisions

Climate change considerations should be embedded into national environmental laws.[34]

a. New climate-change trigger for project assessment

A national trigger to oversee high greenhouse gas emitting projects has long been a major gap in the national environmental law.[35] A climate change trigger in our national environmental laws would link carbon accounting and emissions reduction targets set out in a national Climate Change Act with impact assessment and development conditions. For example, we recommend:

- Introducing prohibitions or restrictions on certain high emission projects. This is similar to prohibitions in place for inappropriate commercial fishing activities[36] and certain nuclear installations.[37] For clarity, high emission projects should be prohibited or unable to be approved where they would result in an exceedance of Australia's carbon budget.
- Adding a greenhouse gas emission trigger that recognises any development that produces over 100,000 tonnes of carbon dioxide (CO_2) equivalent per year (including downstream emissions) as a matter of national environmental significance.
- This should be supplemented by provision for all projects on a designated development list (including expansion of existing projects and significant land use change, including significant land clearing (if there is no separate clearing trigger as we have recommended elsewhere) and motorway projects etc.) to trigger the approval provisions. This would ensure the trigger was more comprehensive in capturing diffuse emissions. A quantitative trigger is easier to apply and administer but might miss smaller but still significant projects, hence the need for a schedule list.
- Best practice climate environmental impact assessment must include mandatory consideration of scope 1, 2 and 3 greenhouse gas emissions[38] in applying the trigger.

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[34] The current 10 year review of the *Environment Protection and Biodiversity Conservation Act 1999* provides an opportunity to embed climate change considerations into our national environmental laws, see https://epbcactreview.environment.gov.au/

[35] When Environment Minister Robert Hill introduced the EPBC Bill in 1998, he noted his government's commitment to negotiate a greenhouse trigger once the Act was passed: Senate Hansard, *Environment Protection and Biodiversity Conservation Bill 1998* [1999], Second Reading Speech, 22 June 1999, at 5990. The Report of the Independent Review of the *Environment Protection and Biodiversity Conservation Act 1999* (October 2009) (the Hawke Review) explored the option of a greenhouse trigger in detail and recommended that an interim greenhouse trigger, with a threshold of at most 500,000 tonnes of carbon dioxide equivalent emissions, be introduced as soon as possible by way of Regulation to sun-set upon commencement of the Carbon Pollution Reduction Scheme (Recommendation 10). Ultimately a Carbon Pollution Reduction Scheme was not introduced and yet a greenhouse trigger has still not been implemented. See Report of the Independent Review of the *Environment Protection and Biodiversity Conservation Act 1999* (October 2019), Recommendation 10.

[36] *Environment Protection and Biodiversity Conservation Act 1999,* Chapter 5B

[37] *Environment Protection and Biodiversity Conservation Act 1999*, s140A.

[38] Environmental assessments of greenhouse gas emissions break them down into the following categories:

- Scope 1 emissions: Direct emissions released to the atmosphere as a direct result of an activity, or series of activities at a project level.
- Scope 2 emissions: Offsite GHG emissions associated with generation of electricity, heat or steam purchased by the project; and
- Scope 3 emissions: Indirect GHG emissions (other than scope 2) that are generated in the wider economy. They occur as a consequence of the activities of a facility, but from sources not owned or controlled by that facility's business.

For further information see http://www.cleanenergyregulator.gov.au/NGER/About-the-National-Greenhouse-and-Energy-Reporting-scheme/Greenhouse-gases-and-energy

- We also recommend a call in power – this could potentially capture projects that may have a significant climate impact that aren't necessarily covered by the threshold or the designated development schedule.

b. Require decision-makers to consider climate change mitigation and adaptation opportunities in strategic assessments and bioregional planning processes.

In addition to a trigger, climate considerations need to be embedded in relevant plan-making processes and standard setting mechanisms under the Act, including:

- Bioregional plans – to assist adaptation planning including for developments in hazard zones (bushfire/floods), wildlife corridors/climate refugia (this should be coordinated with states and territories);
- Consideration for strategic assessments in terms of both emissions reduction and adaptation planning;
- Recovery plans – as highlighted by the recent bushfires recovery actions may need to be reviewed and strengthened to recover species and build ecosystem resilience;
- Threat abatement planning;
- Emergency listing provisions of species and ecological communities most at risk;
- Standard setting for air pollutants;
- In all relevant decisions to ensure the objects of the Act are operationalised; and
- National plans, standards and goals – this can and should be linked to setting carbon budgets.[39]

Recommendations

Recommendation 2: The Commonwealth Government should adopt a whole-of-government approach to climate change by enacting a new national Climate Change Act that addresses both climate change mitigation and adaptation in a clear and coordinated way.

Recommendation 3: Climate change considerations must be embedded into national environmental laws, including a new climate-change trigger for project assessment and requirements for decision-makers to consider climate change mitigation and adaptation opportunities in strategic assessments and bioregional, recovery and threat abatement planning processes.

5.3 Climate-ready water laws

Water laws across the country do not adequately reflect the need to manage water resources in recognition of a changing climate.

It is imperative that we manage our water sources in the context of a changing climate, particularly given the link between climate change, drought and more intense and frequent extreme weather and bushfires. There is already cross-jurisdictional coordination of water management happening in Australia, most notably in the Murray Darling Basin, however the legal frameworks underpinning water management fail to effectively incorporate climate change considerations.

[39] We note this could be done in stand-alone climate legislation as recently proposed by Hon Zali Steggall MP see: https://www.zalisteggall.com.au/climate_change_national_framework_for_adaptation_and_mitigation_bill_2020

EDO recommends that water laws across jurisdictions must incorporate:

- an evidence-based cap on extractions at catchment and basin scales which is informed by climate projections;
- an adaptive water allocation scheme with an embedded climate projection signal;
- protecting environmental flows from extraction;
- protecting different components of the flow regime (from no flows to overbank flows), each of which is required to maintain ecosystem function;[40]
- promotion of longitudinal and latitudinal connectivity (essentially connection throughout a river and floodplain system, particularly to allow migration of biota through the river network) . This requires catchment-based legal instruments to speak to one another;
- in regulated river systems, managing public storages on the basis of climate projections, not historic climate data;
- accurately measuring and reporting water extractions (noting the difficulty of enforcing the law at the licence holder and catchment levels in the absence of reliable evidence);
- fulsome monitoring of groundwater resources, and appropriate limits on extractions which take into account connectivity with surface water, as well as the tendency to shift to consumption from aquifers during periods of water scarcity;
- accurate water accounting which, *inter alia*, takes into account return flows, water theft and floodplain harvesting;
- appropriate governance arrangements for subsidised irrigation modernisation projects, including a requirement to demonstrate that they are actually saving water;
- a requirement to ensure modelling for compliance purposes is based on latest levels of development and its assumptions are transparent and communicable.
- the inclusion of clear duties to, for example, act on the basis of best available evidence and protect water resources from over-extraction;
- appropriately drafted civil and criminal offence provisions supported by an independent regulator;
- third party standing to enforce breaches of laws; and
- objective, transparent and accountable decision-making.[41]

Recommendations

Recommendation 4: Review and amend water management laws across all jurisdictions to ensure they are climate-ready.

[40] Murray Darling Basin Authority, *Ecological needs of low flows in the Barwon-Darling*. 2018, https://www.mdba.gov.au/sites/default/files/pubs/ecological-needs-low-flows-barwon-darling.pdf

[41] See Dr Emma Carmody, Environmental Defenders Office, *Climate change is water change: integrating water management, mitigation and adaptation laws and policies*, Australian Environment Review, 2017. Vol 31 No; see also Environmental Defenders Office, *Presentation to 10th Water Symposium*, hosted by Legalwise in Sydney on 18 October 2019, available at https://www.edo.org.au/2019/12/19/are-water-laws-climate-ready/

5.4 Climate change considerations in state and territory legal frameworks

While the Commonwealth must show clear leadership in climate change mitigation and adaptation, states, territories and local governments also have a role to play. To that end, this Royal Commission should recommend that states and territories review existing legislation with a view to incorporating clear requirements for climate change mitigation and adaptation.

Given the important leadership role of the Commonwealth in building resilience in the face of a changing climate, and to support national coordination, the Commonwealth government should develop national standards to assist states, territories and local governments, and to ensure a strengthened, consistent approach to climate change mitigation and adaptation across the country. This could be done by a new National Sustainability Commission (see below at 7.1).

Recommendations

Recommendation 5: All states and territories must review relevant existing legislation with a view to incorporating clear requirements for climate change mitigation and adaptation.

Recommendation 6: The Commonwealth government should develop national standards on climate change mitigation and adaptation to assist states, territories and local governments, and to ensure a strengthened, consistent approach to climate change mitigation and adaptation across the country, based on best available science.

6 ToR (c) - Whether changes are needed to Australia's legal framework for the involvement of the Commonwealth in responding to national emergencies

6.1 The role of the Commonwealth in emergency and natural disaster management

Historically, states and territories have taken the primary role in managing the response to bushfires and other natural disasters. Accordingly, each state and territory has legislation relating to the bushfire management and emergency management, including natural disaster management (see **Attachment 1** - Summary of key bushfire and emergency legislation in Australian States and Territories).

The Commonwealth is involved in emergency and natural disaster management, and drives initiatives such as:

- Emergency Management Australia, a division of the Commonwealth Department of Home Affairs that delivers programs, policies and services that strengthen Australia's national security and emergency management capability and coordinates the Australian Government physical and financial support for disasters and emergencies;
- The National Disaster Risk Reduction Framework;[42]
- The Australian Government Crisis Coordination Centre, a 24/7 centre that provides whole-of-government situational awareness to inform national decision-making during a crisis;

[42] Commonwealth of Australia, *National Disaster Risk Reduction Framework*, 2018, available at https://www.homeaffairs.gov.au/emergency/files/national-disaster-risk-reduction-framework.pdf

- The Australian Institute for Disaster Resilience, which provides thought leadership, professional development and knowledge sharing, working in collaboration with government, community, research, education and the private sector.

However, the Commonwealth's legal functions and powers are unclear as there are no specific Commonwealth bushfire or natural disaster emergency management laws. While this has not prevented the Commonwealth from coordinating with state and territory governments in responding to natural disasters or driving the initiatives outlined above, it does leave a question mark over the exact scope of the Commonwealth's powers, and may cause difficulties in the event of any future conflicts or uncertainties in relation to the Commonwealth's role.

Given the predicted increased risk and intensity of natural disasters due to a changing climatic conditions, our historical way of dealing with natural disasters should be reviewed, as there may be a need for the Commonwealth to have clear, and even strengthened powers, to take leadership, including immediate and urgent action in order to prepare for, respond to and recover from natural disasters.[43] This may be in stand-alone legislation, or through a range of legal mechanisms or intergovernmental agreements, and must include strengthening the Commonwealth's role in mitigating greenhouse gas emissions and adapting to the impacts of climate change, as outlined above.[44]

Recommendations

Recommendation 7: Ensure that the powers and responsibilities of the Commonwealth government, including in relation to coordinating, preparing for, responding to, and recovering from natural disasters, and providing funding and coordinating long-term action to build resilience, are clearly set out in legislation and/or intergovernmental agreement/s ahead of the next bushfire season.

6.2 Emergency management frameworks must address climate change

Given the clear link between climate change and the increasing severity of bushfires and other natural disasters, it is recommended that there be an explicit requirement in relevant emergency legislation that the best available science regarding climate change impacts on the likelihood, severity, and locations of bushfires and other natural disasters be relied upon in the formulation of measures to prevent, prepare for, respond to and assist recover from bushfires. By way of example, the *Government Code of California* requires[45] that local hazard mitigation plans[46] address climate adaptation and

[43] For further information on this issue see Australian National Audit Office, *Commonwealth Emergency Management Arrangements*, 2000, available at https://www.anao.gov.au/sites/default/files/anao_report_1999-00_41.pdf?acsf_files_redirect; see also Michael Eburn, *Responding to Catastrophic Natural Disasters and the need For Commonwealth Legislation*, Canberra Law Review (2011) Vol. 10, Issue 3, available at http://www.austlii.edu.au/au/journals/CanLawRw/2011/30.pdf; see the work of the Policies, institutions and governance project of the Bushfire and Natural Hazard Cooperative Research Centre, available at https://www.bnhcrc.com.au/research/governance

[44] A new intergovernmental agreement could complement existing agreements, such as the Intergovernmental Agreement on the Provision of Bureau of Meteorology Hazard Services to the States and Territories (2018), National drought agreement (2018) and Intergovernmental Agreement on Federal Financial Relations (2011) (see Schedule D which relates to the payments for natural disaster relief and recovery arrangements). The Inter-governmental Agreement on National Search and Rescue Response Arrangements (2017) could also provide some guidance. See https://www.coag.gov.au/agreements and http://www.federalfinancialrelations.gov.au/content/intergovernmental_agreements.aspx

[45] At s65302. See SB-379, available at https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=201520160SB379.

[46] Adopted in accordance with the federal *Disaster Mitigation Act of 2000*.

resiliency, based on an assessment including an assessment of how climate change may affect wildfire risks. In addition, the *California State Hazard Mitigation Plan*[47] incorporates climate change models into its assessment of, amongst other things, wildfire vulnerability.[48]

To the best of our knowledge, no key state or territory emergency legislation or plans currently factor climate change into decision-making, risk management, or disaster preparedness as a specific consideration. Given the increasing risks associated with the impacts of climate change, we believe the failure to factor climate change into emergency management could be a breach of duties. For example, in NSW this could be considered a failure by the Minister of their duty under the *State Emergency and Rescue Management Act 1989* to ensure that "adequate measures are taken by government agencies to prevent, prepare for, respond to and assist recovery from emergencies".[49]

Recommendations

Recommendation 8: Ensure that any recommendations to establish Commonwealth emergency and natural disaster legislation include a requirement to mitigate greenhouse gas emissions and adapt to the impacts of climate change.

Recommendation 9: Include provisions in state and territory emergency legislation that explicitly require plans developed under emergency legislation to factor climate change into decision-making, risk assessment and management, or disaster preparedness, and be addressed consistent with the principles of ESD.

7. ToR (f) - Ways in which Australia could achieve greater national coordination and accountability — through common national standards, rule-making, reporting and data-sharing — with respect to key preparedness and resilience responsibilities, including for the following:

i. **land management, including hazard reduction measures;**
ii. **wildlife management and species conservation, including biodiversity, habitat protection and restoration;**
iii. **land-use planning, zoning and development approval (including building standards), urban safety, construction of public infrastructure, and the incorporation of natural disaster considerations.**

7.1 Overview - national standards, rule-making, reporting and data-sharing

We believe that there is benefit in common national standards, rule-making, reporting and data-sharing with respect to key preparedness and resilience responsibilities.

[47] Required by 44 Code of Federal Regulations (**CFR**) Part 201 Mitigation Planning.
[48] See California State Hazard Mitigation Plan, September 2018, Section 8.1, available at https://www.caloes.ca.gov/cal-oes-divisions/hazard-mitigation/hazard-mitigation-planning/state-hazard-mitigation-plan
[49] *State Emergency and Rescue Management Act 1989* (NSW), s 10(1)(a)).

Our recent submission to the 10-year review of EPBC Act explores some of these issues in greater detail in the context of our national environment laws.[50] For example:

- ***National Sustainability Commission:*** A National Sustainability Commission should be established with clear functions for strategic oversight and the development of national standards. The Commission could establish a specific Natural Disaster Commissioner with a mandate to develop and coordinate plans and standards in relation to disaster responses, adaptation and resilience measures.

- ***National Ecosystems Assessment***: To ensure that we have a baseline to measure the effectiveness of national environmental laws, including with respect to preparedness and resilience , EDO recommends a National Ecosystems Assessment. This positive flagship initiative should be coordinated by the Commonwealth Environment Department, assisted by a new Sustainability Commission, National Environment Protection Agency, and counterpart state/territory agencies. A National Ecosystems Assessment would bring together and enable important new tools and programs, particularly for wildlife management and species conservation. In particular, it could:
    - involve a rapid initial assessment to identify areas under imminent threat, including threat from bushfire and other natural disasters, and other immediate and essential actions to protect the national environment, such as the identification and protection of High Conservation Value Vegetation. This kind of assessment is urgently needed in light of the impacts of the recent bushfires;
    - support the Minister's legal duty to identify, assess and list (via the Scientific Committee) all nationally Threatened Ecological Communities, with ongoing duties to keep lists up-to-date;
    - identify, recognise and map Ecosystems of National Importance and a comprehensive, adequate and representative National Reserve System;
    - provide a properly resourced and comprehensive update to Australia biodiversity mapping and integrated data-sharing systems;
    - better inform a national network of Bioregional Plans;
    - identify baselines, reference points or indicators for a system of National Environmental Accounts, with clear timeframes, stages and budgetary allocations from the Commonwealth, state and territory governments; and
    - promote the concept of ecosystem services and identify the benefits (or services) that key natural assets provide to human society,[51] consistent with Aichi targets under the Convention on Biological Diversity.

    The UK's National Ecosystems Assessment provides a useful point of reference. With initial findings delivered in 2011, it was a broad collaboration that focused on the connection

[50] Environmental Defenders Office, *Submission to the 10 year review of the EPBC Act,* April 2020, available at https://www.edo.org.au/wp-content/uploads/2020/04/EPBC-Act-10-year-review-Environmental-Defenders-Office-submission-.pdf

[51] For example, water purification by swamps, pest control by birds, bats and insects, pollination by native bees, carbon storage in wetlands, climate control by urban forests, soil erosion and salinity prevention from rural ecological communities, storm surge protection from coastal mangroves.

between ecosystems, the services they provide, and emerging pressures on the environment.[52]

- ***National environmental reporting:*** National environmental reporting is able to report on key environmental drivers contributing to increased risk of bushfires and other natural disasters, however current processes for national environmental reporting could be improved. EDO recommends that data collected through mandatory monitoring and reporting should be centrally compiled by, or with the assistance of, the relevant Department. Repeated State of the Environment reports have noted deficiencies in environmental data and the absence of joined-up environmental information across the jurisdictions. The *State of the Environment Report 2016* reiterated that a lack of monitoring and reporting data is hindering effective policy-making and environmental management in every jurisdiction.

Given that environmental drivers are influencing the frequency and intensity of bushfires and other natural disasters, greater national coordination and accountability in monitoring and addressing those environmental drivers, through strengthened environmental reporting and ecosystems assessment can contribute to preparedness and resilience.

7.2 Land management, including hazard reduction measures

EDO supports ecologically sustainable land management practices. Specifically in relation to bushfires, EDO supports bushfire management practices that are science-based, protect lives and property, and are ecologically sustainable. Bushfires can have a significant impact on ecosystems, natural landscapes and environments. Firefighting responses have the capacity to alter this impact either positively or negatively, depending upon the strategies and tactics used to combat the fire.

Backburning tactics for example could be expected to have high impacts on environments through the interaction of fire-fronts and the trapping of wildlife between approaching fronts, whereas aggressive fire suppression tactics early in a fire event may minimise burnt areas. Backburning becomes an increasingly common tactic as fires grow in size and the perimeters become too large to contain directly, so a fundamental question is whether there are ways in which fires can be contained at a smaller size using more aggressive tactics? For example, in the recent NSW fires, were adequate numbers of Remotely Trained Fire Teams (RAFT) and support aircraft available? Were small, remote ignitions prioritised for rapid suppression, or were they treated as lower priority because they did not immediately threaten life and property assets? Were backburns conducted through high conservation value or World Heritage environments without recognition of their value as assets? Research to quantify resources that would enable more fires to be contained at a small size and minimise the need for backburning, using the bushfires as focus, should be prioritised. If this research finds that close containment is an effective and more environmental appropriate approach, the findings could form the basis of plans to transition firefighting resources toward rapid suppression and close containment.

Following the 2019-20 bushfires, there has also been considerable discussion about prescribed burning, including whether it can reduce the spread and severity of bushfires and whether adequate prescribed burning was undertaken prior to the bushfire season. To our knowledge, despite decades of research,

[52] Robert Watson & Steve Albon, 'UK NEA: Synthesis of Key Findings' (2011) at http://www.wensumalliance.org.uk/publications/UKNEA_SynthesisReport.pdf, p 15.

no evidence yet exists to show that burning remote areas provides any material protection to houses, yet the pressure to burn more area results in an increase in burning of remote hectares and a reduction in treatments adjacent to assets, where they may provide assistance.[53] Regular burning of bush land has the potential to lead to environmental degradation, so prescribed burning should only be conducted where it can be shown to be effective and at a location and scale where this loss is deemed acceptable or unavoidable, or can be mitigated consistent with the principles of ecologically sustainable development.

For further discussion on hazard reduction measures, see the case study below, *Case Study: Hazard reduction measures – A NSW perspective,* which provides a further analysis of prescribed burning and other land management practices such as grazing and selective logging from a NSW perspective. Based on our experience in NSW, EDO does not support environmentally destructive, unsubstantiated land management practices introduced under the guise of bushfire management.

Given that bushfire management is primarily the responsibility of state and territory agencies, there is a risk of inconsistent approaches being used to prepare for and manage bushfire risks. Institutions such as the Bushfire and Natural Hazard Cooperative Research Centre and the Australasian Fire and Emergency Service Authorities Council can provide research and guidance for use by all states and territories.[54] Importantly, land management practices, including in relation to hazard reduction, must be based on the best available science, including in relation to climate change, and include Indigenous input (see response to ToR (g) below).

Recommendations

Recommendation 10: Undertake research to quantify resources needed to enable more fires to be contained at a small size and minimise the need for backburning, and based on the findings of that research allocate resources accordingly.

Recommendation 11: Recognise the value of long-undisturbed forest in mitigating landscape fire risk in fire management planning.

Recommendation 12: Ensure that prescribed burning and other methods of reducing risk via disturbance are primarily applied close to assets where they may provide material benefit.

Recommendation 13: Reject environmentally destructive, unsubstantiated bushfire management practices such as grazing in national parks and selective logging.

Recommendation 14: *Land management practices*, including in relation to hazard reduction, must be based on the best available science, including in relation to climate change, and include Indigenous input.

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[53] Inspector-General for Emergency Management, *Review of performance targets for bushfire fuel management on public land.* (2015), https://www.igem.vic.gov.au/reports-and-publications/igem-reports/review-of-performance-targets-for-bushfire-fuel-management-on

[54] For example, the Australasian Fire and Emergency Service Authorities Council and Forest Fire Management Group have developed *National Guidelines for Prescribed Burning Strategic and Program Planning,* 2017, available at https://knowledge.aidr.org.au/media/4897/national-guidelines-for-prescribed-burning-strategic-and-program-planning.pdf; see also the Forest Fire Management Group *National Bushfire Management Policy Statement for Forests and Rangelands,* 2014, available at https://knowledge.aidr.org.au/media/4935/nationalbushfiremanagementpolicy_2014.pdf

Case study: Hazard reduction measures – A NSW perspective

In light of calls to increase prescribed burning, it must be recognised that the NSW bushfires occurred at the peak of historic prescribed burning frequency in NSW national parks. Analysis of Department of Planning Industry and Environment (**DPIE**) mapped records[55] indicate that, in the decade leading up to the bushfires, more than twice the area of national park estate was burnt for fuel management compared to the previous decade, and more than the total in any of the five mapped decades prior to that.[56] If a lack of prescribed burning leads to large fires, then fires of this scale would have been more likely across the national park estate during the previous five decades when less of it was being carried out. There is no prima facie argument to support the claim that the bushfires resulted from a lack of prescribed burning. For further information, please refer to the expert report provided by Dr Philip Zylstra at **Attachment 2**.

Empirical evidence for the effectiveness of prescribed burning in NSW also conflicts with the claim that more hectares should have been burnt. Analysis following the 2009 Black Saturday fires found that very recent burns conducted close to structures did provide a small level of assistance in protecting those structures, but, critical to this inquiry, there was no evidence that remote burns provided any assistance in protecting houses.[57]

Following significant bushfire events, perceived tensions between conservation, asset protection and disaster preparedness present risks of 'maladaptation' and can lead to perverse outcomes. For example, following bushfire events in October 2013, where 1,157 bushfires burnt across NSW, including six major bushfires at Port Stephens, in the Blue Mountains, in the Southern Highlands and on the Central Coast,[58] the NSW Government introduced the *Rural Fires Amendment (Vegetation Clearing) Act 2014* (**the 10/50 Bushfire Code**) which provided new vegetation clearing rules for homeowners in designated bushfire prone areas. The 10/50 Bushfire Code led to widespread reports of suburban trees being felled to enhance views, rather than protect from threats – at a time when the cooling effects of street trees were being recognised, and the Government was embarking on a program to plant 5 million trees in Western Sydney. Significant pushback from the community resulted in a review of the 10/50 Bushfire Code and subsequent changes to the rules to limit perverse tree clearing.[59]

There is a real risk that following the bushfires of the 2019-20 summer, the incentive to make swift and far-reaching changes to bushfire management practices will undermine science-based, ecologically sustainable bushfire management practices that protect lives, property and the environment. For example, following the bushfires, there have been renewed calls to allow grazing in national parks.[60]

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[55] https://datasets.seed.nsw.gov.au/dataset/fire-history-wildfires-and-prescribed-burns-1e8b6
[56] https://www.abc.net.au/news/2020-01-22/prescribed-burning-nsw-backburning-hazard-reduction/11878316
[57] Price, O. F. & Bradstock, R. A. The efficacy of fuel treatment in mitigating property loss during wildfires: Insights from analysis of the severity of the catastrophic fires in 2009 in Victoria, Australia. *J. Environ. Manage.* 113, 146–157 (2012)., Gibbons, P. *et al.* Land management practices associated with house loss in wildfires. *PLoS One* 7, e29212 (2012).
[58] See NSW Parliamentary Research Service, *Rural Fires Amendment (Vegetation Clearing) Bill 2014,* June 2014 e-brief 09/2014, https://www.parliament.nsw.gov.au/researchpapers/Documents/rural-fires-amendment-vegetation-clearing-bill-2/Rural%20Fires%20Amendment%20(Vegetation%20Clearing)%20Bill%202014.pdf
[59] See NSW Government, *Review of the 10/50 Vegetation Clearing Entitlement Scheme*, August 2015 https://www.rfs.nsw.gov.au/__data/assets/pdf_file/0019/33607/Review-of-the-1050-Vegetation-Clearing-Entitlement-Scheme-Report.pdf
[60] See, for example, Sydney Morning Herald, *'Cows can't stop bushfires': Minister at odds with Nats*, 18 November 2019.

Grazing of livestock in alpine areas has been shown to have little to no effect on the severity of bushfires.[61] Further, in our view, grazing by livestock in national parks is inconsistent with the objects of the *National Parks and Wildlife Act 1974.*

Similarly, the decision to allow selective logging in certain fire-affected areas,[62] flies in the face of substantial evidence warning against post-fire logging. Detailed studies by the Australian National University, including those done after Victoria's devastating Black Saturday fires, showed that post-fire logging did widespread damage to forest recovery.[63] It hampers species recovery, destroying important areas for refuge, and has negative effects on water, increasing sedimentation and catalysing erosion. Perhaps counter-intuitively, the research also showed that post-fire logging increases future fire risk.

EDO does not support environmentally destructive, unsubstantiated practices introduced under the guise of bushfire management.

7.3 Wildlife management and species conservation

EDO has written extensively on the legal frameworks relating to wildlife management and species conservation including biodiversity, habitat protection and restoration. Most relevant, we draw the Royal Commission's attention to:

- EDO's policy and law reform advice to Humane Society International Australia on Next Generation: Biodiversity Laws;[64] and
- EDO's submission to the 10 year review of the EPBC Act.[65]

These documents discuss opportunities for strengthening Australia's environmental laws to ensure species conservation, including to effectively plan for, mitigate (where possible), and respond to extreme weather events related to climate change.

In terms of opportunities to ensure the protection and restoration of threatened species and ecological communities that have been affected by summer bushfires of 2019-20, our recent letter to the Commonwealth Environment Minister outlines options available under the EPBC Act to protect threatened species and communities, including:

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[61] See, for example, Grant, J. et.al., *Cattle grazing does not reduce fire severity in eucalypt forests and woodlands of the Australian Alps,* Austral Ecology (2014) 39, 462–468; Williams, R.J., et.al. *Does alpine grazing reduce blazing? A landscape test of a widely-held hypothesis' Austral Ecology* 31 (2006) 925-36; Kirkpatrick, J.B., et. al '*Influence of Grazing and Vegetation Type on Post-Fire Flammability'* (2011), *Journal of Applied Ecology* 48.3 (2011) 64- 649.

[62] See https://www.forestrycorporation.com.au/operations/about-our-harvesting-operations/fire-affected-native-forests

[63] See, for example, Lindenmayer1, D. et.al., *Effects of logging on fire regimes in moist forests,* Conservation Letters 2 (2009) 271–277; Lindenmayer1, D. et.al., *Please do not disturb ecosystems further,* Nature Ecology and Evolution, 1, 0031 (2017) 1-3.

[64] EDO NSW and Humane Society International Australia, Next Generation Biodiversity Laws – Best practice elements for a new Commonwealth Environment Act (2018), Humane Society International Australia Ltd, Sydney, available at https://www.edo.org.au/publication/next-generation-biodiversity-laws/

[65] Environmental Defenders Office, *Submission to the 10 year review of the EPBC Act,* April 2020, available at https://www.edo.org.au/wp-content/uploads/2020/04/EPBC-Act-10-year-review-Environmental-Defenders-Office-submission-.pdf

- temporarily suspending the progress of any current decision-making processes under the EPBC Act in relation to proposed actions that are likely to impact threatened species or ecological communities that have also been heavily affected by the bushfires;
- commissioning re-assessments of the impacts of proposed and approved actions on threatened species and ecological communities that have been most heavily affected by the bushfires;
- reconsidering 'controlled action' decisions;
- varying or suspending existing approvals to allow for appropriate protection measures to be implemented, or where certain actions now pose a risk of extinction, revoking existing approvals;
- reviewing the operations of Regional Forestry Agreements (RFAs); and
- revoking or varying Wildlife Trade Operations and Accredited Management Plans for the export of Kangaroos.[66]

We have written similar letters to the Premiers of Queensland and NSW outlining steps that can be taken under relevant state laws to ensure the protection of threatened species and ecological communities that have been affected by the bushfires.[67]

We have also criticised decisions made to allow logging operations to commence or continue in areas that have been burnt, despite evidence that post-fire logging hinders forest recovery.[68] For example, in NSW, EDO has expressed concern over the NSW Government decision to permit selective logging in areas that were subject to this season's unprecedented bushfires – known as post-fire logging or salvage logging.[69]

We welcome the Commonwealth Environment Minister's decision set up an Expert Panel to assist in prioritising recovery actions for native species, ecological communities, natural assets and their cultural values for Indigenous Australians, which have been affected by recent extreme fire events.[70] The Minister should prioritise actions identified by the Expert Panel to ensure the recovery of species, ecologically communities and natural assets. For example, the Expert Panel has recently released provisional lists of 471 priority plants and 191 priority invertebrate species requiring urgent management intervention or on-ground assessment due to impacts from the bushfires. Priority actions recommended by the Panel for priority invertebrates include rapid on-ground surveys to establish the extent of population loss and provide a baseline for ongoing monitoring and protecting unburnt areas (within or adjacent to recently burnt ground, or in suitable habitat away from the burnt areas) that

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[66] Environmental Defenders Office and Humane Society International Australia, Letter to The Hon. Susan Ley MP, Minister for the Environment, 14 February 2020, available at https://www.edo.org.au/wp-content/uploads/2020/02/20-02-14-Joint-HSI-EDO-Letter-to-Minister-Ley-re-EPBCA-decisions-post-bushfires.pdf

[67] See Environmental Defenders Office and Humane Society International Australia, Letter to The Hon Annastacia Palaszczuk, Premier and Minister for Trade, 21 February 2020, available at https://www.edo.org.au/wp-content/uploads/2020/03/EDO-to-QLD-Premier-re-Responding-to-Qld-bushfires.pdf; Letter from Environmental Defenders Office and Humane Society International Australia to The Hon. Gladys Berejiklian, Premier of NSW, dated 25 February 2020, available at https://www.edo.org.au/wp-content/uploads/2020/02/HSI-EDO-Letter-to-NSW-Premier-re-Bushfire-Emergency.pdf

[68] See comments from Professor David Lindenmayer, Fenner School of Environment and Society, ANU College of Science, available at https://fennerschool.anu.edu.au/news-events/news/post-bushfire-logging-makes-bad-situation-even-worse-industry-ignoring-science-prof

[69] See https://www.edo.org.au/2020/02/21/bushfire-emergency-edo-legal-response/

[70] More information on the Wildlife and Threatened Species Bushfire Recovery Expert Panel can be found at https://www.environment.gov.au/biodiversity/bushfire-recovery/expert-panel

provide refuge.[71] A range of suggested management actions for high priority plant species have also been recommended.[72]

We also welcome the release of the Threatened Species Scientific Committee's (**TSSC**) Bushfire Response Plan, which outlines ten key actions including to prevent extinction and limit decline of native species and ecosystems affected by the 2019-20 fires and reduce impacts from future fires.[73] For example, the TSSC has advised that many unlisted species and ecological communities urgently require statutory protection as a result of the 2019-20 fires, and many listed species and ecological communities need re-assessment because their conservation status has deteriorated.[74] The TSCC has also recommended updating Conservation Advices for the highest priority fire-affected species and ecological communities to include the impacts of, and management response to, the 2019-20 fires; the potential impacts and management of future fires and the information needs, key conservation actions and resources that will be needed to support longer-term recovery.[75]

Recommendations

Recommendation 15: Strengthen Australia's environmental laws to ensure species conservation, including to effectively plan for, mitigate (where possible), and respond to extreme weather events related to climate change, and ensure recovery of affected species.

Recommendation 16: Take immediate steps using existing powers under the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) to ensure the protection and restoration of threatened species and ecological communities that have been affected by the summer bushfires of 2019-20.

Recommendation 17: Take immediate steps to prevent forestry operations being undertaken in recovering areas of burnt forest.

Recommendation 18: The Commonwealth Government should continue to support the work of the Wildlife and Threatened Species Bushfire Recovery Expert Panel and Threatened Species Scientific Committee, and urgently prioritise actions recommended by those bodies to assist native species, ecological communities and natural assets to recover from the 2019-20 bushfires and to reduce impacts of fires in the future.

7.4 Land-use planning

The interaction between bushfire preparedness and land use planning has long been recognised. A 2014 report from the former Bushfire Cooperative Research Centre found that *"(t)he succession of bushfire inquiries over the last 100 years increasingly highlights the important role of land use planning in minimising bushfire risk to urban communities*".[76]

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[71] See http://www.environment.gov.au/biodiversity/bushfire-recovery/priority-plants
[72] See http://www.environment.gov.au/biodiversity/bushfire-recovery/priority-plants
[73] See https://www.environment.gov.au/biodiversity/threatened/publications/threatened-species-scientific-committee-bushfire-response-plan
[74] Ibid.
[75] Ibid.
[76] Norman B, Weir JK, Sullivan K and Lavis J (University of Canberra), (2014), *Planning and bushfire risk in a changing climate,* Bushfire CRC, Australia, p 3, available at https://www.bushfirecrc.com/sites/default/files/urban_and_regional_planning.pdf

Land-use planning is primarily the responsibility of states and territories, and local governments. Most jurisdictions have incorporated bushfire considerations into their respective planning regimes. In terms of building standards, the Australian Buildings Standards include *AS3959-2018 – Construction of building in Bushfire Prone Areas.* However, because land-use planning is primarily the responsibility of state and territory agencies, other than national building standards for *Construction of building in Bushfire Prone Areas,* there is no consistent approach for incorporating bushfire risks into land use planning.

Similarly, natural hazard planning has developed across jurisdictions in an ad hoc manner. Hazard management can be incorporated into strategic planning, or through mandatory sustainability building requirements. When it comes specifically to climate change adaptation, legal frameworks are still developing. While policies and guidelines discuss mechanism for incorporating climate change mitigation and adaptation in decision making, only some jurisdictions such as Victoria, the United Kingdom, and Japan have created specific obligations on decision makers to prepare adaptation plans or duties to consider climate change mitigation and adaptation in decision making.[77]

Previous inquiries have considered the role of land-use planning in bushfire preparedness and resilience extensively, and therefore we do not consider this issue in further detail other than to recommend that any findings coming out of this Royal Commission on land-use planning and the incorporation of natural disaster considerations should be based on the best available science, require the consideration of climate change impacts and include Indigenous input (see response to ToR (g) below).

Recommendations

Recommendation 19: Any findings coming out of this Royal Commission on *land-use planning* and the incorporation of natural disaster considerations should be based on the best available science, require the consideration of climate change impacts, and include Indigenous input.

8. ToR (g) Ways in which the traditional land and fire management practices of Indigenous Australians could improve Australia's resilience to natural disasters

We are pleased that the ToRs for this Royal Commission seek to understand ways in which the traditional land and fire management practices of Indigenous Australians could improve Australia's resilience to natural disasters. While we don't have any specific recommendations, we strongly support this Royal Commission inquiring into the views and knowledge of Indigenous landowners regarding traditional land and fire management practices and cultural burning, and make recommendations for recognising and facilitating Indigenous knowledge,land and fire management practices and cultural burning into bushfire and natural disaster management, where appropriate.

Recommendation 20: Recognise Indigenous traditional land and fire management practices and cultural burning, and facilitate its incorporation into bushfire and natural disaster management, where appropriate.

[77] See for example, the *Climate Change Act 2008* (UK), *Climate Change Act 2017* (Vic) and the *Climate Change Adaptation Act 2018* (Japan).

Attachment 1

Summary of key bushfire and emergency legislation in Australian States and Territories

Jurisdiction	Act	Objects/purpose
Australian Capital Territory	*Emergencies Act 2004*	"An Act about emergencies and fire and ambulance incidents, and for other purposes"
New South Wales	*Rural Fires Act 1997*	"An Act to establish the NSW Rural Fire Service and define its functions; to make provision for the prevention, mitigation and suppression of rural fires; to repeal the *Bush Fires Act 1949*; to amend certain other Acts; and for other purposes."
	State Emergency and Rescue Management Act 1989	"An Act relating to the management of State emergencies and rescues."
	State Emergency Service Act 1989	"An Act to establish the State Emergency Service and define its functions; to make provision for the handling of certain emergencies; to repeal the *State Emergency Services and Civil Defence Act 1972*; to amend certain other Acts; and for other purposes."
Northern Territory	*Bushfires Management Act 2016*	"An Act to provide for the protection of life, property and the environment through the mitigation, management and suppression of bushfires, and for related purposes."
	Emergency Management Act 2013	"An Act to provide for matters relating to emergency management, and for related matters."
Queensland	*Fire and Emergency Services Act 1990*	"An Act to establish the Queensland Fire and Emergency Service, to establish a fund for particular purposes, to provide for the prevention of and response to fires and emergency."
	Disaster Management Act 2003	"An Act to provide for matters relating to disaster management in the State, and for other purposes."
South Australia	*Fire and Emergency Services Act 2005*	"An Act to establish the South Australian Fire and Emergency Services Commission and to provide for the Commission's role in the governance, strategic and policy aspects of the emergency services sector; to provide for the continuation of a metropolitan fire and emergency service, a country fire and emergency service, and a State emergency service; to provide for the prevention, control and suppression of fires and for the handling of certain emergency situations; and for other purposes."
	Emergency Management Act 2004	"An Act to establish strategies and systems for the management of emergencies in the State; and for other purposes."

Tasmania	*Fire Service Act 1979*	"An Act to amalgamate fire services in the State, to consolidate and amend the law relating to preventing and extinguishing fires and the protection of life and property from fire, to make provision with respect to incidental matters, and to amend and repeal certain enactments."
	Emergency Management Act 2006	"An Act to provide for the protection of life, property and the environment in the event of an emergency, to establish emergency management arrangements, to provide for certain rescue and retrieval operations, to repeal the *Emergency Services Act 1976*, to consequentially rescind certain statutory rules, to consequentially amend certain Acts and for related purposes."
Victoria	*Country Fire Authority Act 1958*	"An Act to consolidate the Law relating to the Country Fire Authority and the Control of Fire in Country Areas."
	Emergency Management Act 1986	"The purpose of this Act is to provide for the organisation of emergency management in Victoria."
	Emergency Management Act 2013	"The purpose of this Act is to— (a)establish new governance arrangements for emergency management in Victoria; and (b) repeal the Fire Services Commissioner Act 2010; and (c)consequentially amend emergency management legislation and certain other Acts".
	Victoria State Emergency Service Act 2005	"The purpose of this Act is to— (a) establish the Victoria State Emergency Service Authority to manage the Victoria State Emergency Service; (b) re-enact the *Victoria State Emergency Service Act 1987* with amendments to improve the operation and effectiveness of the Victoria State Emergency Service; (c) amend the *Country Fire Authority Act 1958* and the *Metropolitan Fire Brigades Act 1958* to improve the transparency and equity of funding arrangements; (d) repeal the *Victoria State Emergency Service Act 1987* and make consequential amendments to certain other Acts."
Western Australia	*Bush Fires Act 1954*	"An Act to make better provision for diminishing the dangers resulting from bush fires, for the prevention, control and extinguishment of bush fires, for the repeal of the *Bush Fires Act 1937* and for other purposes."
	Emergency Management Act 2005	"An Act to provide for prompt and coordinated organisation of emergency management in the State, and for related purposes."
	Fire and Emergency Services Act 1998	"An Act to provide for functions relating to the provision and management of emergency services, and for related purposes."

Attachment 2

The influence of fire on subsequent risk and the role of prescribed burning

Prepared by Dr Philip Zylstra
Adjunct Associate Professor | Curtin University | School of Molecular and Life Sciences
Honorary Fellow | University of Wollongong
March 2020

I have prepared this advice in response to a request from the Environmental Defenders Office. The advice considers the influence of fire on subsequent fire risk and the role of prescribed burning in fire management. Two forms of landscape analysis have been used to measure the influence of fire on subsequent risk: fire *leverage*, and the *flammability ratio*.

Leverage involves the simple comparison of area burnt by bushfires each year with the area of recently burnt forest present in that year. To date, analyses in NSW have only identified weak and non-significant relationships between these two measures, and these have more often been negative than positive. That is, for more parts of the state, fire has been more likely when the area of recently burnt forest is larger.[1] This relationship applies in areas including the south-east corner, south-east Queensland and south-western slopes bioregions; all of which experienced major fires this past season.[2]

Flammability ratio is a stronger analysis, measuring the direct effect of every past fire on the spread of all parts of each subsequent fire, effectively providing a mass-series of case studies. To date, all forest communities examined using this technique have shown the same trend but with differing intensities: three periods of flammability have been evident. Initially, forests have been unlikely to burn for 2-6 years after a preceding fire ('young' period), most likely to burn for approximately the next two decades ('regrowth' period), but then *unlikely to burn* for an indefinite period after this ('mature' period).

This finding of a decline in the flammability of mature forests is of central importance to the question of prescribed burning. It is a trend consistent with studies of other disturbances such as logging,[3] has a clear causal mechanism in the changes that disturbance promotes in vegetation,[4] and has long been predicted from such changes.[5] The implication is simple, but opposite to popular belief: heightened flammability is a response to disturbance. Current fire management, however, focuses on a planned regime of disturbance, measuring success from the short-term reduction in risk following disturbance, without considering the long-term increased risk that ultimately results.

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[1] Price, O. F. *et al.* Global patterns in fire leverage: the response of annual area burnt to previous fire. *Int. J. Wildl. Fire* **24**, 297–306 (2015)., Price, O. F., Penman, T. D., Bradstock, R. A., Boer, M. M. & Clarke, H. G. Biogeographical variation in the potential effectiveness of prescribed fire in south-east Australia. *J. Biogeogr.* **42**, 2234–2245 (2015).

[2] Fires burning in these areas include the events that destroyed homes at Mallacoota, Cobargo, Wondalga and Rappville.

[3] Taylor, C., McCarthy, M. A. & Lindenmayer, D. B. Nonlinear effects of stand age on fire severity. *Conserv. Lett.* **7**, 355–370 (2014).

[4] Gosper, C. R., Prober, S. M. & Yates, C. J. Multi-century changes in vegetation structure and fuel availability in fire-sensitive eucalypt woodlands. *For. Ecol. Manage.* **310**, 102–109 (2013)., Dixon, K. M., Cary, G. J., Worboys, G. L., Seddon, J. & Gibbons, P. A comparison of fuel hazard in recently burned and long-unburned forests and woodlands. *Int. J. Wildl. Fire* **27**, 609–622 (2018).

[5] Zylstra, P. J. The historical influence of fire on the flammability of subalpine Snowgum forest and woodland. *Vic. Nat.* **130**, 232–239 (2013), Kitzberger, T. *et al.* Fire–vegetation feedbacks and alternative states: common mechanisms of temperate forest vulnerability to fire in southern South America and New Zealand. *New Zeal. J. Bot.* **54**, 247–272 (2016). Tepley, A. J. *et al.* Influences of fire-vegetation feedbacks and post-fire recovery rates on forest landscape vulnerability to altered fire regimes. *J. Ecol.* 1–16 (2018). doi:10.1111/1365-2745.12950, Tiribelli, F., Kitzberger, T. & Morales, J. M. Changes in vegetation structure and fuel characteristics along post-fire succession promote alternative stable states and positive fire-vegetation feedbacks. *J. Veg. Sci.* **29**, 147–156 (2018).

In the context of a changing climate, increased rates of disturbance will therefore result in a more flammable landscape, and a positive feedback where fire promotes more fire. Such so-called *landscape traps*[6] have the potential to accelerate fire frequency and impact until vulnerable ecosystems collapse.[7] Mitigation activities have the potential to either combat this cycle, or accelerate it even further by increasing the rate of disturbance.

Case studies of burning effectiveness have frequently failed to detect this pattern due to their design. These contrast fire behaviour in the young period with what they refer to as "long-unburnt", but this so-called long-unburnt vegetation is at times only a few years old itself, and almost never older than 20 years.[8] In reality, these studies have contrasted the flammability of young vegetation with that of regrowth rather than mature forest. The regrowth period is, however, a product of the fire itself. The 2-6 years of low flammability may be a benefit of burning, but the following decades of increased flammability are a cost imposed by it. When this is treated as if it is mature forest, the cost of burning is falsely treated as if it is a cost of *not* burning.

Current NSW Government modelling tools used for planning prescribed burning programs do not account for the decline in flammability of mature forests, and this has significant consequences. An example from the NSW koala populations illustrates the effect.

Analysis of threats to koalas by the DPIE Saving our Species[9] program identified that koala populations favour mature forests over regrowth, but also listed this preference for mature forest as a threat due to the perceived higher flammability of those forests and the vulnerability of koalas to fire. One population located at Numeralla in the state's south was identified to be predominantly at risk from fire, so the University of Melbourne was contracted to model strategies for fire risk mitigation. Their analysis utilised the software Phoenix RapidFire – a tool jointly owned by the University and three fire authorities including the NSW RFS.[10] Phoenix models fire on the assumption that mature forest is the most flammable period rather than the least, and, as the model cannot calculate the direct risk of fire to fauna, this study also assumed that prescribed burns would have no impact on koalas. Based on these two premises, the researchers concluded that the most effective use of prescribed burning for koala risk reduction was to burn koala habitat forest every 7 years.[11]

A dissenting report to the NSW Government on the same population was prepared by the University of Wollongong as part of a NSW Environmental Trust project "Modelling fire risk to fauna". In contrast to

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[6] Lindenmayer, D. B., Hobbs, R. J., Likens, G. E., Krebs, C. J. & Banks, S. C. Newly discovered landscape traps produce regime shifts in wet forests. *Proc. Natl. Acad. Sci. U. S. A.* **108**, 15887–15891 (2011).

[7] Kitzberger, T., Aráoz, E., Gowda, J. H., Mermoz, M. & Morales, J. M. Decreases in fire spread probability with forest age promotes alternative community states, reduced resilience to climate variability and large fire regime shifts. *Ecosystems* **15**, 97–112 (2012).

[8] Fernandes, P. A. M. & Botelho, H. S. A review of prescribed burning effectiveness in fire hazard reduction. *Int. J. Wildl. Fire* **12**, 117–128 (2003)., Fernandes, P. A. M. Empirical support for the use of prescribed burning as a fuel treatment. *Curr. For. Reports* **1**, 118–127 (2015)., McCaw, W. L. Managing forest fuels using prescribed fire - A perspective from southern Australia. *For. Ecol. Manage.* **294**, 217–224 (2013).

[9] Rennison, B. & Fisher, M. *Framework for the spatial prioritisation of koala conservation actions in NSW. Saving our Species Iconic Koala Project.* (2018).

[10] https://www.acnc.gov.au/charity/361f8be445a08946300aa253c55b6120

[11] Parkins, K., Cirulis, B. A. & Penman, T. D. *Fire risk management of populations of the koala Phascolarctos cinereus in the NSW southern tablelands: A simulation study.* (2019).

the first study, this used a mechanistic model (FRaME[12]) that could account for the effects of vegetation dynamics on flammability and measure the direct impact of fire on the koalas. In contrast to the Phoenix modelling, FRaME predicted that prescribed burns would not only increase the flammability of the koala habitat and the consequent likelihood of wildfire by encouraging the growth of a flammable understorey, they would directly impact the koalas themselves. Frequent prescribed burns would result in increases in the likelihood that koalas would receive 2nd degree burns by up to 810%, 3rd degree burns by up to 1200%, and create the likelihood of immediate mortality where it would not have existed if the forest was left in its long-unburnt state.

These examples illustrate a central issue in fire management. Although it has existential consequences for individuals, communities, species and ecosystems, management bodies do not hold the evidence used to assess the efficacy of tools such as prescribed burning to the same standards as are expected for other highly consequential industries, such as medicine. Leverage values for example are used to inform planning, despite having no statistical significance. Statistical significance has long been used in science as the test by which hypotheses are accepted or rejected, yet not only is its importance ignored in this case, the results are selectively accepted. For example, prescribed burning has not been stopped in those areas where the leverage study suggested it was increasing fire risk.

The underpinning theory for prescribed burning derives from a leaflet published in 1967,[13] claiming a direct correlation between the weight of leaf litter (termed the 'fuel load') and the behaviour of a fire. This claim was never subjected to the basic standards of peer-review applied to other areas of science, and, despite decades of research, no peer-reviewed evidence has yet been published in its support. In fact, subsequent tests published in peer-reviewed literature have consistently falsified the theory.[14] Research conducted using this model has a pre-determined outcome: more burning will be recommended. In my opinion, research that does not provide inputs to this model may be treated by agencies as irrelevant, if the model is their only available tool for management.

In my opinion, government agencies tasked with implementing such consequential measures have a responsibility to ensure that the evidence underpinning their actions meets the basic standards expected in other fields of science. At the same time, however, those agencies are tasked with implementing existing management objectives that may have arisen from non-scientific bases, which in my opinion can give rise to conflicts of interest. This has the further potential to bias future research. In my opinion, this is a core impediment to effective fire management in Australia, and our capacity to face the challenges of a changing climate may depend on our ability to overcome it.

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[12] The Fire Research and Modelling Environment. Zylstra, P. J. *et al.* Biophysical mechanistic modelling quantifies the effects of plant traits on fire severity: species, not surface fuel loads determine flame dimensions in eucalypt forests. *PLoS One* **11**, e0160715 (2016). Zylstra, P. J. Mechanistic fire modelling in R using FRaME: from plant traits to impacts on fauna, flora and soils. *Methods Ecol. Evol.* **Under Review**, (2020).

[13] Gould, J. S., McCaw, W. L. & Cheney, N. P. Quantifying fine fuel dynamics and structure in dry eucalypt forest (Eucalyptus marginata) in Western Australia for fire management. For. Ecol. Manage. 262, 531–546 (2011)., McArthur, A. G. Fire behaviour in Eucalypt forests. Forestry and Timber Bureau Leaflet 107. in *9th Commonwealth Forestry Conference* 26 (1967).

[14] Burrows, N. D. Fire behaviour in Jarrah forest fuels. *CALMScience* **3**, 31–84 (1999)., Cheney, N. P., Gould, J. S., McCaw, W. L. & Anderson, W. R. Predicting fire behaviour in dry eucalypt forest in southern Australia. *For. Ecol. Manage.* **280**, 120–131 (2012)., Zylstra, P. J. *et al.* Biophysical mechanistic modelling quantifies the effects of plant traits on fire severity: species, not surface fuel loads determine flame dimensions in eucalypt forests. *PLoS One* **11**, e0160715 (2016).

Key recommendations for the use of prescribed burning in mitigating bushfire risk

- **Recommendation 1. The value of long-undisturbed forest in mitigating landscape fire risk is recognized in fire management planning**

Three stages of recognition are required. Firstly, ecosystems that have been shown to decline in flammability with maturity should be recognized. Secondly, the evidence that this appears to be a broadly applicable principle due to disturbance-related changes in vegetation should provide the baseline assumption for areas where the dynamics have not yet been measured. Thirdly, research should be directed toward addressing the gaps in this knowledge, including measurement of timing and feedback strength, potential exceptions, and potential complicating factors.

Recognition will require that this knowledge is incorporated into fire management planning, so that mature forests are not intentionally disturbed, strategies and resources are engaged to capitalize on their lower flammability, and other strategies are developed to progress regrowth forests into a mature state where possible.

- **Recommendation 2. Prescribed burning and other methods of reducing risk via disturbance are applied close to assets where they may provide material benefit**

Due to the nature of flammability dynamics, these interventions will only be of value if applied frequently and intensively, maintaining forests in their 'young' state. This has the potential to lead to environmental degradation, so it should only be conducted at a location and scale where this loss is deemed acceptable or unavoidable, or can be mitigated.

- **Recommendation 3. Fire management is regulated and assessed for efficacy by an external body that is not also responsible for implementing Government objectives**

A regulating body must be free to question Government policy and not be tasked with meeting KPIs that are open to question.

- **Recommendation 4. Scientific research is independent from Government policy**

Scientific research must be independent from Government policy, and in particular:

- Research funding should not be administered by an agency tasked with enacting Government policies which could be questioned by that research.
- Agencies responsible for enacting policy should divest from companies such as Phoenix fire predictions Ltd that legally bind them to management actions which may be questioned by research