

**ANNUAL  
PROGRESS REPORT  
2023-24**

storm

earthquake

tsunami

bushfire

cyclone

heatwave

flood

coastal  
inundation

Natural Hazards Research Australia's staff work from Burrumattagal, Dharawal, Dharug, Dja Dja Wurrung, Gadigal, Turrbal/Yuggera, Wadawurrung, Wangal and Wurundjeri Countries. We thank and acknowledge the Traditional Custodians of these lands and all the lands where we work, live and walk, and pay our respects to Elders past, present and emerging. We recognise that these lands and waters have always been places of teaching, research and learning, and that sovereignty has not been ceded. We are committed to strengthening reconciliation and building resilience through respectful and empowering relationships with First Nations communities, peoples and partners.

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Australian Government



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# Introduction

Three years ago, Natural Hazards Research Australia (the Centre) embraced an ideal that would provide guidance, inspiration and support for the years ahead.

A vision:

*that communities will be safer, more resilient and sustainable in the face of natural hazards.*

This Annual Progress Report 2023–24 presents our progress towards achieving this vision through our strategic direction, a growing network of Participants and a targeted national research program.

The Centre seeks to develop the knowledge and insights to better manage the impacts and consequences of natural hazards, as they combine with changes in climate, demographics, technology and other societal-wide factors. As conditions around us change at an alarming rate, so must we change and be innovative in what we think and what we do.

We engage regularly with our Participants, research partners, local, state and territory governments, and the Australian Government to ensure our growing research program remains aligned to our mission:

*to work closely with partners and the community on research that is useful, actionable and supportive of better decision-making to save lives and protect communities.*

The Annual Progress Report 2023–24 shows how the Centre is developing research that is useful, usable and used. Our research outputs are more than high-quality academic products – they are in the hands of those who are making decisions and creating policies in government, business and the community.

Our purpose is to provide a national natural hazards research capability – one that addresses the complex and difficult questions surrounding natural hazards. Our *Be Ahead of Ready* initiative this year was a further prompt for the sector to be more innovative in defining research that meets the challenge.

The Centre continues to be attractive to those who see value in becoming Participants join the Centre. This year we reached the stage where we could pronounce that all states and territories are now a core part of the Centre. The research has always been enriched by both the depth and diversity of those who contribute. The growth in our Participant base will only serve to improve that outcome.

Our strategy is based on utilisation and engagement on a national scale. Everything we do is driven by Centre Participants and the communities they represent. The research is all shaped, developed, monitored and supported by those who will ultimately use it, giving it the best possible chance of being relevant and useful from the start. Our model is flexible, so that our funding decisions are responsive to the changing needs of the environment.

As the world seeks to better understand how to manage frequent and severe natural hazards, the Centre and Participants take on that challenge for Australia. Together, that journey is well underway, and this Annual Progress Report 2023–24 is an informative account of our third year.

On behalf of the Board and Directors, I would like to thank everyone who has contributed to the achievements of the Centre to this point – researchers and postgraduate students, Participants and the broader sector, community members, Centre staff and management.

We all know our mission is not yet complete, but this Annual Progress Report 2023–24 demonstrates that we can all be confident the Centre is making real progress towards the vision of safe, resilient and sustainable communities.

**Iain MacKenzie**, Chair,  
Natural Hazards Research Australia



The Centre has successfully completed its third year of operation in 2023–24. The success of the Centre is driven by the commitment and passion of its Participants and researchers to achieve safer, more resilient and sustainable communities through research that is useful, useable and ultimately, used.

The Centre's program aligns strongly with the research needs of users and policy directions including support of all 24 actions detailed in the National Action Plan for Disaster Risk Reduction and contribution to the implementation of Royal Commission into National Natural Disaster Arrangements' recommendations.

Growth of the Centre's networks continued throughout the year, welcoming new Participants from Victoria, Northern Territory and Western Australia and bringing the Centre's total number of Participants to 32. The Centre now also works with 47 research providers.

The 2024 Natural Hazards Research Forum saw attendance by more than 300 participants from 108 organisations, illustrating the breadth, scope and diversity of organisations engaged in the Centre's research program.

Two successful research concept rounds were undertaken throughout the year, with \$21M in research investment now allocated to 67 core research projects. These projects are at various stages of completion, reflecting the Centre's end-user driven approach to research that aligns with our *10-Year Research Strategy* and *Biennial Research Plan 2023–25*. The quality of the Centre's research is demonstrable through the national recognition our researchers have received in various awards and accolades.

The Centre also continued to successfully manage two large portfolios of contract research for the Victorian Country Fire Authority and the Victorian Department of Energy, Environment and Climate Action.

Through the implementation of the Centre's evaluation framework, the use of the Centre's research continues to be measured. Key examples include the national roll-out of the *SES Fit for Task* program, ABC Emergency's evidence-based Community Service Announcements for floods and storms based on research findings, more than 55,000 registered users of the Australian Disaster Resilience Index, and the incorporation of research findings into national emergency management doctrine.

Demonstrating thought leadership through a partnership with Suncorp Insurance, the Centre delivered a discussion paper following a high-level roundtable event on the topic of assisted relocations. The launch of the *Be Ahead of Ready* initiative further encouraged sector and wider big thinking to prompt transformative change to safeguard Australia's future resilience.

Investment in the next generation of researchers and policy makers continued through the Centre's education and training program. The Centre now has 39 active postgraduate and 21 associate students, with three scholarship students completed. Throughout the year, Centre staff worked with First Nations research leaders to co-design a First Nations Scholarship to be officially launched later in 2024. We also launched our first industry internship.

The Centre again hosted the Disaster Challenge to inspire innovation and support early and mid-career researchers and practitioners to connect with industry. Congratulations to the 2023 winner, Lydia Wardale. The Centre launched its Early – and Mid-Career Academic and Practitioners Community to advocate for the next generation of natural hazards leaders by supporting and fostering excellence in the science and management of natural hazards.

Throughout the year, the Centre was asked to contribute advice to strategic policy initiatives including the review of flood hazard mitigation methodology to inform resilience programs in the NSW Northern Rivers; participation in the National Emergency Management Agency (NEMA) National Disaster Risk Profile Expert Reference Group and Disaster Ready Fund Assessment Panel; and contributions to the National Climate Risk Assessment. The Centre also made submissions to various inquiries and reviews.

As the Centre's research portfolio matures, activities to translate research into practice continue through regular webinars, participation in conferences and key sector events, as well as regular engagement with the media. This has seen our research reach thousands of people in the last year alone.

Centre management continued to enhance the Centre's capability welcoming several new staff and enhancing policies and systems to ensure sound management and governance of activities. The Centre also opened its Western Australia Node Office, significantly enhancing connections with Western Australian and South Australian Participants and stakeholders.

The ongoing journey to promote reconciliation continued through the implementation of the Centre's REFLECT Reconciliation Action Plan, with the vast majority of actions now completed.

Looking towards the 2024–25 financial year, the Centre will continue to expand and mature its research portfolio with a focus on ensuring the translation and utilisation of research outcomes. It is vital that our research program remains future-focused to answer the vital questions that will enable the ongoing safety, sustainability and resilience of communities as natural hazard risk continues to worsen.

I look forward to continuing to work with Participants, researchers and staff to further the Centre's work in achieving its vital mission. Well done to all for your efforts throughout the year.

**Andrew Gissing**, CEO,  
Natural Hazards Research Australia



**WE CREATE  
RESEARCH THAT IS  
USEFUL, USABLE  
AND USED  
DEFINED BY USERS  
FRAMED BY  
NATURAL HAZARDS  
CONTEXTUALISED  
BY THEMES  
INFLUENCED  
BY A RANGE  
OF FACTORS**

# Overview of the Centre

Natural Hazards Research Australia (the Centre) is Australia's research centre for natural hazards resilience and disaster risk reduction. The Centre was established 1 July 2021 and works closely with the Australian Government and other participating organisations across Australia to deliver a strategic research agenda for the nation and actively promote research utilisation.

The Centre is focused on undertaking research that promotes natural hazard resilience and reduces disaster risk to support the needs of a variety of critical stakeholders – including emergency service agencies, government, industry and communities, in mitigating impacts of, responding to, and recovering from disasters caused by natural hazards.

It is built on the strong foundations of its preceding Cooperative Research Centres, the Bushfire CRC and Bushfire and Natural Hazards CRC.

The Centre is both a leader and catalyst for expansion of natural hazards research in Australia, ensuring that research informs national and regional policy and capability, and improves public safety, resilience and sustainability.

## Vision

That communities will be safer, more resilient and sustainable in the face of natural hazards.

## Mission

To work with partners and the community on research that is useful, actionable and supportive of better decision-making to save lives and protect communities.



# Key achievements

The Centre is on track to deliver on its Strategic Plan 2021–2031 and 10-Year Research Strategy.

## Governance and Management

### 20 STAFF ACROSS 4 NODES IN QUEENSLAND NEW SOUTH WALES VICTORIA AND WESTERN AUSTRALIA

The Board met five times with a strong focus on maturing the Centre's practices and research portfolio to meet the needs of Participants.

The Board approved the *2024–2026 Biennial Research Plan*, which provides a strategic guide to the research activities and targets over the next two years.

The International Research Advisory Panel and End-user Advisory Panel met to discuss relevant issues and deliver advice.

The Centre continued its journey to promote reconciliation through the implementation of the REFLECT Reconciliation Action Plan, with the majority of actions now complete.

Governance and management systems were enhanced through the development and implementation of new policies and systems.

The implementation of an evaluation framework significantly enhanced the Centre's capacity to measure the impact and benefit of its research program.

The new Western Australian Node opened to better connect the Centre with Western Australia and South Australia Participants and facilitate the delivery local research projects with national application.

Prof Cheryl Desha, formerly of Griffith University, was appointed as Science and Innovation Director.

#### MORE IN 2024–25

- Review and development of *Biennial Research Plan 2024–26*
- Continued enhancement of Centre policies and systems

## Partnerships

### NETWORK EXPANDED TO 32 FORMAL PARTICIPANT ORGANISATIONS

### 47 RESEARCH PROVIDERS

Expanded investment in research with new participant arrangements with Western Australian and Northern Territory Governments, Emergency Management Victoria and Fire Rescue Victoria. A Memorandum of Understanding (MoU) was signed with the Victorian Inspector-General Emergency Management.

The Centre works in the broad emergency management and disaster resilience sector, with Participants drawn from all states and territories, levels of government, key industry bodies, the private and not-for-profit sectors, and other organisations with a stake in protecting Australian communities.

The Centre continued to share natural hazards and disaster resilience knowledge and experience through international collaborations and exchanges throughout Europe, North America and New Zealand.

#### MORE IN 2024–25

- Growth in international collaboration, particularly through the Centre's International Research Advisory Panel
- Further expansion of the Centre's end-user network



Left and right: More than 300 people attended the Centre's Natural Hazards Research Forum, Adelaide.





## Research and Implementation

**300 PEOPLE FROM 108 ORGANISATIONS AT NATURAL HAZARDS RESEARCH FORUM 2024**

**\$21M INVESTMENT ALLOCATED ACROSS THE RESEARCH PROGRAM**

**67 RESEARCH PROJECTS UNDERWAY INCLUDING 15 NEW PROJECTS APPROVED BY THE CENTRE BOARD THIS YEAR**

**CENTRE'S RESEARCH SUPPORTS ALL 24 ACTIONS FROM THE SECOND NATIONAL ACTION PLAN FOR DISASTER RISK REDUCTION**

Centre research strongly supports implementation of the recommendations of the Royal Commission into National Natural Disaster Arrangements

New project proposals were evaluated and reviewed by the Research and Implementation Committee prior to Board endorsement. All projects align with the *Biennial Research Plan 2023–25* and identify translation and implementation pathways co-developed and agreed with Participants.

Projects continue to attract significant interest and implementation with Participants and the wider sector. Evaluation shows Centre research is being used to enhance safety and resilience, including:

- National implementation of the *SES Fit for Task* project to enhance volunteer safety and capability
- Enhanced mapping of water bodies to improve planning for aerial firefighting operations
- Enhancing community safety through research-informed emergency Community Safety Announcements during floods and cyclones
- Improved understanding of national community resilience through the Australian Disaster Resilience Index
- Innovative child-centred bushfire education engagement with school children to build resilience through the expansion of action-based research

The third annual Natural Hazards Research Forum was hosted in Adelaide in May. Almost 300 attendees represented 108 organisations.

The Centre organised, supported or participated in 90 research events, including conferences, knowledge sharing forums, workshops and industry training courses.

The establishment of a data catalogue to share natural hazards data is progressing through the Research Data Management Project.

The Centre continues to successfully manage large contract research portfolios for the Victorian Country Fire Authority (CFA) and the Victorian Department of Energy, Environment and Climate Action (DEECA).

### MORE IN 2024–25

- The next Natural Hazards Research Forum in June 2025
- Further research investment rounds will be announced
- Further development of the Centre's data catalogue and sharing platform
- Research translation initiatives including the pilot of Translation and Implementation Panels



## Capability

**63 SCHOLARSHIP  
AND ASSOCIATE  
POSTGRADUATES  
INCLUDING  
3 COMPLETED PHDS**

**2 ACTIVE AND  
3 COMPLETED  
EARLY CAREER  
RESEARCHER FELLOWS**

**1 INDUSTRY  
INTERNSHIP**

Research capability was enhanced through participation of 39 scholarship students (two have completed their PhDs), 21 associate students (one completed) and five Early Career Researcher Fellowships.

Research outputs are being developed into professional development for stakeholders. Three professional development modules that translate research on extreme fire behaviour are available for fire weather and behaviour analysts.

The Disaster Challenge 2023 promoted innovation, capacity and networking opportunities among the postgraduate entrants in addition to the working group of Participant representatives who provided intellectual rigour to the challenge.

The Centre launched its Early – and Mid-Career Academic and Practitioners Network to advocate for the next generation of natural hazards leaders

### MORE IN 2024–25

- Disaster Challenge 2024 is underway with new winners to be announced in October 2024 at a public event in Perth.
- First Nations Scholarship is ready for launch
- Further scholarship, fellowship and internship opportunities



## Research Informed Strategic Advice

**RESEARCH IS  
INFLUENCING  
DECISION-MAKING**

**215 MEDIA  
APPEARANCES**

**60 VIDEOS:  
7980 VIEWS  
OVER 572 HOURS**

Throughout the year stakeholders sought strategic evidence-informed advice from key staff at the Centre to shape key policies:

- Membership of Independent Peer Review Panel for Flood Hazard Mitigation Methodology for the NSW Reconstruction Authority
- Participation in National Disaster Risk Profile Expert Reference Group to develop national natural hazards risk profile
- Participation in the National Disaster Ready Fund Assessment Panel to allocate funding under the Commonwealth Government's Disaster Ready Fund
- Participation in the National Climate Change Risk Assessment

The Centre provided high level advice, including submissions to:

- Independent Review of Commonwealth Disaster Funding
- Department of Home Affairs Alternative Commonwealth Capabilities for Crisis Response Discussion Paper
- Australian Climate Service Review and meetings with the Independent Panel
- Department of Climate Change, Energy, the Environment and Water regarding the National Adaptation Plan Issues Paper
- Department of Infrastructure, Transport, Regional Development, Communications and the Arts on the draft National Urban Policy for Australia
- Queensland Inspector-General Emergency Management regarding the 2023–24 Severe Weather Season Review
- Parliament of Victoria Legislative Assembly Environment and Planning Committee regarding climate change adaptation

To provoke thought leadership across the sector, the *Be Ahead of Ready* initiative saw participants from the sector contribute their big ideas to improve sector and societal policy and capability around natural hazards. *Be Ahead of Ready* was launched at the Natural Hazards Research Forum 2024 in Adelaide.

The Centre demonstrated thought leadership through a partnership with Suncorp Insurance to deliver a discussion paper and roundtable event with senior government and industry representatives on the topic of assisted relocation.

Centre staff and researchers presented research findings, outcomes and research-informed advice at many conferences, workshops and meetings, across Australia and across a range of subject matter.

Regional, national and international media regularly sought comment and information from the Centre on natural hazards issues.

A range of communications products developed to suit the needs of the Centre partners and the public were distributed, including publications, reports, briefing papers, videos, webinars, case studies and tools for operational roles in partner organisations.

An annual calendar of engagement activities continues to foster greater collaboration between researchers, all levels of government and the emergency management sector, as well as support the needs of communities across Australia.

### **MORE IN 2024–25**

- Thought leadership events, activities and publications
- Continued involvement in aligned strategic initiatives
- Regular workshops and webinars

# Strategic Alignment

Australia is a land of natural hazards. Flood, bushfire, cyclone, storm, earthquake, tsunami, heatwaves and other hazards have always been a feature of our landscape. For tens of thousands of years, First Nations peoples have understood these as a natural and inevitable part of life on this continent and today, learning how to live with and minimise natural hazards' negative impacts is an essential part of life.

Recent years, highlighted by the 2019–20 bushfire season and the 2022–23 east coast floods, illustrate the impacts of compounding natural hazards and their intersection with longer-term stressors such as the COVID-19 pandemic. Some Australian communities were only beginning to recover from bushfire or repeated flooding while managing the unprecedented effects of the COVID-19 pandemic.

The financial costs of natural hazards continue to grow, placing greater pressures on the ongoing resilience and sustainability of communities.

The 2020 Royal Commission into National Natural Disaster Arrangements concluded that natural hazard emergencies are expected to become more complex, more unpredictable and more difficult to manage.

Based on an environmental scan of current risk, capability and policy trends (including themes from recent natural hazards and inquiries), and feedback from Centre Participants and other subject matter experts, the Centre established and continues to update a set of research and key capability areas and themes, documented in ongoing Biennial Research Plans. The 2024–26 *Biennial Research Plan* was approved by the Centre's Board in June 2024.

In July 2021, the Centre was established with the guiding vision of working with partners to make communities safer, more resilient and sustainable in the face of natural hazards. Three years into executing this vision, the Centre continues to work collaboratively across the sector to define end-users' research needs.

In 2024 and beyond, the achievement of this vision remains multi-faceted, as articulated in the following strategic documents:



## Strategic Plan 2021–2031



The Centre developed the *Strategic Plan 2021–2031* as the overarching corporate vision and strategy. This is a big-picture document that outlines the vision, mission, partners, principles, plans and strategic themes of the Centre.

This plan identifies five key strategic themes for the Centre to focus on over the 10-year funding period:

- Governance and management
- Partnerships
- Research and implementation
- Capability
- Research-informed advice

## National research priorities



The *National research priorities for disaster risk reduction and community resilience to the impacts of natural hazards* assesses Australia's natural hazards research priorities – building on what was already known about disaster risk reduction in 2021 and identifying any knowledge gaps. Eight overarching research themes were used as a guide for a series of collaborative workshops with key stakeholders in 2021. Working with these key stakeholders from government, emergency management agencies, private sector organisations and not-for-profit companies, the Centre co-developed the research priorities that can be used to inform research to deliver valuable outcomes over a decade.

These research priorities are national in scale. They can (and should) be used by organisations beyond the Centre for developing or investing in research projects and programs, and for developing collaborative research initiatives. They identify important research areas by stakeholders who have participated in their development. They do not attempt to cover all possible research related to natural hazards, disaster risk reduction and national resilience.

## 10-Year Research Strategy 2022



The *10-Year Research Strategy* details the themes and factors influencing the Centre's research focus. It informs decisions about which kinds of research projects are funded in the short-, medium- and long-term. As a strategic document, it highlights what the Centre will achieve over 10 years rather than what specific research will be undertaken. The *10-Year Research Strategy* outlines a need for balance across mitigation, response and recovery, across different types of hazards and projects of different lengths and types.

The *10-Year Research Strategy* will be reviewed every five years and was heavily influenced by the *National research priorities*, the National Disaster Risk Reduction Framework, the findings and recommendations of the Royal Commission into National Natural Disaster Arrangements (and similar inquiries) and the evolving threats of natural hazards in a changing climate. As of 30 June 2024, the Centre was three years into this cycle.



## Biennial Research Plan 2024–26



The Biennial Research Plans outline the Centre’s research activities and how they will deliver the outcomes described in the Centre’s *10-Year Research Strategy 2022* and *Strategic Plan 2021–2031*.

The current *Biennial Research Plan 2024–26* (published June 2024) provides an overarching strategic guide for the Centre’s research activities and describe the Centre’s research focus areas. It provides a two-year outlook and will be reviewed annually to ensure that the Centre continues to meet the needs of its Participants and stakeholders while building on the pre-existing research direction of the Centre.

The Plan outlines key focus and capability areas reflecting the shifting drivers and priorities of the sector as it responds to the unfolding and changing risks of natural hazards. The focus areas are illustrated in the diagram below, showing how they interlink with capabilities, and are outlined in detail within the plan.

## Research Data Management Framework



→ The Centre maintains a *Research Data Management Framework* to ensure that the Centre can support and contribute to accessible national data and knowledge collections. Ultimately, all funded or affiliated research projects will be expected to contribute to accessible, sustainable national research or operational data collections with ongoing agreed access, visibility to others, custodianship, governance and standardized data dictionaries.

This Framework focuses on the creation, curation and accessibility of research data sets and how the Centre will achieve this.

## End-user driven research

→ The Centre engages with its Participants to ensure the research program is driven by the needs of government, emergency services, industry and the community. All projects have identified translation and implementation pathways that have been co-developed and agreed with relevant end-users before the commencement of each project.

# Governance and management

## Staff

Twenty Centre staff (pictured, right) are located in Victoria, New South Wales (NSW), Western Australia (WA) and Queensland.

In June, Professor Deborah Bunker completed her role as Chief Science Officer and was succeeded by Professor Cheryl Desha as the new Science and Innovation Director. Professor Desha is working closely with Participants and stakeholders to lead the Centre's research strategy, education and training programs, as well as evaluation, thought leadership and innovation and data management.

To support the Centre in meeting its vision and mission, the Board approved four new roles. This includes the establishment of the Science and Innovation team under Professor Desha, to provide much-needed capacity to enhance data management, evaluation, and education and training. These positions are currently in recruitment.

The current organisational structure is shown in Figure 1.

Finance and business support continues to be provided through the Australasian Fire and Emergency Service Authorities Council (AFAC).

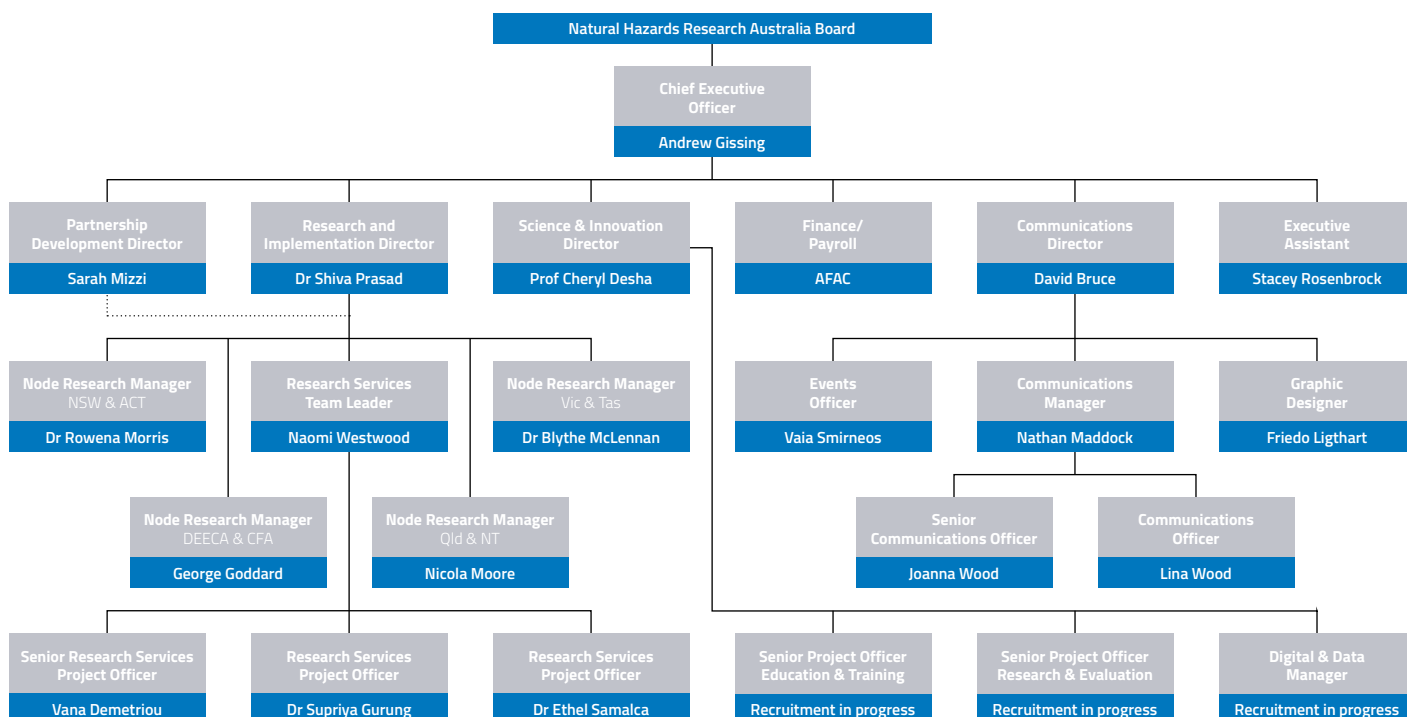


Figure 1: Corporate structure, 2023–24 financial year



## Board

The Board of eight independent members met five times over the reporting period with a strong focus on maturing the Centre's practices and research portfolio to meet the needs of Participants. The Board held its Annual General Meeting on Monday 27 November 2023. At that meeting, Sandra Whight was reappointed as a member of the Board for a further three-year term.



Iain MacKenzie (Chair)



Adj Prof Tim Moltmann



Dr Greg Ayers



Doug Smith



Oliver Costello



Kate Vinot



Dominique Hogan-Doran SC



Sandra Whight

## Board Committees, Panels and Working Groups

### Research and Implementation Committee

The Research and Implementation Committee provides the Centre Board with strategic advice on the overall development of research and implementation programs, consistent with the Commonwealth Funding Agreement.

The Committee met four times during the reporting period.

The Committee's membership is Dr Greg Ayers (Chairs), Adj Prof Tim Moltmann and Kate Vinot, all Board directors. The following are co-opted members:

- **Ricky Archer**, CEO, North Australian Indigenous Land and Sea Management Alliance (until November 2023)
- **Anthony Bradstreet**, Director Strategy and Programs, NSW Rural Fire Service (until April 2024)
- **Mal Cronstedt**, Independent Member
- **Jennie Fluin**, Manager Service Partnerships, Department of Environment and Water, Government of South Australia (until December 2023)
- **Rebecca Quinn**, A/Manager Environmental Science and Research Partnerships (attended January 2024)

- **Rob Webb**, CEO, AFAC
- **Melissa Pexton**, Deputy Commissioner, Strategy and Emergency Management Command, Department of Fire and Emergency Services
- **Hannah Wandel**, First Assistant Coordinator-General of Programs and Policies, National Emergency Management Agency (until April 2023)
- **Raoul Raward**, Director, Nature, Partnerships and International, Strategy and Resilience Policy Branch, National Emergency Management Agency (attended January 2024)
- **Jo Hutchinson**, Director, Natural and Social Systems and Urban Policy, Resilience Policy and Design Branch, National Emergency Management Agency (attended October 2023)
- **Sally Kuschel**, Assistant Coordinator General, Strategy and Resilience Policy Branch, National Emergency Management Agency (attended April 2024)

### Risk, Audit and Compliance Committee

The Risk, Audit and Compliance Committee provides the Centre's Board with assurance of adequate processes in place regarding matters of risk, audit and compliance.

The Committee met four times during the reporting period.

The Committee's membership is Adj Prof Tim Moltmann (Chair), Oliver Costello, Dominique Hogan-Doran SC and Kate Vinot, as Board Directors.

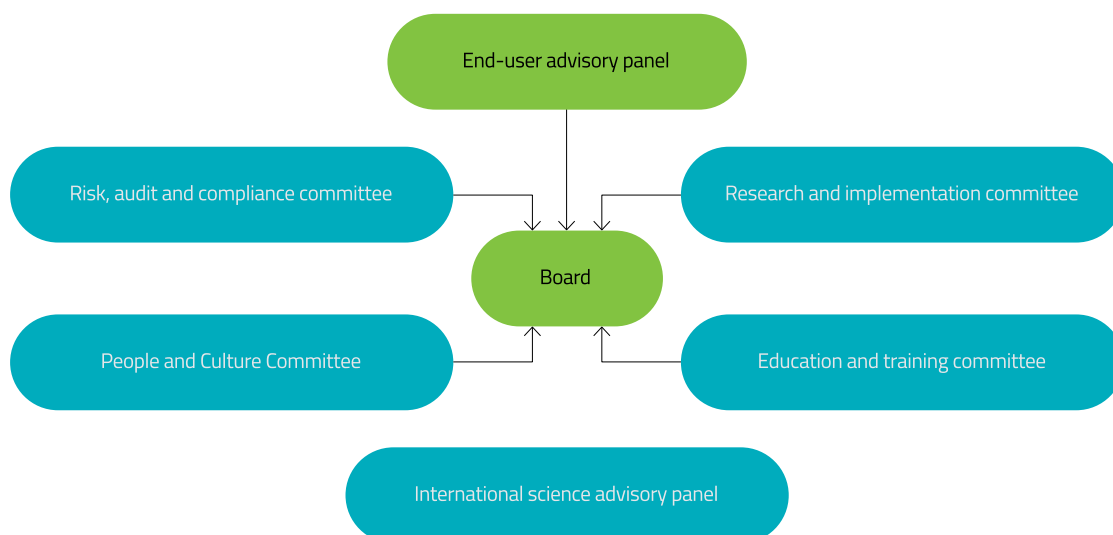


Figure 2: Board committee and panel structure

## Education and Training Committee

The Education and Training Committee provides the Centre Board with advice on strategic directions to support and promote training and education to improve resilience to natural hazards.

The Committee met three times during the reporting period.

The Committee's membership is Sandra Whight (Chair), Oliver Costello and Doug Smith as Board Directors, and the following co-opted members:

- Clare Russell, Director Research Partnerships and Initiatives, RMIT University
- Prof Cheryl Desha, Professor School of Engineering and Built Environment, Griffith University (until June 2024)
- Paul Seager, Asst Commissioner NSW Rural Fire Service
- Bhiamie Williamson, Research Fellow, Monash University

## People and Culture Committee

The People and Culture Committee oversees strategies to manage and enhance the Centre's workforce, including attraction, retention, remuneration and conditions, performance management; development and succession-planning of staff; equity and diversity; workplace relations; staff, health, safety and wellbeing; and organisational culture.

The Committee met five times during the reporting period.

The Committee's membership is Kate Vinot (Chair), Oliver Costello and Sandra Whight.

## International Research Advisory Panel

The International Research Advisory Panel provides the Board, Research and Implementation Committee and Education and Training Committee with strategic advice on the quality and overall development of the Centre's research and education programs.

During the reporting period, the Panel provided feedback on the Centre's *Be Ahead of Ready* report and *Biennial Research Plan 2024–26*. This advice improved research quality by providing an international perspective on research trends and collaboration opportunities, as well as professional and research development opportunities. The International Research Advisory Panel met once during the reporting period.

The Panel comprises representatives from the global research community with expertise relevant to physical, social and political sciences reflecting the Centre's research program. Panel members have knowledge and expertise relevant to natural hazards and disaster risk reduction. The panel comprises:

- Dr Amy Cardinal Christianson, Fire Social Scientist, Northern Forestry Centre (Canada)
- Dr Mark Finney, Research Forester (Rocky Mountain Research Station), USDA Forest Service (US)
- Associate Professor Susanna Jenkins, Earth Observatory of Singapore, Nanyang Technological University (SG)
- Professor Jessica Lamond, University of the West of England (UK)
- Dr Sarah McCaffrey, Research Forester, US Forest Service, Rtd (US)
- Dr Richard Smith, Research Strategy and Science Investment, Earthquake Commission (NZ)
- Professor Thomas Wilson, Chief Science Advisor, National Emergency Management Agency (NZ)

## End-User Advisory Panel

The End-User Advisory Panel provides the Board with strategic advice on the development of research, education and utilisation programs. It is the Centre's primary end-user advisory body.

The Panel met once during the reporting period to receive updates on Centre activities and provide advice on direction. Out of session consultation took place on the development of the *Biennial Research Plan 2024–26*.

The panel is chaired by the Chair of the Board and consists of representatives of all of Centre Participants.

## Centre policies and processes

The Centre holds and manages substantial financial and intellectual resources on behalf of Participants. Strong governance and management processes are in place to ensure confidence in the use of those resources. Throughout the year, the Centre has enhanced its governance and management by developing and reviewing policies, including:

- Annual Leave Policy
- Family and Domestic Violence Leave Policy
- Performance and Development Planning Policy and Procedure
- Public Holiday Substitution Policy
- Information Security Policy
- Acceptable Use of Information Technology Policy
- Workplace Harassment and Bullying Policy
- Conflict-of-Interest Policy
- Policy Management Policy
- Privacy Policy
- Work Health and Safety Policy

The Centre undertook a significant uplift of its information security controls following an in-depth review and subsequent implementation of information security recommendations.



## Measuring Performance

In July 2023, the Board endorsed a performance measurement evaluation framework. Implementation took place throughout the year, focusing on the development of research utilisation case studies and incorporation of key data collection into Centre processes.

The Chief Science Officer co-authored an editorial on research utilisation titled *Real impact: Challenges and opportunities in bridging the gap between research and practice – making a difference in industry, policy and society* in the International Journal of Information Management, published in early 2024.

## Opening of Western Australia node

The Centre's Western Australia (WA) node was officially opened by Department of Fire and Emergency Services Commissioner, Darren Klemm AFSM and Centre CEO, Andrew Gissing in December 2023.

Dr Brendon McAtee was appointed the first WA Node Research Manager, leading research operations in WA and SA. Based in the Department of Fire and Emergency Services (DFES) headquarters in Perth, the Centre's newest node already demonstrates the value of place-based representation in strengthening relationships with Participants and stakeholders, as well as facilitating and supporting local research with national impact.

**Right:** (DFES) Deputy Commissioner Strategy and Emergency Management Melissa Pexton, Fire and Emergency Services Commissioner Darren Klemm AFSM, Andrew Gissing, Brendon McAtee. Credit: DFES WA

## Diversity

The Centre is culturally diverse with research leads, Board members and staff speaking the following languages: Catalan, Chinese, Czech, Dutch, English, Filipino, French, German, Greek, Hindi, Italian, Japanese, Nepali, Persian, Russian and Spanish. See Table 1 below for diversity in gender and geography.

**Table 1:** Gender and diversity

	Research Leads	Board	Staff
<b>Gender</b>			
Male	16	5	7
Female	26	3	13
<b>Aboriginal or Torres Strait Islander</b>			
	3	1	0
<b>Geographic – residential</b>			
Victoria	22	2	9
New South Wales	8	2	5
Queensland	3	1	5
Tasmania	2	2	
South Australia	2		
Northern Territory	1		
Australian Capital Territory	1		
Western Australia			1



# Partnerships

## Participants

The Centre is an aggregator and enabler of research capabilities, insights and projects, delivering the maximum value to Participants as a priority, with broader benefits to other stakeholders. As a collaborative, end-user-driven research centre, the focus is addressing real-world problems and the delivery of usable knowledge through products and networks that address these problems.

Research projects are co-designed by the Centre and Participants to that deliver value and meaningful outcomes for the sectors and stakeholders they represent. To do this strategically, the Centre draws on the science and expertise of its significant and growing knowledge network.

Working in the broad emergency management and disaster resilience sector, the Centre's Participants are drawn from all states and territories, federal, state and local governments, key industry bodies, private and not-for-profit sectors and other organisations with a stake in protecting Australian communities. This network is growing, with collaborative relationships continuing to be fostered with key partners and stakeholders nationally and internationally, including organisations representing interests in planning, health, insurance and infrastructure.

32 formal Participants were engaged with the Centre during this reporting period. In this 12-month period, Participant agreements were signed with:

- Department of Fire and Emergency Services, Western Australia (also on behalf of Landgate and the Department of Biodiversity, Conservation and Attractions)
- Northern Territory Police, Fire and Emergency Services (on behalf of the Northern Territory Government)
- Fire Rescue Victoria
- Emergency Management Victoria

A memorandum of understanding was signed with the Victorian Inspector-General Emergency Management.

Participants as at 30 June 2024 are shown in Figure 3.



Figure 3: Signed Participants as of 30 June 2024



The Centre cultivates and supports relationships with many stakeholders in addition to formal Participants, either at a whole-of-Centre level or individual projects or activities level. In the last year, the Centre and project teams collaborated with:

- Australian Research Data Commons
- Bush Heritage
- Queensland Reconstruction Authority
- Queensland Department of Energy and Public Works
- Queensland Department of Housing, Local Government and Planning and Public Works (DHLGPPW)
- Local Government Association of Queensland
- Queensland Inspector-General Emergency Management
- Carpentaria Land Council Aboriginal Corporation
- Powerlink Queensland
- NSW Bushfire and Natural Hazards Centre
- Emergency Recovery Victoria
- Department of the Premier and Cabinet, South Australia
- Environment Protection Authority Victoria
- Department of Health, Victoria (via Pheonix Australia)
- Department of Education, Victoria
- Suncorp Insurance
- Western Sydney Regional Organisation of Councils
- Queensland Police Service
- Floodplain Management Australia
- Dja Dja Wurrung Clans Aboriginal Corporation
- Gunaikurnai Land and Waters Aboriginal Corporation
- East Gippsland Shire

- Mid Murray Council
- Moreton Bay Regional Council
- City of Gold Coast
- Taungurung Land & Waters Council
- Tumut Aboriginal Land Council
- Victoria Inspector-General Emergency Management
- North Australia Indigenous Land and Sea Management Alliance
- Yarra Valley Water
- Burrandies Aboriginal Corporation and Southeast Aboriginal Focus Group
- Australian Reinsurance Pool Corporation
- Emergency Services Foundation
- Sustainable Timbers Tasmania
- City of Hobart
- Forest Practice Authority
- NT St Johns Ambulance
- SA Limestone Coast Landscape Board;
- Shoalhaven City Council;
- South East Queensland Water (Seqwater);
- Unitywater;
- Livingstone Shire Council;
- NZ Fire and Emergency;
- Air services Australia;
- National Emergency Management Agency

Over the last year, the Centre continued its focus on engaging with representatives of Australian Government departments and agencies. This included engagement with:

- NEMA
- National Resilience Taskforce
- Department of Climate Change, Energy, the Environment and Water
- Australian Climate Service
- Australian Reinsurance Pool Corporation
- Australian Building Codes Board
- Commonwealth Science and Industrial Research Organisation (CSIRO)
- Bureau of Meteorology (the Bureau)
- Geoscience Australia (GA)
- Department of Defence
- Department of Industry, Science and Resources

The Centre continues to regularly engage with representatives from the insurance, local government, police, philanthropic sectors and others to ascertain their knowledge needs and discuss possible collaboration opportunities.

In addition, the Centre's research program delivers tangible outcomes and outputs gaining interest with new sectors, informing the Centre's broader engagement activities focus and participation opportunities.

**Table 2:** Participant and end-user contributions

<b>Contributions</b>	<b>2021–22</b>	<b>2022–23</b>	<b>2023–24</b>
Cash	\$2,573,700	\$2,693,694	\$4,012,976
In-kind	\$1,665,000	\$2,331,000	\$2,938,000

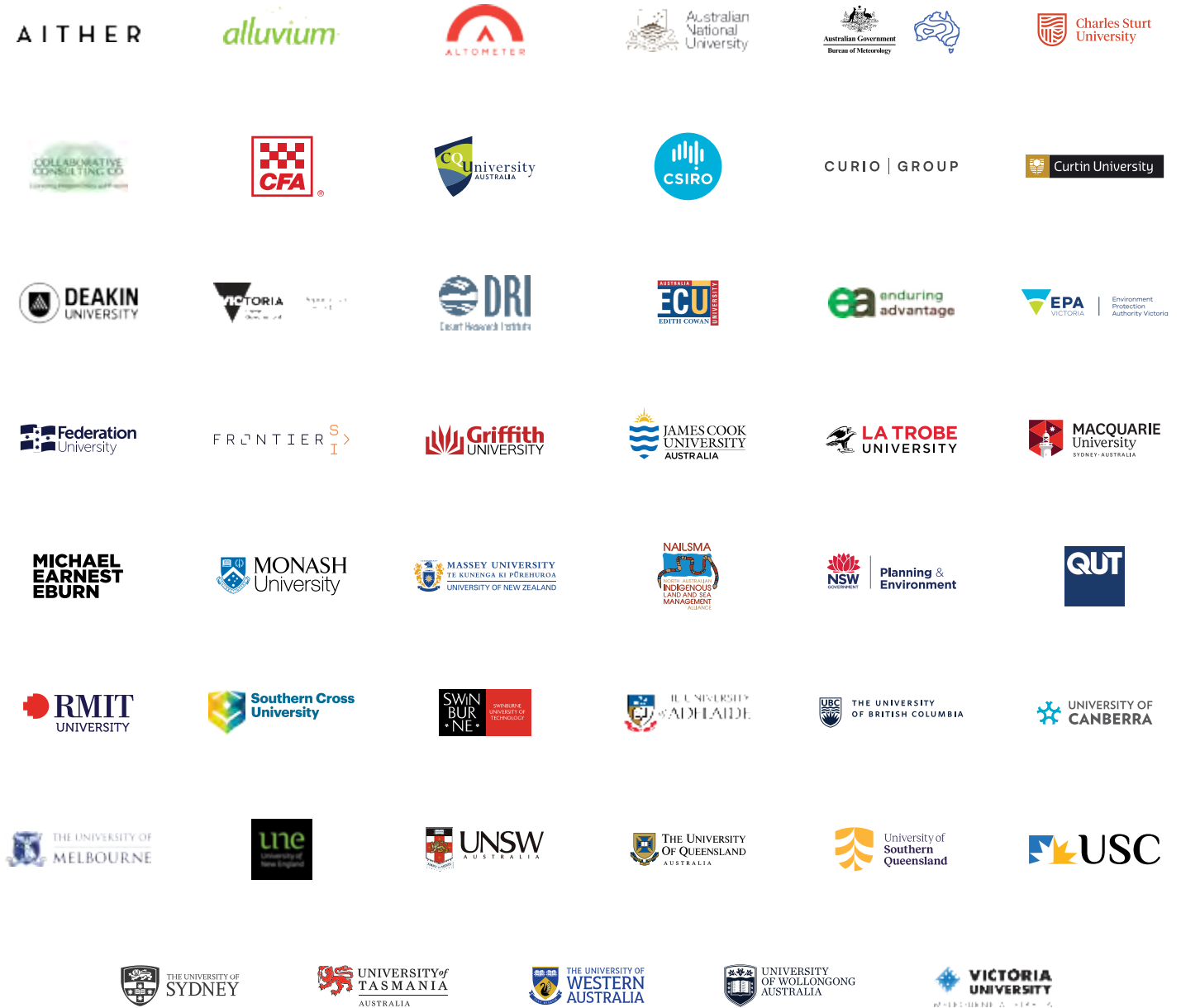
# Research providers

Research providers play a critical role in the Centre’s delivery of quality research. 47 research providers make up the Centre’s network include tertiary institutes and consulting bodies across many jurisdictions, as well as state and federal government agencies that provide research.

**Table 3:** Estimated contracted research provider in-kind commitment

	2021–22	2022–23	2023–24
In-kind total	\$81,000	\$556,000	\$2,422,000

**Figure 4:** Research Providers as at 30 June 2024.





# International Engagement

In addition to the International Research Advisory Panel, the Centre continues to share knowledge and experience through international collaborations and exchanges.

The Centre is a partner in FirEUrisk. FirEUrisk is a European collaboration between 38 international partners to drive multi-perspective strategy enhancing understanding of extreme wildfires.

In the past 12 months, the Centre undertook knowledge exchange projects with:

- *Resilience to Nature's Challenges*, National Science Challenge (New Zealand)
- FP Innovations (Canada)
- UK Environment Agency (United Kingdom)
- International Association of Wildland Fire (International)

Prof Gavin Smith, North Carolina State University (US), as a guest of the Centre, provided keynote presentations at the Centre's assisted relocation roundtable with Suncorp and the Floodplain Management Australia Conference 2024. Professor Smith also presented to the NSW Reconstruction Authority, Queensland Reconstruction Authority, Queensland Department of Energy and Public Works, and the launch of Resilient Sydney.

He also facilitated a workshop for state and local government representatives at the Floodplain Management Australia Conference 2024.

As co-hosts with the International Association of Wildland Fire, the Centre supported international fire science through the 7th International Fire Behaviour and Fuels Conference in April. Held concurrently across Boise (US) and Tralee (Ireland), the Canberra conference included more than 100 presentations over three days.

Dr Sally Potter, GNS Science (New Zealand) was funded by the Centre to deliver a keynote presentation about personalised warnings at the Centre's Natural Hazards Research Forum 2024, where she also addressed industry leaders during an executive breakfast event.

In November 2023, the Centre hosted a webinar on culturally appropriate research practices. The event included Canadian perspectives and research from Dr Amy Cardinal Christianson, Parks Canada and Alex Zahara, Canadian Forest Service.

At the project level, international collaborations included:

- Participation in the Understanding Risk global Forum, Himeji, Hyogo, Japan. *Project – Integrated solutions for bushfire-adaptive homes*

→ UK agencies supporting and promoting the *Enhanced decision-making in emergency management* project:

- National Fire Chiefs Council (NFCC)
- Association of Ambulance Chief Executives (AACE)
- UK National Police Chiefs Council (NPCC)

→ Engagement with Fire and Emergency New Zealand (FENZ), New Zealand (NZ) Police, the Department of Conservation (DOC) and NZ Ambulance about potential participation in the project. *Project – Enhanced decision-making in emergency management.*

→ Hosted Prof Alexandra Syphard; Senior research Ecologist at the Conservation Biology Institute (Oregon, US) *Project – Bushfire risk at the rural-urban interface*

→ Research presentation from Prof Sean Wilkinson, University of Newcastle (UON) at the University of Queensland (UQ) to research team and broader disaster research community at UQ. *Project – Modelling impacts of natural hazards on interconnected infrastructure networks*

→ PhD student exchange visit UQ/ Louisiana Tech. PhD student Katya Opal from Louisiana Tech visited UQ for two months, undertaking a literature review on models for infrastructure vulnerability to flood. *Project – Modelling impacts of natural hazards on interconnected infrastructure networks*

→ Connection with European Centre for Medium-Range Weather Forecasts (ECMWF) long range flood forecasting team to collaborate and exchange information. *Project – Long range flood outlook for strategic preparedness*

→ Workshop with Heather Simpson, Canadian Interagency Forest Fire Centre (CIFFC) and Melanie Wheatley, Ontario Ministry of Forestry and Natural Resources at CSIRO in Canberra in March. *Project – Why Fly? How do we know that aerial firefighting operations are effective and efficient*

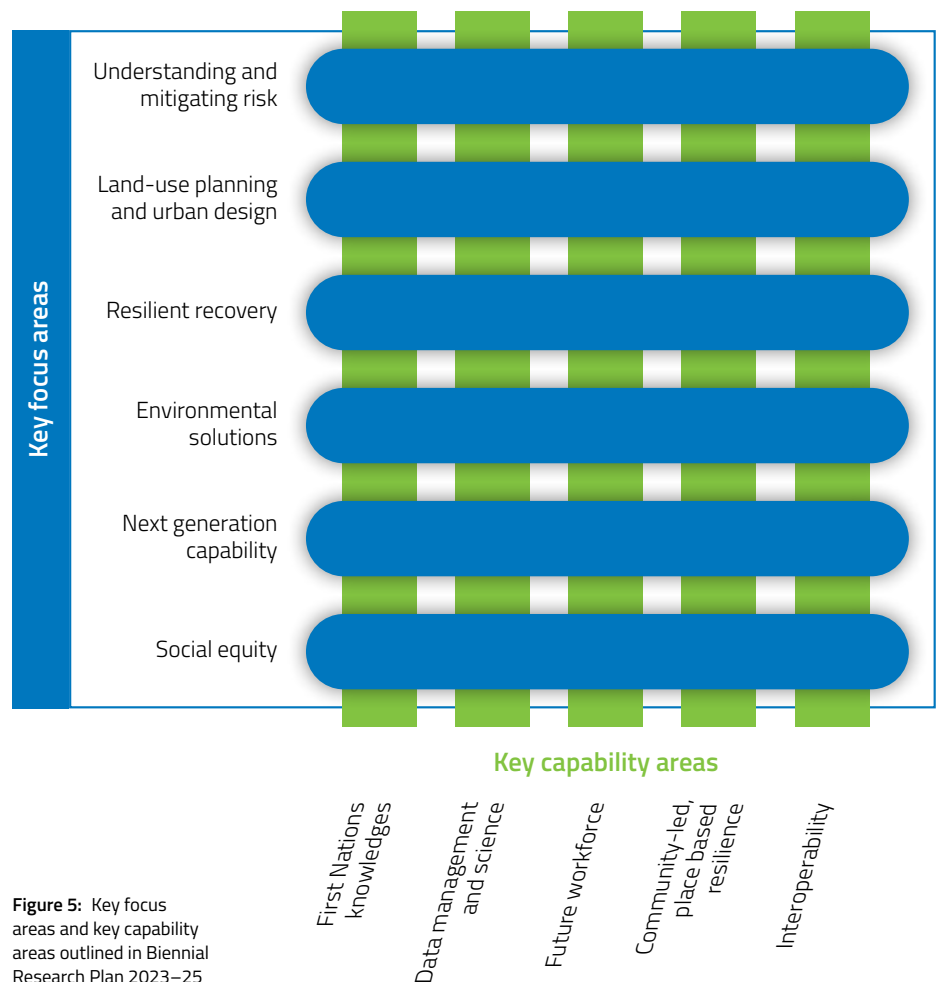


Above: The International Fire Behaviour and Fuels conference in Canberra, included more than 100 science presentations.

# Research and implementation

The Centre continues to develop a research program that ensures it will meet its vision and mission. As the research program continues to mature, strategic and targeted efforts ensure outputs are useful, useable and used, with the Centre's research focus and capability providing a broad framework for implementation:

The Centre continues to engage with Participants to ensure its research program provides maximum relevance and value and is driven by the needs of government, emergency services, industry and the community.



**Figure 5:** Key focus areas and key capability areas outlined in Biennial Research Plan 2023–25



## A portfolio of projects

Managed as a portfolio, the Centre's research is developed and managed through strong engagement with Participants, guidance from research organisations and internal leadership. The Centre's Board and Research and Implementation Committee regularly review the research portfolio of 67 core projects, listed in Attachment 2.. These projects are at various stages in their life cycle, with some recently completed and now commencing utilisation. To date, eight projects are completed with a further 10 expected to be completed within the next 12 months.

## Project governance

Research projects are managed by the Centre's research team via formal governance structures and systems. All projects have:

- an agreed and documented project plan and contract
- identified research and end-user project leaders
- clear end-user expectations and performance measures
- a timeline that includes performance review stage-gates
- a project management group
- linked to a Translation and Implementation panel
- regular reporting obligations
- been regularly reviewed by the Research and Implementation Committee

Ultimately, the aim of these structures ensures research is undertaken collaboratively and meets the desired outcomes of Participants and end-users.

## Development of new projects

User-driven investment rounds are open to Participants and Board-approved end-users. Research ideas are submitted, evaluated using a published set of criteria and endorsed by the Research and Implementation Committee, before being endorsed by the Centre's Board.

Once approved, researchers are onboarded consistent with Centre policies and a collaborative co-design inception process takes place, including the development of a project plan endorsed by a governing project management committee consisting of end-user, researcher and Centre representatives.

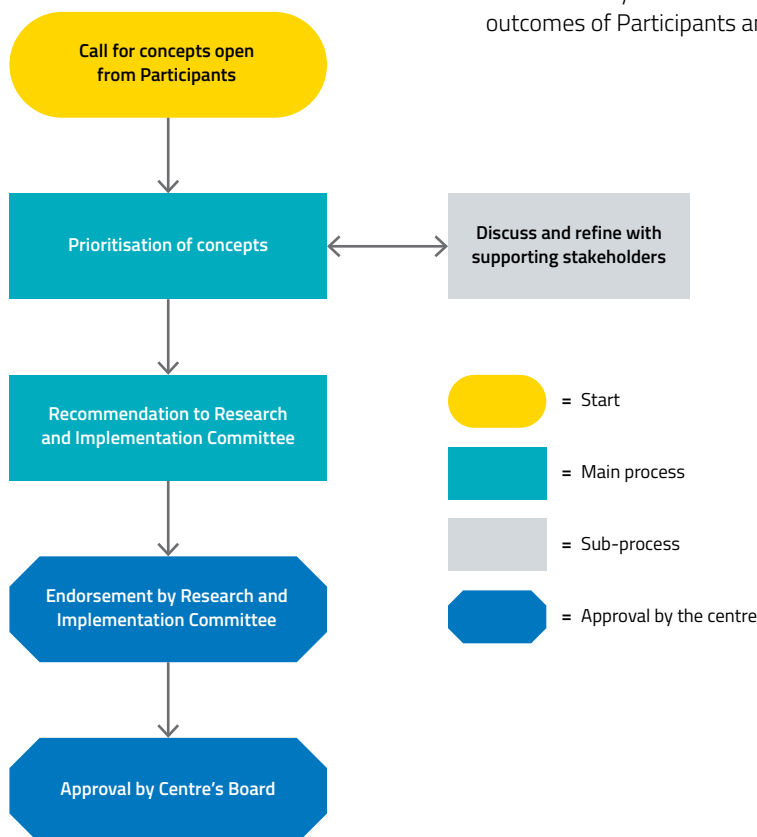


Figure 6: Project proposal process

# Showcase projects

The Centre successfully delivered several projects in 2023–24 and is near completion of others. A full list of current research projects is in Attachment 2.

## Predictions in public

The way community members with experience of bushfires understood, used, and took action in response to existing bushfire maps was investigated so that future maps can be better understood and utilised by members of the public.

With the support and guidance of sector partners, this project is developing evidence-based principles that will inform a nationally consistent approach to the future design and communication of predictive bushfire and incident maps during future emergencies.

The *Predictions in Public: Understanding the design, communication and dissemination of predictive maps to the public* (*Predictions in Public*) project aims to develop a clearer understanding of the role of fire predictions in agency communications with the public during an emergency. The project design was created through discussions and support from the AFAC Predictive Services Group and the AFAC Warnings Group.

The first phase of the project was completed in 2023 by a research team including representatives from the Victorian CFA, and the universities of Deakin, Swinburne, RMIT and QUT. The first phase focused on understanding current levels of comprehension and use of maps for public information and warnings. This included a survey of 3,007 fire-affected residents around Australia to understand how they used, comprehended, perceived and acted on maps, including fire spread prediction maps. 95 in-depth interviews were carried out in West Gippsland, Victoria; the Huon Valley, Tasmania; the southern ACT; and the Snowy Monaro, NSW.

Through the stories and experiences of these residents, *Predictions in Public* provides critical insight into future bushfire map design that will benefit agencies and communities around Australia. In conjunction with other parts of the project these findings will inform the development of design concepts for fire spread prediction maps that will be tested and refined in subsequent *Predictions in Public* phases.

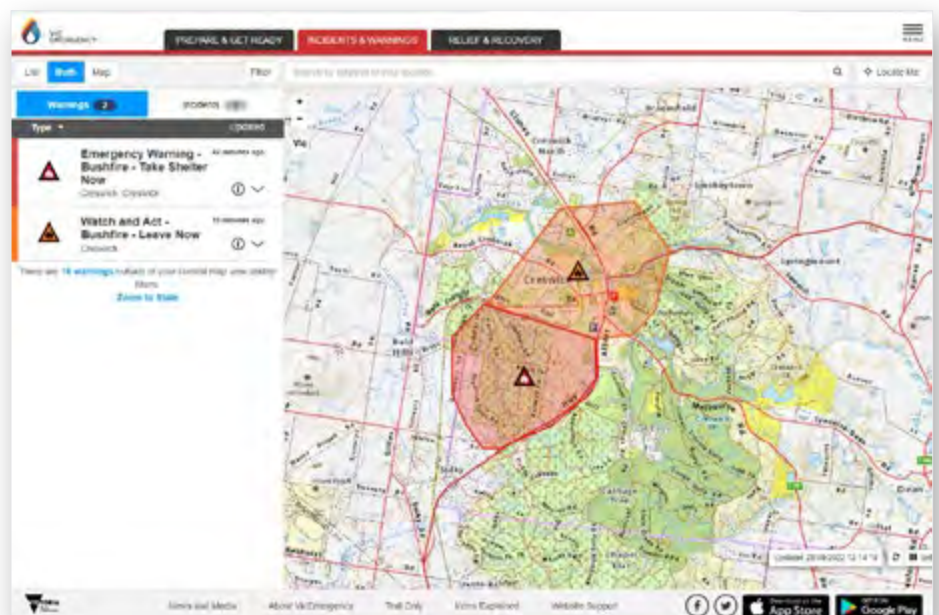
Participant suggestions about ways fire spread prediction maps could more effectively communicate risk and uncertainty will be tested in Phase 2 of *Predictions in Public* via laboratory experiments, surveys and focus groups.

The involvement of the project steering committee in the development of fire prediction maps, their support in defining the scope of the research and interpreting the results has ensured the project's findings are useful, usable and used.

*The Predictions in Public project has provided an opportunity for representatives from across the Australian emergency management sector to come together and discuss, reflect, and collaborate on a topic that is relevant to current and future agency practice. [...] The research can inform both our current practice [...] and the future use of predictive products [...] agencies can share their experiences and knowledge to inform the research as well as assist in the development of outputs that can support nationally consistent approach and use of predictive products in the future.*

**Don MacCorquodale**, Project Officer, Fire Management Information Architecture, Bushfires NT, Department of Environment, Parks and Water Security, Northern Territory Government

Right: A mocked up incident map shown to Victorian interview participants





## Evaluating the Resilient Homes Fund

Co-funded by the Centre and the Queensland Reconstruction Authority, this project evaluates the success factors of, and lessons learnt from Queensland's Resilient Homes Fund (RHF) by addressing the physical, financial, social and emotional dimensions of resilience through the assessment of the fund's buy-back, retrofit and house-raising measures.

The RHF's measures not only aim to reduce the physical and financial costs to community members affected by flood, but the social and emotional impacts. The fund's programs, the Resilient Retrofit program, the Home Raising program and the Voluntary Home Buy-Back program provide Queenslanders whose homes are damaged by floods, with access to grants to raise, retrofit or have their home voluntarily acquired. The RHF is being implemented across 39 Local Government Areas (LGAs) impacted by the 2021–22 Queensland floods.

Through engagement with stakeholders across the diverse population of affected LGAs, the University of Queensland (UQ) team will:

- review previous Australian and international reconstruction and relocation programs
- evaluate the relationship between the RHF and the four dimensions of resilience for individuals and communities
- compare reconstruction processes funded by solely by insurance claims or the RHF, and a combination of funding provider
- evaluate the likely future flood insurability of reconstructed and retrofitted homes;
- evaluate the RHF program performance against its objectives within the context of recovering communities
- provide practitioner-focused guidelines for implementation of other resilient reconstruction and relocation programs in Australia

The project was recently extended to evaluate the accompanying RHF Industry and Community Education Program and the Property Level Flood Information Portals Program.

This research will provide actionable findings that improve the responsiveness and efficacy of recovery activities and ultimately enhance the resilience of communities.

*This project is an in-depth review of the Resilient Homes Fund, enabling QRA to work with the research team to consider what we need to both monitor and evaluate the effectiveness of the program, and shape future programs of its kind. We are committed to ensuring that the investment is making a difference where it counts – reducing risk and building resilience in our Communities.*

**Vina Varsani**, Queensland Reconstruction Authority



## Sector engagement to enhance severe weather impact predictions

*Sector partner engagement to enhance severe weather impact predictions* set out to explore the potential utility of exposure and impact forecasting for severe weather, specifically severe thunderstorms and large-scale winds. The project sought to understand the exposure and impact information that emergency management sector partners require to better support their decision making in preparing for and responding to severe weather to mitigate the impact for communities.

Alongside the Centre, Collaborative Consulting Co, the Bureau and GA engaged with emergency management sector partners to understand the sector's needs for advancing severe weather impact forecasting capabilities.

Throughout this project, many sector partners indicated that as exposure and impact forecasting is still a new concept, they are yet to fully turn their minds to impact forecasting information to support decision making during severe thunderstorms and large-scale wind events. However, the sector indicated significant interest and appetite to better understand exposure and impact-based forecasting generally and how it can be used to better support decision making across all hazards.

Insights from sector partners informed a report that will help steer further research projects that will be of most benefit for emergency response agencies, acknowledging there is strong interest in exposure and impact forecasting from a wide range of sector partners and industry stakeholders. The research formed the basis of a submission by the Centre to the Queensland Inspector-General Emergency Management's 2023–24 Severe Weather Season Review and has been presented to AFAC collaboration groups.

*This research not only enhances our ability to make informed decisions regarding operational response but also aids in effectively planning for relief and recovery efforts in the face of severe weather events. The collaboration between AFAC Flood and Severe Weather Intelligence Services Technical Group and the research team enabled access to various views and requirements across all jurisdictions.*

*This project facilitated improved coordination and consultation between response agencies and the Bureau. I commend the team's efforts in enhancing communication between stakeholders in the emergency management sector. This collaborative effort has undoubtedly strengthened our ability to mitigate the impact of severe weather events on our communities.*

**Steve Muncaster**, Victorian Head Office, Victorian State Emergency Service (VICSES)

## Community risk assessment

Collaborative research between the NSW State Emergency Service (SES) and the University of Sydney (USyd) aimed to improve the understanding of risk assessment by better consideration of the social and physical factors driving disaster vulnerability in local communities.

NSW SES will use the research insights into community risk assessments to get the right resources in the right place at the right time to support the right people to make the right decisions.

The main outcome improves the knowledge base of community risk assessment approaches, while the involvement of stakeholders through New South Wales State Emergency Service (NSW SES) ensures the context of community risk assessment and the democratisation of community risk assessment.

NSW SES now uses the research to enhance their community risk assessment approach, while informing the implementation of its capability development framework. This includes defining a SES Unit classification matrix and capability targets, ultimately aiming to ensure resources are best allocated within a community.

At a project workshop this year, SES NSW attendees examined opportunities to implement the research findings into agency culture, emergency planning, community strategy, systems and resourcing.

*Being involved all the way along meant that the direction and learnings were able to be used to adjust what we were delivering. We got what we needed rather than what we thought we might want at the start of the process. We were able to mould the work as we went along so that we were getting what we needed out of it.*

**Sara Morgan**, NSW SES

## Principles of best practice strategic crisis management arrangements for catastrophic disasters

Australia is continually challenged by the threat of natural hazards. Leaders are constantly required to maintain public confidence in the context of uncertain crises. While the impacts of natural hazards are generally well managed, there is always the inevitability that the impacts will at some time exceed current capacity and thinking, with a catastrophic outcome.

A catastrophic disaster overwhelms current systems, resources, and governance, extending beyond regular emergency management capabilities and significantly impacts communities.

Tasked by NEMA, the Centre identified key principles for best practice strategic crisis management arrangements for catastrophic disasters. The literature review and the 10 resulting key principles assist in building practitioners and policy makers' knowledge, understanding and adoption of evidence-based crisis management arrangements in the face of increasing numbers of catastrophic disasters.

The research has assisted in building the knowledge and understanding of practitioners and policy makers and was recently presented by NEMA at a national crisis management exercise.

## Cultural land management research and governance in south-east Australia

Building on the previous Centre funded *Cultural Land Management* project under the 2019–2020 Black Summer research program, *Cultural land management research and governance in south-east Australia* enhances existing partnerships and relationships between Indigenous land management organisations, Traditional Owner groups and university-based researchers to create opportunities for new or future partnerships between these groups.

The project asks and answers two questions: 1) What are the existing and potential points within land management governance structures for Indigenous voice and representation to be included equitably and effectively? and 2) What are appropriate research principles, protocols, and processes capable of guiding more ethical and collaborative cultural land management research in the future?

The project team includes researchers and representatives from Deakin University, Jagun Alliance, Monash University, University of Melbourne (UoM), University of Wollongong (UOW), and the Department of Planning and Environment, NSW.

Due for completion this year, the project is guided by a project steering group and has completed interviews and workshops with a range of groups involved in cultural land management to learn more about how to support collaborative relationships.

The project developed *Principles and protocols for cultural land management governance* and the companion guide, *Using cultural land management principles and protocols*. Additional pathways for translating and sharing the learnings from this project are currently in development with key stakeholders.





## Community-led recovery: evidence, dimensions and supports for Community Recovery Committees

This completed project was co-funded by the Centre and Emergency Management Victoria and carried out by the UoM built on a previous project under the Centre's 2019–2020 Black Summer research program to:

- determine what Community Recovery Committee (CRC) members consider a recovery group to be in terms of the group's objectives, make-up, social position, relationships and mission
- test and validate a self-assessment tool for CRCs
- investigate the representativeness of CRCs by looking at their social networks within the community

The project produced and tested two prototype tools for use by community groups, local governments and emergency management agencies and included case studies from four disaster-affected communities and surveys of disaster recovery workers.

Key findings include:

- **Participants found the self-assessment tool and the community network mapping tool helpful.** Proof of concept was established that these tools can support community-led recovery and should be refined to be accessible to any community to use.
- **No silver bullet exists for effective models of CRCs,** as the context of communities before and after disasters varies too widely.
- **Very little consistency across important issues identified by groups,** highlighting how crucial access to flexible support that incorporates individual communities' context is for communities.
- **Government action and inaction in disaster affected communities influences how CRCs define themselves,** including how their role, scope and obligations are perceived.
- **Representativeness differs between CRCs.** Some CRCs saw their main function as being a voice for their community, while others didn't see themselves as fulfilling this role.
- **Deeper understanding of CRCs may expand understanding of collective action theory.** CRC members take on a high workload during an incredibly stressful time, however may also be able to action change in their community more swiftly than in times of non-disaster.

The Centre and UoM are now engaging with stakeholders to develop a pathway to further develop and implement these tools for national use.

*This project informs how we can define CRC functions and its role in community recovery operations. It does this by exploring similarities and differences in CRC definitions in various contexts. We acknowledge there is no single formula for community-led recovery there are many contributors and unique contexts that feed into CRC development. The project sees the development of a CRC self-assessment tool that can enable identification of network gaps and missing community members by utilising features that illustrate CRC representativeness and social network mapping.*

**Melinda Nicholls**, Manager of Research and Evaluation, Emergency Recovery Victoria

*Moving forward we understand that the rigid chain of command is going to have a very difficult time in connecting with the very nebulous, jellylike structure that is community, we are hoping to address that structural part using this tool so that we can create a strong nexus point.*

**Melanie Bloor**, Resilient Uki

## Bushfire risk at the rural-urban interface

Rural–urban interfaces are areas of high-risk exposure to fire. This collaboration between the Centre and the University of Tasmania (UTAS) explores the changing characteristics of vegetation in disturbed areas in the rural–urban interface, improving understanding of extreme fire behaviours in fragmented interface fuels (patch and corridor).

The project will develop decision-support tools to estimate risk of fire disaster and house loss, evaluate the effectiveness and social acceptability of interventions to reduce bushfire risk at landscape to garden-scale, identify barriers to diverse community groups who want to use fire to manage fuels and develop and test educational materials designed to drive individual and community bushfire adaptation.

The project continues to generate considerable interest and has presented to Queensland’s Disaster Management Officer’s Network and the Western Australian Interagency Bushfire Operations Committee research group.

*Professor Bowman’s presentation on the Bushfire risk at the rural-urban interface project was really relevant to Western Australia. We have been investigating the bushfire risk profile, and trying to quantify changes in bushfire behaviour, at the rural urban interface. It’s hoped that these novel approaches being developed in Tasmania can be applied to our own bushfire risk management challenges to inform better policy decision within WA.*

**Chris Dunne**, Policy Manager, Office of Bushfire Risk Management WA

## Enhanced decision making in emergency management

Effective decision making is a critical part of emergency management, however, the very nature of emergency management makes this difficult. *Enhanced decision making in emergency management*, a partnership between the Centre and Central Queensland University (CQU) enhances Australian emergency management decision making training with a set of a prototype training and learning products that support decision makers operating in a variety of decision-making environments.

The skills acquisition framework produced will assist organisations, teams and individuals to better understand decision making and how to best train professionals in this discipline. The products are based on an analysis of the current practice and future requirements of emergency management decision makers.

*Enhanced decision making in emergency management* adopts a human centred design approach by working closely with end-users, emphasising close collaboration to design tools and identify challenges and opportunities.

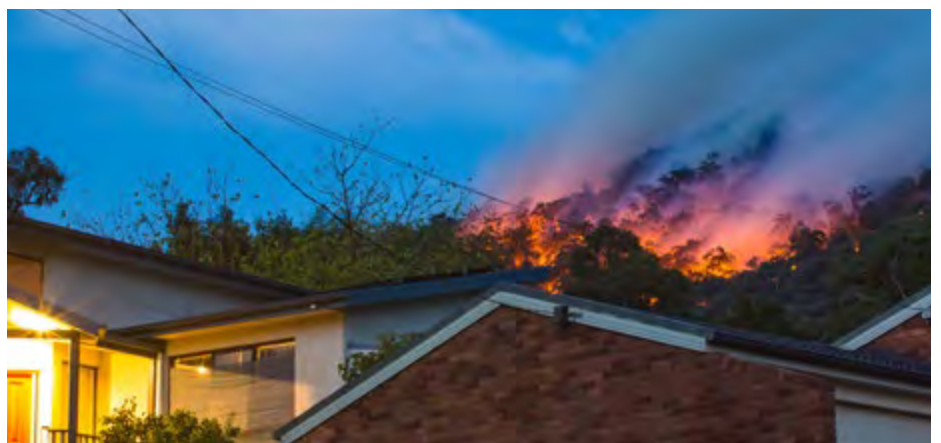
Engagement and support for the project is widespread, with international bodies providing input and collaboration. The project is supported by the UK National Fire Chiefs Council, Association of Ambulance Chief Executives and the UK National Police Chiefs Council, while participation discussions are ongoing with FENZ, NZ Police, DOC and NZ Ambulance.

Project objectives include:

- The development of a sound understanding of current practice and future needs of decision making based on literature reviews, surveys and interviews.
- The development and evaluation of a set of training and learning products that support the needs of decision makers operating in a variety of decision-making environments.
- The development of a skills acquisition framework to assist organisations, teams and individuals to better understand decision making and how it needs to be trained.

Data has been collected in Australia (154 survey participants, 40 interviews), the UK (66 survey participants, 30 interviews) and NZ (one survey participant, one interview).

Data analysis shows that people use a combination of recognitional (intuitive) and structured analytical (deliberative) decision-making processes. While some participants clearly have some level of insight into their decision-making processes most reported not understanding the strengths and limitations of the different types of decision-making processes. Just over a third of participants used cognitive aids and tools to help make decisions, while a third regularly used decision-making tools or procedures not officially sanctioned by their organisation.



## Commissioned Research Program

In conjunction with its core research program, the Centre operates a commissioned research program providing organisations the opportunity to work with the Centre to develop and produce research or research-informed activities that fulfill a bespoke business need. In the last year, the Centre undertook commissioned research for Powerlink Queensland.

In addition to these ad hoc commissioned projects, the Centre continues to coordinate multimillion dollar commissioned research portfolios for DEECA and the CFA in Victoria. The Centre provides end-to-end support, including research development, coordination and delivery of outputs in partnership with a range of research providers.

15 active projects were undertaken for DEECA during the last year covering ecosystem resilience, native wildlife management, smoke exposure modelling, climate change and planned burn outcomes tracking

Six active projects were undertaken for CFA during this period, focusing on bushfire risk reduction effectiveness, roadside burning, upper atmosphere influence on fire behaviours, tanker design and community engagement in vegetation management.

**Table 4:** Research Outputs

<b>Academic publications</b>	<b>Total 2023–24</b>
New technologies	10
Published journal articles	35
Book chapters	1
Conference presentations	52
Media mentions (includes newspaper articles, radio interviews, etc)	215
Other (includes project reports)	62



# Case studies of research utilisation

## KEEPING RESPONDERS SAFE

The national *SES Fit for Task* program was launched by AFAC and State Emergency Service (SES) agencies at the AFAC23 conference in Brisbane in August. The program provides a single approach to ensuring SES staff and volunteers have and maintain the physical fitness needed to operate safely as first responders.

Based solely on Centre research findings and jointly funded by the Australian Council of State Emergency Services, the project was undertaken by Human Performance Science in partnership with SES agencies and AFAC.

*Fit for Task* is backed by more than a decade of research measuring the minimum physical fitness required by SES members to do their job safely and effectively. The program promotes the safety, health and wellbeing of SES members across Australia, reduces the risk of injury while performing required tasks and builds a culture of wellbeing and safety of SES members. The program also ensures SES members' ability to safely assist when deployed to support other states and territories during major emergencies.

Nine activities replicating key operational tasks members carry out were assessed, including the effort level and minimum physical fitness level required and typical environments in which SES members operate.

Since launching in August, implementation of *Fit for Task* has rolled out nationally. Pilot trials are underway in Victoria, Northern Territory (NT), Australian Capital Territory (ACT), Queensland, South Australia (SA), New South Wales (NSW) and Tasmania, with stakeholder consultations in Western Australia (WA). The program and research that informed its development were featured in the *SES Community Matters* magazine and *Asia Pacific Fire* magazine. The Fit for Task Implementation Group, endorsed by AFAC's national SES Operations Group, was established to ensure the implementation rollout contains a robust governance framework.

*Turning research into action isn't easy. Every SES agency's active involvement in the research and its practical application demonstrates our collective belief and commitment to the program, as well as a strong dedication to delivering health and safety benefits to our members across the country.*

**Tim Wiebusch**, Chief Officer, Victoria SES



Photo: AFAC



Current procedures are overly manual, so the automation of this process ensures the capture and dissemination of real-time data during tropical cyclone events is more robust, reliable, and timely.

*We want to understand the impacts on property damage and insurance losses, so it is really valuable for us to have those observations in and among the community to understand what the wind speeds actually were at those particular occasions and use it to validate it against the simulated data that we rely on for our overall loss estimates.*

**Francesca Kirby**, Pricing Manager, Australian Reinsurance Pool Corporation



Photo: Cyclone Testing Station

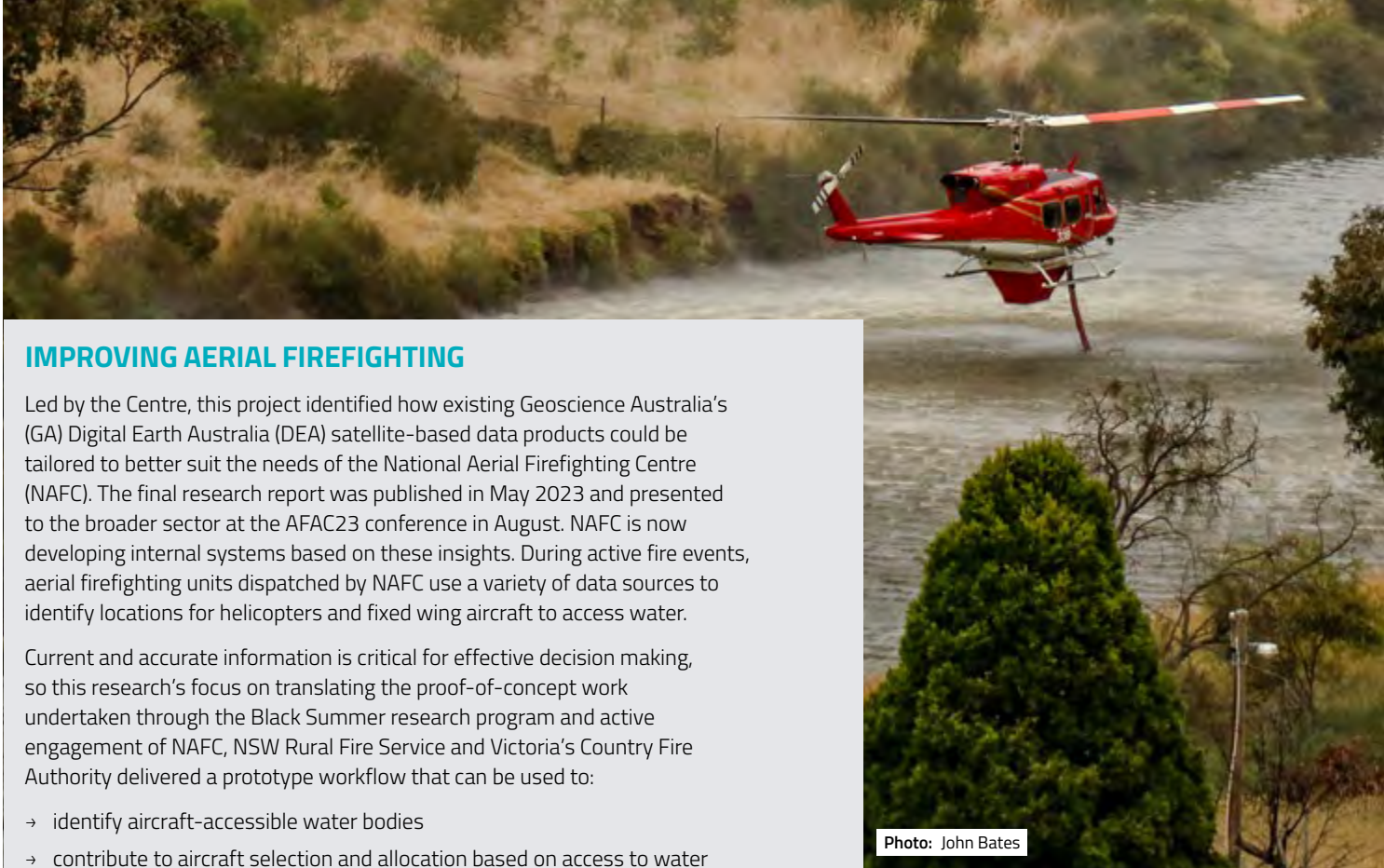


Photo: John Bates

## IMPROVING AERIAL FIREFIGHTING

Led by the Centre, this project identified how existing Geoscience Australia's (GA) Digital Earth Australia (DEA) satellite-based data products could be tailored to better suit the needs of the National Aerial Firefighting Centre (NAFC). The final research report was published in May 2023 and presented to the broader sector at the AFAC23 conference in August. NAFC is now developing internal systems based on these insights. During active fire events, aerial firefighting units dispatched by NAFC use a variety of data sources to identify locations for helicopters and fixed wing aircraft to access water.

Current and accurate information is critical for effective decision making, so this research's focus on translating the proof-of-concept work undertaken through the Black Summer research program and active engagement of NAFC, NSW Rural Fire Service and Victoria's Country Fire Authority delivered a prototype workflow that can be used to:

- identify aircraft-accessible water bodies
- contribute to aircraft selection and allocation based on access to water
- contribute to efficient use of aircraft
- provide advice to air desks, air bases and air crews to assist in their situational awareness and decision-making

The project identified additional attributes that add value to the existing DEA Waterbodies product for users in the emergency management sector. A workshop targeting these users provided insight into how current waterbody datasets are used and the additional waterbody attributes needed. Subsequently, a localised prototype workflow was developed and implemented that better identified several waterbody properties (such as the surface area of water in the waterbody and the most recent date that water was observed) to assist in the placement of aircraft during future fire seasons.

*The earlier version of DEA Waterbodies did not necessarily contain the information agencies are seeking when trying to understand where water might be in the environment. The new product includes information that helps to understand the data currency, as well as the potential extent of the waterbody.*

**Sandra Whight**, Executive Director National Capability, AFAC

*As part of a collaborative project between AFAC, Natural Hazards Research Australia and FrontierSI, we learned that emergency managers wanted clearer and more reliable information about our satellite data on water to make it more useful in pre-season and pre-flight planning.*

*We improved our data to clarify when the satellites had last seen water, and when the last satellite passed over the waterbody, as well as to provide an estimated wet surface area of each waterbody from the most recent satellite observation. These updates will help support aerial firefighters in understanding the currency and distribution of surface water across Australia when planning emergency responses.*

**Bex Dunn**, project lead and Earth Observation scientist



## FLOOD RESEARCH INFORMS LESSONS

The Centre completed a major research report into the 2022 eastern Australia floods, exploring community experiences before, during and after flooding. Since its completion in 2023, substantial investment in a series of activities to translate this research into practice was undertaken by the Centre to aid its use and implementation by end-users.

A survey of 50 end-users found:

- 98 per cent of respondents from organisations whom the research was relevant believed the results would be useful
- The findings would most likely be used to educate staff and volunteers, inform information campaigns, change practice and inform doctrine and policy.

Further research is underway exploring community experiences of flooding during 2022 and 2023 in Tasmania, south-west NSW, Victoria and SA with a new set of stakeholders.

NSW SES is using the research to inform the planning of future flood response coordination and informs community engagement around flood preparedness. With findings that 70 percent of Hawkesbury-Nepean residents not acting on evacuation warnings during the 2022 floods as they believed the risk did not directly affect them, the NSW SES and NSW Reconstruction Authority jointly developed the Future Flood campaign to raise awareness of the risk in flood prone areas. The video and other campaign materials simulated flood events at a personal level for residents.

The Queensland Fire Department (QFD) (formerly Queensland Fire and Emergency Services (QFES)) captured the research's main findings in its Central Repository Framework within the Lessons Management Unit, ensuring insights and learnings will be embedded in its future planning and operations.

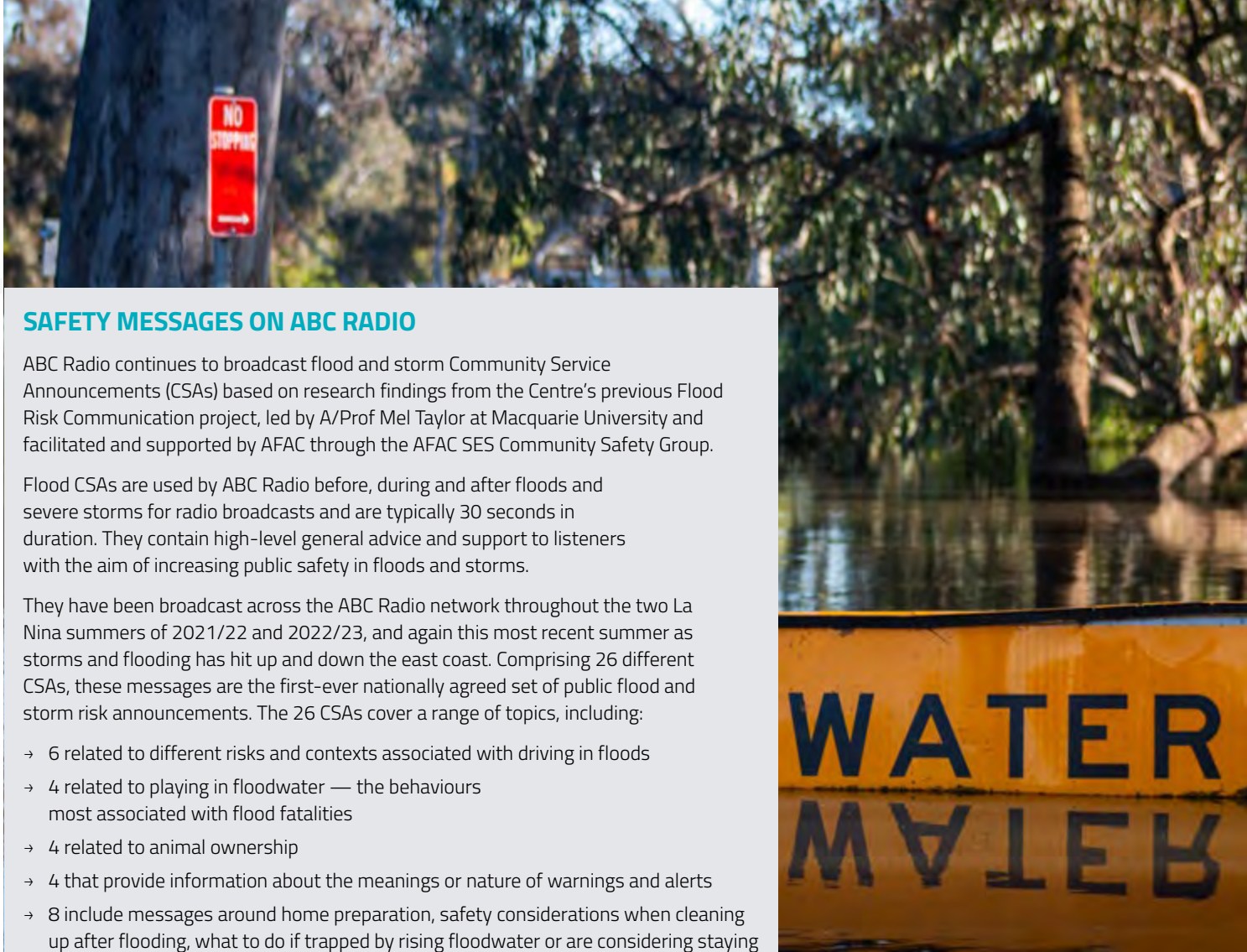
***Making flood risk relatable can be challenging – we often refer to probability and complex details relating to when and where floods will hit – this campaign taps into the way people's decisions are influenced and highlights how past floods are not a reliable indicator of what a future flood may look like.***

**Spokesperson, NSW Reconstruction Authority**



Photo: Queensland Fire and Emergency Services





## SAFETY MESSAGES ON ABC RADIO

ABC Radio continues to broadcast flood and storm Community Service Announcements (CSAs) based on research findings from the Centre's previous Flood Risk Communication project, led by A/Prof Mel Taylor at Macquarie University and facilitated and supported by AFAC through the AFAC SES Community Safety Group.

Flood CSAs are used by ABC Radio before, during and after floods and severe storms for radio broadcasts and are typically 30 seconds in duration. They contain high-level general advice and support to listeners with the aim of increasing public safety in floods and storms.

They have been broadcast across the ABC Radio network throughout the two La Nina summers of 2021/22 and 2022/23, and again this most recent summer as storms and flooding has hit up and down the east coast. Comprising 26 different CSAs, these messages are the first-ever nationally agreed set of public flood and storm risk announcements. The 26 CSAs cover a range of topics, including:

- 6 related to different risks and contexts associated with driving in floods
- 4 related to playing in floodwater — the behaviours most associated with flood fatalities
- 4 related to animal ownership
- 4 that provide information about the meanings or nature of warnings and alerts
- 8 include messages around home preparation, safety considerations when cleaning up after flooding, what to do if trapped by rising floodwater or are considering staying when advised to leave, and flash flooding and the implications of flooding upstream.

*Prior to the develop of these CSAs, the safety messages broadcast differed state by state and were not consistent. The value of these CSAs is they are informed by the research, and they are nationally consistent – no matter which state or territory you're in, you'll hear the same safety messages.*

**Pat Hession**, Emergency Broadcast Lead, ABC Radio



## INDUSTRY GUIDES BACKED BY SCIENCE

The Centre's research input into the Australian Institute for Disaster Resilience's (AIDR) Handbook Collection continues to provide authoritative and accessible knowledge on disaster resilience principles to Australian disaster and emergency managers.

The collection promotes good practice and a common language of disaster resilience across many jurisdictions in the public, private and community sectors.

Centre and the previous Bushfire and Natural Hazards CRC research contributed to the handbooks below, which continue to grow in popularity and use.

**Table 5:** Handbooks with Centre and Bushfire and Natural Hazards CRC input – downloads since publication (Source *AIDR*)

Name	Published	FY 23/24
Communities responding to disasters: Planning for spontaneous volunteering	2019	463
Evacuation planning	2019	558
Tsunami emergency planning	2019	240
Community engagement	2020	1,546
Flood emergency planning for disaster resilience	2020	354
Health and disaster management	2020	296
Land use planning	2020	515
Disaster resilience education for young people	2021	292
Public information and warnings	2021	766
Systemic disaster risk	2021	821
Australia's Riskscape	2023	312
Incident management	2023	1,709
		<b>7,872</b>

*The Handbooks are an authoritative, trusted and freely available source on disaster resilience principles so it is essential they are underpinned by solid research and evidence. Natural Hazards Research Australia's research provides a valuable input into that process across a range of subjects that are important to governments, agencies and individuals across Australia.*

**John Richardson**, A/Manager Knowledge and Capability, AIDR

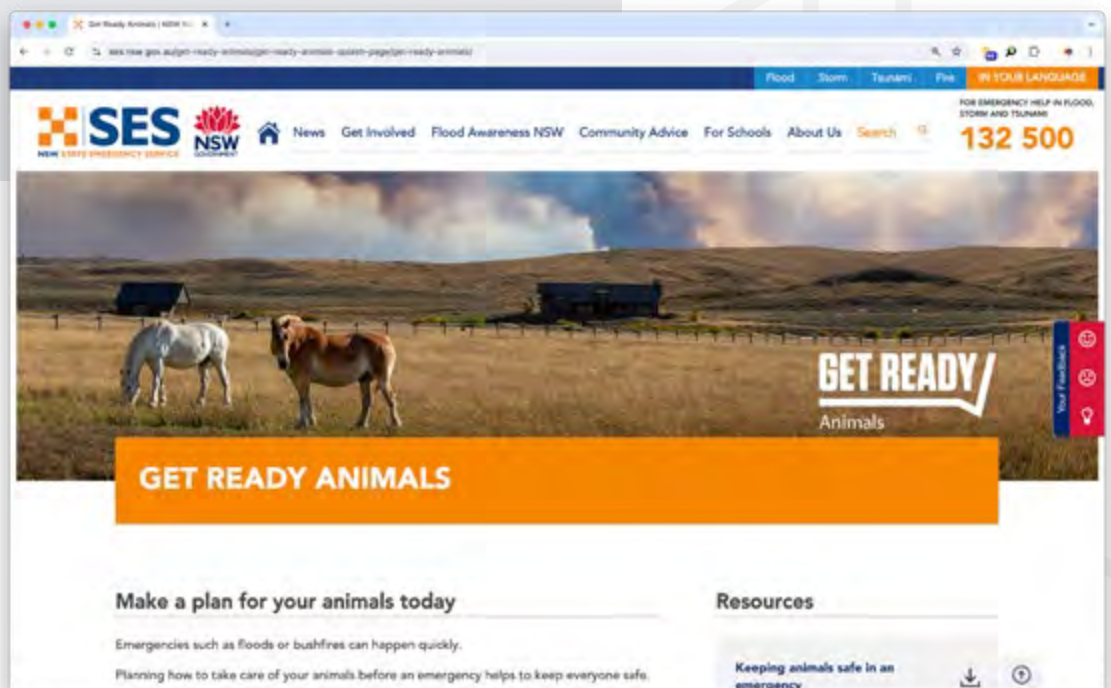
## HELPING PEOPLE CARE FOR THEIR ANIMALS DURING DISASTERS

*Managing Animals in Disasters: Improving preparedness, response and resilience* led by A/Prof Mel Taylor from Macquarie University for the previous Bushfire and Natural Hazards CRC, continues to generate further research utilisation opportunities.

The AIDr *Planning for Animals in Disaster Handbook* is due for publication in late 2024, while NSW SES hosts research resources on its [Get Ready Animals](#) webpage. The resources support owners to plan and implement safe care and evacuation for animals during emergencies and hard copies continue to be distributed at community events and pre-bushfire season activities.

Several videos created from this research are supported by NSW SES, Infrastructure NSW, NSW Department of Primary Industries (DPI), Greater Sydney Local Land Services (LLS), Hawkesbury City Council and the Agnes Banks Equine Centre.

The *Small Companion Animal Incident Management Project – Skills Impact* references the importance of this research in the Australian Animal Care and Management Industry Sector Annual Update 2021: IRC Skills Forecast and Proposed Schedule of Work to support the development of a TAFE unit in Companion Animal Emergency Management.







## EMERGENCY LAW ONLINE

The *Australian Emergency Law* blog, supported by the Centre and other sector organisations, is a discussion forum for the laws that apply to, or affect Australia's emergency services and emergency management sector. Produced by Dr Michael Eburn, formerly Ass/Prof at Australian National University, the blog was developed from research funded by the previous Bushfire and Natural Hazards CRC and is a popular educational tool that unpacks the legal principles that affect emergency services and management, as well as developments in case law and legislation that impact on the sector.

2,029 subscribers directly receive each edition of the blog, while *Australian Emergency Law* enjoys a strong social media following (Facebook: 5,234 followers and Twitter: 149 followers) and international distribution through Newstex. The blog consistently ranks in the top three Best Australian Law Blogs and Websites and is listed in the Global Top 200 Law Blogs. This year, *Australian Emergency Law* delivered 147 posts, an average of one post every 2.5 days with 142,242 visitors to the associated website, reading 285,833 pages.

## TEAMWORK TOOLS

Effective decision making and teamwork are essential in ensuring incident management teams function at their best in challenging, high stakes environments. The previous Bushfire and Natural Hazards CRC established the *Improving decision-making in complex multi-team environments* to improve these skills and develop simple practical tools to support better teamwork management, improve decision making and develop more creative solutions.

The resulting tools included the Team Process Checklist, the Emergency Management Breakdown Aide Memoire, the Psychological Safety Checklist and the Cognitive Bias Aide Memoire, covering communication, coordination and cooperation, as well as helpful suggestions on identifying and resolving teamwork problems in complex situations.

Recent examples of this project's utilisation include:

- Victorian Comprehensive Cancer Alliance using research outputs in four training modules on leadership excellence, with another three under development
- Presentation of research outcomes and resources to the Canadian Interagency Forest Fire Centre National Fire Management Conversation

Around Australia, various emergency service organisations continue to integrate these research findings into their organisational learning and development frameworks to enhance in-house incident management and leadership skills, including Emergency Management Victoria's *Introduction to Emergency Management Non-Technical Skills*. Since launching, 202 people have successfully completed the course, with 75 per cent of participant indicating that they would recommend the course to a colleague. Other emergency service agencies in NSW, Queensland and Victoria have also adopted the training into their learning management systems.

*This research was critical to ensure the learning modules were evidence based and was a key asset in the success of the project.*

**Justin Kibell**, Lead Learning and Development Analyst, Emergency Management Victoria

*This is honestly the best eLearn emergency management course I have completed by far (both content and visual engagement) and I have completed many over the years. I will be championing it in my team and embedding it into our ways of working.*

**Course participant**, Introduction to Emergency Management Non-Technical Skills module

## MAINTENANCE OF THE AUSTRALIAN FLAMMABILITY MONITORING SYSTEM

Fire and land managers are benefiting from a new online vegetation condition and flammability mapping tool – the first of its kind introduced to Australia.

Effectively providing a clearer picture of immediate fire risks, the Australian Flammability Monitoring System (AFMS) uses satellite data to collect information on live moisture content in trees, shrubs and grass. This information is then displayed on an interactive map, helping fire managers in their prescribed burning efforts and repositioning firefighting resources.





Dr Marta Yebra at the Australian National University led the previous Bushfire and Natural Hazards CRC project that developed the AFMS following the Black Summer Bushfires on the east coast of Australia in 2019. Working closely with fire behaviour analysts at the NSW Rural Fire Service (RFS) State Operations Centre, Dr Yebra developed the first-ever interactive map clearly showing vegetation and soil dryness across Australia. This enabled informed decision-making about where fire may spread and priority areas when allocating resources and equipment.

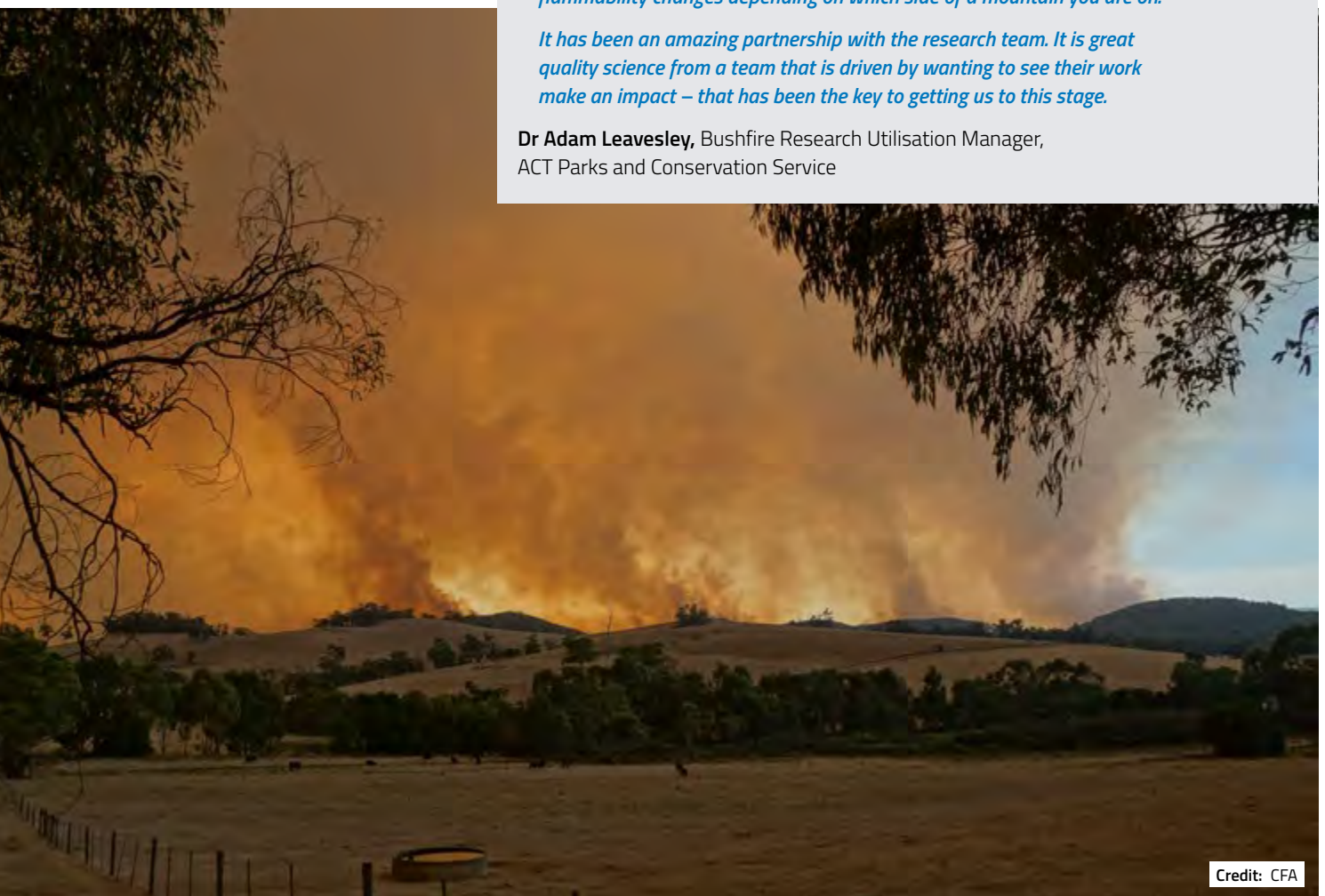
The core of AFMS is satellite-derived live fuel moisture content (LFMC) and flammability information across Australia at 500m resolution, using MODIS satellite data. It also provides soil moisture content information at 5km, provided by BoM via a workflow maintained by the Australian National University (ANU). AFMS is available via a web portal that was viewed around 3,000 times in the past year.

Recent developments to AFMS include a higher spatial resolution (20m) version of the LFMC product, generated using Sentinel-2 satellite data via the GA DEA platform, which will be fully implemented into GA's systems in 2024 following Centre funding to support system updates in 2022 and 2023.

*The Australian Flammability Monitoring System gives us a really good guide across the whole country for how we expect fire to behave on any particular day. This helps agencies position resources during a bushfire, keeping our people safe and also with prescribed burn planning – particularly in mountainous locations where flammability changes depending on which side of a mountain you are on.*

*It has been an amazing partnership with the research team. It is great quality science from a team that is driven by wanting to see their work make an impact – that has been the key to getting us to this stage.*

**Dr Adam Leavesley**, Bushfire Research Utilisation Manager,  
ACT Parks and Conservation Service



Credit: CFA

## MEASURING RESILIENCE

Backed by the previous Bushfire and Natural Hazard CRC research at the University of New England, with support from agencies and governments around Australia, the Australian Disaster Resilience Index (ADRI) provides the first nationally-standardised snapshot of Australian communities' capacity for disaster resilience. Communities, government and emergency services can use the ADRI to take informed and practical steps towards improving the disaster resilience of their local communities before, during and after natural hazards.

Index access includes (Source UNE):

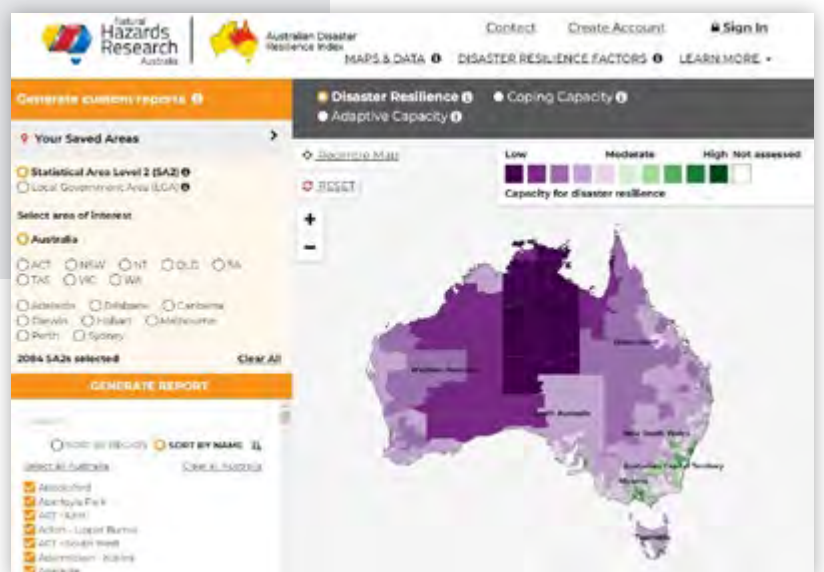
- 560 user accounts. Noteworthy as users are not required to create an account to access general ADRI information, only more advanced functions like storing searches. This indicates actual usage is much higher. User accounts are created on a regular basis; between three to 12 per months.
- Users represent more than 280 different organisations, consisting of state and territory emergency organisations, various Commonwealth and state departments, 16 Australian universities, 97 organisations with a .gov.au URL, not-for-profit and public good organisations including the Red Cross and St. Vincent de Paul Society, and a number of private and public companies. Several international organisations also created accounts.
- ADRI recorded more than 55,717 unique user sessions in the past three years, with 13,049 unique user sessions in the last year.

An Application Programming Interface (API) delivering the ADRI data used was integrated into several other systems by external organisations, resulting in several formal data access agreements. A total of 18 unique API keys have been issued to date, to a mix of emergency service agencies, Commonwealth and state departments, community support services, philanthropic organisations and academic institutions, with most accessed regularly.

Recent use cases:

- inclusion in the Commonwealth Department of the Treasury's *Measuring What Matters* report
- inclusion in the NSW Reconstruction Authority's NSW Natural Hazards Risk Assessment
- inclusion in the CSIRO and NEMA's multi-criteria analysis for the Rapid Project Prioritisation for flood resilience in the NSW Northern Rivers

The Centre is working with National Emergency Management Agency (NEMA) to update ADRI to ensure its ongoing value and use.



Above: The Australian Disaster Resilience Index.



## BETTER BUSHFIRE EDUCATION FOR KIDS

*Schools In Fire Country* empowers students with knowledge and skills to ensure their local area is safer from bushfire. Research funded by the Bushfire and Natural Hazards CRC, led by Dr Briony Towers at RMIT University and Prof Kevin Ronan at CQUniversity, found that for school-based bushfire education to be effective it must be holistic, participatory, action-oriented, place-based and collaborative. The development of a program that embodies these principles is a major paradigm shift for fire management agencies.

*Schools in Fire Country* is this paradigm shift – a school-based bushfire education program designed to empower Victorian upper primary school children to navigate the complexities of bushfire risk management. The program was developed and tested via a collaborative, multi-agency, cross-sector partnership between the research, education and fire management sectors within Victoria. It employed a human-centred, iterative design process that centred needs and priorities of educators, students and fire managers collectively.

The outcome was the development of a three-phase learning model and a comprehensive set of teaching and learning modules to support schools to implement the program in the classroom. This was trialled and iteratively developed with Harkaway Primary School in Victoria in 2022, which demonstrated that when quality, research-backed resources and localised support are provided, the contributions that students and teachers can make to bushfire risk management are wide-ranging and profound. This was further tested and validated at Chewton Primary School in 2023, along with Newstead Primary School and Heathcote Primary School in 2024. Harkaway Primary School plans to run the program again in late 2024.



Credit: Neil Munro, Safer Together/CFA

A \$650,000 grant from the National Emergency Management Agency's Disaster Ready Fund is now enabling delivery of the program in more schools around Victoria, supported by the Country Fire Authority (CFA), the Department of Energy, Environment and Climate Action Victoria, and other local experts and connections. It will also support implementation of teacher professional development, fire agency capability building, a website housing classroom resources and further research.

*We're just 11 and 12-year-olds and we made a difference. We told our community what to do during a bushfire and I think that's the best thing that we've all learned.*

**Grade 6 student**, Harkaway Primary School

*Schools in Fire Country gave our students voice and agency through an incredibly rich collaborative partnership between experts and novices (the students). By taking this participatory and cooperative approach, our students were more likely to learn the lessons, remember them and do something with their learning before danger strikes.*

*The Victorian teaching and learning model captures what Schools In Fire Country has achieved. 'All students are empowered to learn and achieve, experiencing high quality teaching practice that promotes learning and wellbeing, equipping them with the knowledge, skills and dispositions for lifelong learning and to shape the world around them.*

*As end-users of this research, Schools in Fire Country answers the number one question that drives our teaching at Harkaway: 'Is there something so important to learn that we have to change the way that we teach?' The answer is 'Yes!' The urgency for climate change education, and child-centred disaster risk reduction education, demands a response that is commensurate with the challenge. Schools in Fire Country is a crucial platform to that response.*

**Leigh Johnson**, Principal, Harkaway Primary School

*I've no doubt they're much more skilled and empowered with knowledge about bushfire...the more we understand, the more knowledge we gain, we can ease some of that fear and anxiety. It also covered loads of curriculum. There was reading, writing, science, maths, geography, Indigenous perspectives, sustainability, art, digital technology.*

**Scott Purdon**, Teacher, Chewton Primary School

*As a key partner and lead for the Schools in Fire Country program, the Country Fire Authority has benefited greatly from the research that was undertaken over a six-year period. It has informed the programs design, providing an evidence-base for the development of effective, scalable and sustainable school-based bushfire education. Schools in Fire Country showcases true industry-research collaboration and has resulted in outcomes that will benefit children throughout their lives.*

**Alen Slijepcevic**, Deputy Chief Officer Fire Risk, Research and Community Preparedness, CFA

*I think as fire agencies, sometimes we underestimate the capabilities of children and what they are able to learn, what actions they're able to take, what impact they can have in the community. We're bringing that back into the organisation because we know now that it's possible to get children really invested in these projects, and to develop a really deep understanding of bushfire and how they can make a difference.*

**Neil Munro**, Project Lead Bushfire Education, CFA

## TRAINING FOR FIRE EXPERTS

Following the 2019 –2020 Black Summer bushfires, the Bureau of Meteorology (the Bureau) led a project to use advanced super-computer simulations to better understand the drivers of extreme fire behaviour as part of the Centre’s Black Summer research program.

The outcomes of this research advanced understanding of atmospheric processes that influence fire behaviour and improved operational practice within the Bureau, leading to enhanced intelligence to inform decision making by fire agencies. There has also been significant interest from international organisations about developing similar capabilities overseas.

The Centre and the Bureau are now working together to systematise and consolidate the methodology for developing fire case studies to enable faster future results and have developed a series of learning modules based on the research findings.

*Meteorologists in the Bureau have used the high-resolution simulations to better understand the complex interactions between a fire and the atmosphere that can lead to extreme fire behaviour. This understanding can then be used to make an assessment of the potential for extreme fire behaviour over current incidents.*

**Bradley Santos**, Team Lead Fire, Heatwave and Air Quality, Bureau of Meteorology

## WEATHER THE STORM

Completed by researchers from JCU and GA with funding from the previous Bushfire and Natural Hazards CRC, this project identified vulnerable legacy house types across Australia and developed cost-effective retrofits to mitigate damage during windstorms.

The project’s legacy is *Weather the Storm*, a website that translates research findings into easy-to-understand actions and information for builders and homeowners. The website provides targeted information about how to improve an existing homes’ key structural connections against extreme wind. Encouraging widespread public use during cyclone system events, such as April 2024’s, period of cyclone activity at the tail end of the season, *Weather the Storm* achieved 571 unique visitors.

Other research utilisation achievements include:

- The foundational selection of mitigation strategies for the Queensland Government Household Resilience Program
- Expansion of vulnerability assessments of housing archetypes for insurance and other purposes
- Expansion of the Queensland Severe Wind Hazard Assessment project (SWHA – SEQ) to provide modelling for potential cyclone impact
- An outcome from the SWHA-SEQ project is the Gold Coast City Council’s project on building beyond the minimum
- Providing guidance to the Australian Reinsurance Pool Corporation (ARPC)
- Contributing to content for the GA Severe Wind Hazard Assessment website
- Contributing to improvement of building standards by providing input to the Insurance Council of Australia
- Contributing to the production of GA’s retrofit guide for flood, earthquake, and cyclone, wind through parallel projects to *Weather the Storm*







Photo: NSW RFS

## PREDICTING FIRE THUNDERSTORMS

The previous Bushfire and Natural Hazards CRC research to determine the favourability of the atmospheric environment for fire-induced thunderstorms – or pyrocumulonimbus (pyroCb) – successfully completed trials by fire managers on active bushfires and is now poised to be operationalised across Australia.

pyroCb are associated with unpredictable changes in fire intensity, spread rates and direction, enhanced ember transport and lightning ignitions. In favourable atmospheric conditions, suitably large and hot fires can produce pyroCb cloud in the form of deep convective columns with many similarities to conventional thunderstorms. They may be accompanied by strong inflow, dangerous downbursts and lightning strikes, which may enhance fire spread rates and fire intensity, cause sudden changes in fire spread direction and the lightning may ignite additional fires. Dangerous pyroCb conditions are not well understood and can be very difficult to forecast.

The method developed by the Bureau combined with a plume-rise model originally developed for pollutant dispersion prediction, determines how much heat a fire must produce for pyroCb to develop in a given atmospheric environment.

Specifically, this fire heat is the rate at which heat enters the fire plume (which has units of power), often termed the 'power of the fire' or 'firepower'. A theoretical minimum firepower required for pyroCb to develop in a given atmospheric environment is calculated, termed the Pyrocumulonimbus Firepower Threshold (PFT).

The PFT tool was introduced in trial format during the 2019–20 Black Summer bushfire season. Direct feedback from fire forecasters at multiple active bushfires was used to refine the tool into its current form. While still in trial, the tool remains in regular use by fire forecasters during the bushfire season, particularly across southern and eastern Australia where pyroCb are more likely to form.

Bureau researchers continue to share the research behind the tool with colleagues in Europe and in North America after US fire researchers discovered the tool in a Bushfire and Natural Hazards CRC online training session.

Following extensive trials during the 2019–20 Black Summer bushfire season, users of the PFT tool were asked to evaluate its potential.

*We trialed the PFT and PFT-flag products on a few occasions in the SCC during this last fire season. I found them particularly helpful and accurate on these days where we were a bit unsure about pyroCb potential. The products helped confirm both situations of high pyroCb potential but also situations where it was lower than people were thinking and we were able to translate this into pretty key messaging for senior staff in the SCC.*

**Fire-behaviour analyst**, Department of Environment, Land, Water and Planning, Victoria

*Based on evaluations conducted in Western Australia to date the PFT provides useful guidance in a form that is readily interpreted by fire managers and is consistent with the ACCESS modelling framework used to generate routine and incident weather forecasts.*

**Fire-behaviour analyst**, Department of Biodiversity, Conservation and Attractions, Western Australia

*The PFT flag and its novel but physically consistent approach introduces a powerful means in which to more efficiently identify areas of potential pyroconvection that is important to communicate to firefighting authorities to support not only fire behaviour analysis and strategic firefighting planning activities, but also to protect life and firefighting assets.*

**Fire-weather product developer**, Extreme Weather Desk, Bureau of Meteorology

## Education and training

A key aim of the Centre is to develop Australia's ongoing and future research capacity through the upskilling of the next generation of qualified researchers. An essential component of this is development opportunities through a robust education program and other initiatives.

The Centre's education program provides four main types of support, postgraduate scholarships, associate scholarships, Early Career Researcher development and industry fellowships and internships.

The postgraduate scholarship program provides full and top-up scholarships over three and a half years, as well as access to industry expertise and support. The Centre currently supports 39 postgraduate students. In addition, two have completed their studies; Dr Heather Simpson, University of Wollongong and Dr Wavne Rikkers, University of Western Australia.

The associate student program is specifically designed for students conducting research in relevant areas of significant interest to Participants, where students are not already directly involved with the Centre. There are currently 21 associate students, plus one who has completed their studies.

Fellowships support the career development of late-stage PhD students, Early Career Researchers and researchers employed within industry. Two Early Career Researcher fellows are currently undertaking the program, while two have completed their fellowships.

The Centre is piloting the first internship opportunity to support postgraduate students to transition into industry. One postgraduate intern is currently placed with NSW National Parks and Wildlife Service (NPWS), expected to finish in September 2024.

**Table 6:** List of current student projects

Name	Institution	Project Title
Cameron Atkinson	University of Tasmania	Creating resilient and sustainable critical infrastructure using evidence-informed policy
Louise Buckley	Deakin University	Cross-cultural relationships in natural resource management: Understanding the nature and experiences of partnership and collaboration
Louise Mitchell	University of Sydney	Multi-agency collaboration in disaster recovery after bushfire
Phoebe Quinn	University of Melbourne	Exploring the role of civic technologies in community decision making in the face of climate change and disasters
Fadia Isaac	Federation University	An online cognitive-behavioural intervention for treatment of insomnia and nightmares in bushfire survivors
Hafiz Suliman Munawar	University of NSW	Machine learning for humanitarian disaster relief efforts through employing rule-based verification on drone aerial imagery
Sarah Cooley	University of Melbourne	Response, resilience and recovery of Tasmania's endangered pencil pine using a multi-archive palaeoenvironmental record
Christy Hung	University of Sydney	Determining changes in eucalyptus litter during decomposition
Mohamed Sharaf	Victoria University	Parametric study of the transition from a surface fire to a crown fire through physics-based modelling
Rebecca Ryan	University of Wollongong	Developing novel geochemical and spectroscopic techniques to extend existing bushfire records
Kiam Padamsey	Edith Cowan University	Smoke exposure profiles of bushfire fighters in the southwest ecoregion of Western Australia
Jady Smith	University of the Sunshine Coast	Mitigating fire through water management in the wildland-urban interface
Jiyu Liu	University of NSW	Assessing post-fire forested ecosystem by using Spaceborne LiDAR over south-eastern Australia
Catherine Ryland	University of Wollongong	Planning for bushfire protection: maintenance of protection measures
Kate Simmonds	University of Melbourne	Impact of fires on temperate rainforests in northern New South Wales

Name	Institution	Project Title
Matthew Kyng	Victoria University	Parameterisation for a simplified short-range firebrand model from physics-based modelling
Saimum Kabir	University of Melbourne	Flood risk reduction in a dynamic urban context exploring the urban-water-resilience nexus
Shauntelle Benjamin	University of New England	Why do people decide to drive through floodwater? Utilising virtual reality to assess motivations and behaviour associated with driving through floodwater.
Simeon Telfer	RMIT University	Remote sensing of fuel to improve fire behaviour predictions in Mallee and Heathy shrublands
Anna Durkin	RMIT University	Landscape architecture design and development of natural systems wastewater treatment and landscape design
Suki Jaiswal	University of NSW	Impact of bushfire smoke on the ocular surface
Nina Rogers	University of Tasmania	Exploring leadership for municipal climate change adaptation planning and implementation
Brigit Maguire	University of Sydney	Strengthening the experiences of people who are deaf or hard of hearing during extreme weather events and other disasters
Ahmad Hassan	Victoria University	Physics-based modelling of field-scale junction fire
Michael Meadows	RMIT University	Correcting vertical errors in a global Digital Elevation Model to derive a bare earth terrain surface for improved flood modelling in data-scarce regions
Audrey Cetois	University of Queensland	Focusing on the intersection of community resilience and energy resilience
Alex Tanfield	University of Canberra	The effect of disrupted social connection on wellbeing during prolonged disasters
Thanirosan Krishnakumar	Queensland University of Technology	Bushfire risk assessment of buildings using advanced technologies
Sarah Jayne Griffiths	Charles Darwin University	Emergency and disaster practice across the spectrum of mobility
Belinda Davis	Monash University	Building social and transformative resilience through school education: A case study on bushfire learning
Gabrielle Miller	University of Melbourne	Exploring settler perspectives and engagements with cultural land management initiatives and its implications for working together on bushfire management.
Susan Atkinson	University of Canberra	Understanding people's communication needs and behaviours and how community communication ecologies spontaneously form in a natural disaster crisis.
Oscar Metcalfe	Charles Darwin University	Developing ecosystem services based economic opportunities for Indigenous communities in northern Australia
Elena Skoko	Queensland University of Technology	Maternity care in disasters: new frameworks for immediate action
Syed Aktar	University of Tasmania	Application of emotional intelligence in emergency management for improved trust building and decision making
Evelyn Adade	Monash University	Water experimentation towards more sustainable urban water management in rural/regional townships: a journey of processes and places
Natasa Adamovic	Charles Darwin University	Death in disaster: sociocultural perspectives and challenges in Disaster Victim Identification
Benedict Fleming	Deakin University	Scientific understanding of coastal cohesive (soft) cliff failure
Natale Froia	University of Melbourne	Community experiences of floodplain management in the context of post-disaster reconstruction in regional Australia

## Associate students

While associate students do not receive direct funding, they are supported by the Centre through professional development and networking opportunities in recognition of their projects' alignment with the Centre's research themes. Opportunities include invitations to the Natural Hazards Research Forum, dedicated student engagement sessions, the Early and Mid Career Academic and Practitioner (EMCAP Community and more. Associate students can apply for discrete Centre funding support, such as travel grants to present their research and build networks at industry events. The table below summarises associate students, their institutions and projects.

**Table 7:** Associate students and projects

Name	Institution	Project Title
Danielle O'Hara	University of Queensland	Conflict in disaster recovery: why does it happen and what can we do about it?
Douglas Radford	University of Adelaide	An integrated modelling approach for the planning of collaborative and adaptive wildfire risk-reduction activities
Eleanor Williams	University of Queensland	The effectiveness of rapid evidence in fast-paced policy contexts
Haydn McComas	Griffith University	Working together or working apart? Interoperability and organisational culture across RESLEM agencies and organisations during major disaster responses.
Heba Ali	Griffith University	How can hospitals improve their resilience and ensure business continuity during disasters
Sarah Hoyle	University of British Columbia	Restor(y)ing fire-adapted territories: wildfire recovery, Indigenous leadership and restoration in Secwepemcul'ecw
Sheriden Keegan	Griffith University	Enabling governance for sustainable and resilient regional food system development in Australia
Yunjin Wang	Griffith University	Urban green space is a critical component for children living in urban areas to enrich their mental and physical development
Tony Jarrett	CQUniversity	Agency experts supporting bushfire disaster resilience education for primary school students: a case study in NSW
Harikesh	University of the Sunshine Coast	An empirical & dynamic tool for predicting forest fire spread using remote sensing and machine learning techniques
Anna Williams	Australian National University	Exploring community resilience to cascading disasters in Australia
Annal Dhungana	Massey University	Effective communication of uncertainty around modelling in hazard and risk models
Russell Dippy	Charles Sturt University	The human capacity demands of an emergency manager in Australia
Ryan Smith	University of the Sunshine Coast	Developing bioclimatic urban planning and design policy for the public realm
Victoria Heinrich	University of Tasmania	Use of weather and climate information: risk perception and decision making in Antarctica, the sub-Antarctic and Australia
Sumayyah Ahmad	Curtin University	An investigation of spontaneous volunteers' social media engagement in emergency disaster management
Zakria Qadir	Western Sydney University	UAV trajectory optimisation for pre – and post-bushfire disaster assessment using artificial intelligence
Michael Johnson	Monash University	Exploring the Australian practices of disaster resilience, with a focus on community-led approaches
Ahmed Qasim	Griffith University	Using digital technology to share and trade local food and improve community food resilience
Anna Kennedy-Borissow	University of Melbourne	Creative, recovery and resilience: how the arts strengthen resilience in communities affected by disasters
Atul Rai	University of Wollongong	Quantifying runoff in arid zone basins of central Australia
Jane Toner	Griffith University	Enhancing community ecoliteracy for regenerative design: Inspired by nature



## Case study of students

### SUKI JAISWAL

#### IMPACT OF SMOKE ON THE OCULAR SURFACE

Suki Jaiswal is an optometrist and final year PhD candidate at School of Optometry and Vision Science at UNSW, and a Centre postgraduate scholar.

Suki's research explores the impact of bushfire smoke on the eye surface. Through qualitative and quantitative research projects in this area, Suki has engaged with stakeholders in emergency services agencies, fire and smoke research and eyecare associations. Her aim is for her research to be translated into industry and public health practice to ensure the eye safety of fire management professionals and volunteers, and the general public.

As an optometrist treating patients during the 2019–2020 Black Summer bushfires, Suki realised the lack of guidelines for optometrists on how to best treat the impact of smoke on the eyes of clients. While bushfire smoke impacts on the broader community, firefighters close to the fire front exhibit the greatest symptoms of smoke impact. Through attendance at prescribed burns and collaboration with agencies such as NSW National Parks, NSW Rural Fire Service and ACT Parks and Conservation Service, Suki has been able to monitor smoke impact on eyes.

*I think in the future when my research is implemented into practice, I would like to be able to come up with outputs that are applicable to people across all sectors and across all agencies. Natural Hazards Research Australia is the ideal platform that brings everyone together and gives me the opportunity to share my research and outputs with them.*



### HARIKESH

#### AN EMPIRICAL AND DYNAMIC TOOL FOR THE PREDICTION OF FOREST FIRE SPREAD USING REMOTE SENSING AND MACHINE LEARNING TECHNIQUES

Harikesh is undertaking his PhD at the School of Science, Technology and Engineering at USC, and is a Centre associate student funded by the SmartSat CRC. Harikesh is developing an empirical and dynamic tool to predict forest fire spread using a blend of remote sensing and machine learning techniques. Harikesh completed a Master of Technology in Geographic Information Systems (GIS) and remote sensing at the Indian Institute of Remote Sensing and is driven by his passion for environmental conservation and the application of advanced technology.

*I am working on satellite imagery and this imagery has many bands. If you open any single band, you can find many things related to fire. You will find something new about fire every time. That is why I have set about doing fire research.*







## DOUGLAS RADFORD

### AN INTEGRATED MODELLING APPROACH FOR THE PLANNING OF COLLABORATIVE AND ADAPTIVE WILDFIRE RISK-REDUCTION ACTIVITIES

Douglas is undertaking his PhD at the School of Architecture and Civil Engineering, University of Adelaide (UoA), and is a Centre associate student. He hopes to contribute to how society manages the climate and natural hazard risks of the future. Douglas' PhD applies optimisation techniques to landscape management action planning in Australia, looking for the 'optimal' strategies in the context of different community objectives and constraints. Through better understanding the influence of factors such as budget, priorities and objectives on decisions, Douglas believes the way landscapes are cared for and managed can be improved.

Douglas' research interests include decision-support systems, process-based and data-driven modelling, and is supported by a Westpac Future Leaders scholarship.

*What I have gained the most out of the association with Natural Hazards Research Australia and being a part of this community is the exposure to different ideas and learning from different people. Moving forward, I think I would like to continue to learn from and talk to practitioners and people in communities who are affected by natural hazards and learn their perspectives and understand what makes them tick. That's been a really great part of the PhD experience. A big shout out to the Natural Hazard Research Forums, which are great.*



## REBECCA RYAN

### DEVELOPING NOVEL GEOCHEMICAL AND SPECTROSCOPIC TECHNIQUES TO EXTEND EXISTING BUSHFIRE RECORDS

Rebecca is undertaking her PhD at the School of Science, Medicine and Health at UoW and is a Centre associate student. While the frequency of high intensity fires in Australia has increased in the last 200 years, Rebecca's PhD assesses the change in frequency of high-intensity fire events in southeastern Australia during the last 3,000 years. Understanding the link between changes in climate and major fire events, as well as past fire regime behaviour enables better predictions of these things in the future.

Using Fourier Transform Infrared (FTIR) spectroscopy and geochemical changes in the sediment record to determine fire characteristics such as frequency, severity and intensity have changed throughout the recent past, Rebecca aims to reconstruct the fire history of the Blue Mountains (NSW) and Namadgi National Park (ACT). Rebecca has been assisted by Centre Participants NSW Parks and Wildlife Service and ACT Parks and Conservation Service.

*I have worked with Parks both in the ACT and in the Blue Mountains in New South Wales initially for my all my field work. I am hoping to be able to extend that with the findings, once they are in a more final state and hopefully, they can be used to help with management practices and planning for future fire events.*

## CASE STUDY ON NATURAL HAZARDS RESEARCH FORUM 2024 STUDENT SYMPOSIUM

Postgraduate and early career research was a focus at the Natural Hazards Research Forum 2024, with dedicated student presentations, posters, research utilisation workshops and networking opportunities featured throughout the three-day program.

A pre-Forum student workshop brought together 19 Centre-funded postgraduate and early career researchers, hosted by Centre Research and Implementation Director, Dr Shiva Prasad and Research Services Project Officer, Dr Supriya Gurung.

Kiam Padamsey, who is researching smoke exposure on bushfire fighters in south-west Western Australia with Edith Cowan University, said this workshop provided a much-needed focus on career pathways beyond the PhD that didn't necessarily include in academia. Through networking at the Forum Kiam has received around 15 requests for follow up presentations on his research from Forum delegates.

Christy Hung, who is studying the changes in eucalyptus litter during decomposition at the USyd, said this workshop combined with the workshops at past Forums has helped her build strong relationships with the other students, Centre staff and key people in the sector. In particular, she keeps in touch with the progress of other students outside of the Forum, the events they were attending, and other opportunities that arise.

Pathways from research to industry and practice, networking and supporting future leaders were the key takeaways from the student workshop.

Featured in the session were:

- Dr Felipe Aires, former Bushfire CRC PhD student, now Fire Science Interpretation Officer with National Parks and Wildlife Service NSW, with the presentation *Beyond academia: navigating the path to practical impact*
- Dr Johanna Garnett, Manager for Disaster Risk Reduction and Resilience, South Australian Fire and Emergency Services Commission (SAFECOM) with the presentation *Research to utilisation and impact*
- A 'research speed dating' opportunity for students to meet each other and share their ongoing projects
- Friedo Ligthart and Joanna Wood, from the Centre's communications team, with the presentation *Tooling up your digital communications toolbox*

The Forum also launched the Centre's new Early- and Mid-Career Academic and Practitioner (EMCAP) Community, specifically aimed to support EMCAPs to grow, learn and become the next generation of leaders in the natural hazards space.



## Fellowships

The Centre's two current fellowship opportunities target academia and industry. Each fellowship recognises the value of supporting Early Career Researchers and practitioners to expand their professional networks, strong local and international collaborations and compare the challenges facing natural hazards research in different geographic, societal, cultural and climatic settings. Fellowships are open to Early Career Researchers up to five years post-PhD excluding periods of parental leave, family care duties or ill health. The following table summarises Early Career Researchers to date.



## Case study of a fellow

### DR KATE BRADY

Since completing her PhD in disaster recovery in 2020, Dr Kate Brady is a Community Resilience Research Fellow in UoM's School of Population and Global Health and a Disaster Recovery Technical Adviser at the Red Cross. Kate's research investigated what people consider to be helpful in their recovery from a disaster.

*I travelled to the United States for two weeks in July 2023 to meet with researchers and science communicators and to attend the Natural Hazards Workshop in Colorado. Cities visited were New York, Boston, Boulder and San Francisco. In each of the meetings, I was not only exposed to new recovery focussed research being undertaken in disaster affected communities, but I was also able to discuss challenges for researchers in science communication with non-academic audiences.*

*As part of the fellowship, I was able to commence a prospective study, Better Science Communication in Disaster Recovery. I undertook semi-structured interviews with a focus on identifying barriers and enablers for researchers to communicate with non-academic audiences.*

*Natural Hazards Research Australia's Early Career Research Fellowship allowed me to connect with colleagues and institutions in the United States, be exposed to new ideas and concepts in contemporary research in my field, expand my understanding regarding ethics in science advocacy and how equity perspectives can be better applied in disaster research and policy.*

*I intend to pursue the collaboration opportunities identified on this trip, including potentially sharing research protocols with colleagues at the University of Oregon, identifying joint opportunities with the State University of New York and a planned joint publication with the United States Geographical Survey (USGS).*

*As part of the Fellowship, I was also able to identify a number of professional development networks and training opportunities that I intend to pursue and share with colleagues.*

**Table 8:** Fellows and projects

Name	Institution	Project title
Dr Phillipa McCormack	University of Adelaide	Bushfire mitigation and hazard reduction in Australian law 2023
Dr Kate Brady	University of Melbourne	Fostering international collaborations and improving science communication for disaster recovery
Dr Amelie Jeanneau	University of Adelaide	Interdisciplinary collaborative platform for reducing future bushfire risk and increasing community resilience
Dr Nick McCarthy	CFA	Enhancing resilience and safety in bush and grass firefighting; adapting interdisciplinary and international frameworks for Australian contexts
Danielle Heinrichs Henry	Griffith University	Resilience building through collaborative adaptation of heatwave messaging

## Industry Internship

Through real-world application, PhD candidate Shabnam Varzeshi is developing her skills as the inaugural recipient of Natural Hazard Research Australia's (the Centre) postgraduate student internship program.

In collaboration with Australian Postgraduate Research Intern and NSW National Parks and Wildlife Service (NPWS), Shabnam is reviewing the research utilisation at NPWS to improve decision making for fire and land management agencies. The internship provides an opportunity to connect the next generation of scientists/researchers with industry professionals.

Shabnam is a PhD candidate at RMIT University working on integrating smart city technologies and urban resilience. The internship will enhance NSW NPWS's understanding of how research outcomes are currently used to inform practical strategies in environmental management and will highlight opportunities for increased evidence-informed practice.

Shabnam will be able to draw upon her skillset developed through her studies and apply it to the real world. She will investigate the barriers and enablers to research utilisation with NSW NPWS.

Shabnam says the internship provides her with a valuable combination of academic rigour and practical application.

"Having the opportunity to apply theoretical knowledge to real-world challenges in fire management has not only deepened my understanding but also contributed significantly to my professional development," Shabnam says.

"Working directly with NPWS initiatives allows me to contribute effectively to conservation efforts, providing critical insights that shape both my research and future career prospects."

**Right:** Shabnam Varzesh with Dr Felipe Aires, Dr Kat Haynes and Dr Shiva Prasad. Credit: NSW NPWS.

Shabnam's insights will provide valuable guidance for improving research utilisation. Fire Science Interpretation Officer, Dr Felipe Aires will be Shabnam's primary supervisor at NSW NPWS. Dr Kat Haynes at the NSW Department of Climate Change, Energy, the Environment and Water will provide additional end-user mentorship whilst Shabnam's academic mentorship will be provided by her PhD supervisor and Centre researcher at RMIT, Prof John Fien.

Dr Felipe Aires said: "This internship offers a valuable opportunity to gain insights into NPWS knowledge brokering, research implementation practices, and barriers, guiding the agency's pathway to effectively engage with scientific research and translate evidence into operational improvements. Additionally, this pilot internship fosters collaboration between agencies and promotes the development of the next generation of professionals in our sector."

The six-month paid internship began in March 2024.

## Progress towards a First Nations Scholarship

In 2023, the Centre designed a First Nations Research Scholarship to support an outstanding First Nations research candidate to undertake academic project work.

To inform the design of the scholarship and a broader roadmap to underpin the Centre's relationship with and support of First Nations scholars, a workshop with First Nations representatives and researchers, as well as members of the Centre's Education and Training Committee in July, with a First Nations Research Scholarship principles and structure document discussed by the Education and Training Committee in December.

An Expression of Interest for education providers to administer the scholarship will be open in 2024, with a call for scholarship applications to open soon after.

The scholarship program is ambitious as it not only aims to support First Nations scholarship and research training objectives, but also identify, develop and provide opportunities and support for future First Nations research leaders.





## Early- and Mid-Career Academic and Practitioners Community

The Early- and Mid-Career Academic and Practitioner Community advocates for the next generation of natural hazards leaders by supporting and fostering excellence in the science and management of natural hazards. It will also underpin the long-term development of the Centre and its outcomes, ensuring collaboration with our partners and the community on research that is useful, useable and used to create a safer and more resilient Australia.

The community was launched at the Centre's May Natural Hazards Research Forum and is led by an Executive Committee made up of EMCAPs to oversee and deliver professional development activities, grow stakeholder connections and strengthen ties between research and practice.

Executive Committee members:

- Dr Hamish Clarke, UoM, Chair
- Ruby Campbell, Stantec
- Suki Jaiswal, UNSW
- Dr Thomas Johnson, UoN
- Dr Adriana Keating, Monash University
- Dr Kirstin Kreyscher, Deakin University
- Dr Petter Nyman, Alluvium
- Dr Deb Parkin, Inspector-General for Emergency Management, Victoria
- Dr Kamarah Pooley, FR NSW

Ensuring there are opportunities to develop and lead for Australia's emerging natural hazards leaders is a key role of the EMCAP Community believes inaugural Chair, Dr Hamish Clarke.

"We need all hands-on deck and we need to jump out of our lovely silos and build bridges. Bridges between scientific disciplines, between hazards, between research and management, between Indigenous and non-Indigenous knowledge, between professionals and communities. We need to plan ahead and that means supporting the next generation of academics and practitioners, which is exactly what this network aims to do," explained Hamish.

## Professional development

The Centre continues to progress the development of courses that translate research into professional development for stakeholders.

### Translation of observed and modelled extreme bushfire behaviours to improve fire prediction and fire ground safety

This project optimises the translation and utilisation of research outcomes from the previous *Modelling fire weather interactions using the ACCESS-Fire model* project through the development of professional development learning modules. The modules focus on providing professional development information for Fire Meteorologists, Decision Support Meteorologists, Fire Behaviour Analysts (FBANs) and other practitioners to evaluate the potential of extreme fire behaviour risk and provide operational guidance and fire weather intelligence.

The project has developed three Extreme Fire Behaviour modules:

- introductory module
- Fire-Generated Vortices module
- Low-Level Jets and their fire plume interaction module

These modules provide information relating to complex fire behaviours and map effective collaborative approaches between professional FBANs and Meteorologists, drawing on their different expertise and intelligence sources to more effectively determine and predict risk factors and considerations during bushfire events. The modules also draw on current practice of experienced Meteorologists and FBANs and how they have worked together during previous bushfires.

Feedback from the AFAC Predictive Services Training Working Group members on the draft modules:

*Overall, I'm incredibly impressed with how the science has been distilled into practical applications/scenarios that form part of the e-learning module*

*Good work on this complex beast*

*I found the package easy to follow, practical and useful. The science has been well synthesised.*





## Disaster Challenge

The Disaster Challenge is a national disaster management research innovation challenge that encourages new ideas, new thinking and new research. It invites early career researchers, postgraduate and undergraduate students in Australia to take their research training and academic studies and apply them to solving a real-world problem faced by disaster management agencies.

The Disaster Challenge 2024 is currently underway, while 2023 marked the second successful Disaster Challenge. Hosted by the Centre and guided by a Victorian-based working group with representatives from AFAC, the Australian Red Cross, CFA, DEECA, EMV, Fire Rescue Victoria, Inspector-General for Emergency Management Victoria, Monash University, RMIT University, UoM, Victoria SES and Yarra Ranges Council, working group members were actively engaged developing the wicked problem, promoting the Disaster Challenge within their sector, considering all proposals, mentoring finalists and selecting the winners, who received a cash prize and other support.

Disaster Challenge 2023 asked entrants to develop a solution to the wicked problem: *In the midst of disruption, chaos and calamity, how can resources from across society be accessed and connected in new and innovative ways to improve disaster response and link those who have the resources and supports with those that are most in need?*

The three finalists were linked with academic and sector mentors to develop their solutions, which they pitched to a judging panel at a public event in Melbourne, marking the International Day for Disaster Risk Reduction in October. The judging panel comprised representatives from AIDR, RMIT University and Victoria SES.

A concept to empower young people aged 13–18 to take a leading role in disaster resilience in their local area, called Youth Guardians, took out the challenge.

My solution to the wicked problem empowers teenagers to use their knowledge and experience,” said Lydia Wardale, a recent Masters graduate in development economics and public policy economics from UQ.

Joint runners up were a team of undergraduate students from the University of Technology Sydney (UTS), and a team of early career researchers and postgraduate students from the Queensland University of Technology (QUT), Monash University, Oregon State University, the University of Tasmania and UQ.

Feedback from finalists and other participants was overwhelmingly positive, with engaging with mentors a highlight for finalists and mentors alike.

*Professionally, I gained experience within disaster resilience. Personally, I gained confidence in what I can bring to the table as a young person in the disaster risk reduction field.*

**Lydia Wardale**, Disaster Challenge 2023 winner

With support from the Centre and a mentor from the University of Sydney, Lydia is preparing to pilot her youth-led community resilience program in a Queensland high school in 2024.

For the Centre, working group members, mentors, finalists and judges, Disaster Challenge 2023 fostered new connections between innovative thinkers, university programs and the emergency and disaster management sectors.

Highlighting this was the integration of the Disaster Challenge 2023 into Central Queensland University’s Emergency Services and Disaster Management postgraduate program. Additionally, the UTS undergraduate team developed its submission through an innovative course co-designed with the Australian Red Cross at UTS’s Transdisciplinary School, while the QUT-based team initially developed their idea for a Brisbane Flood Hackathon held in the QUT Centre for Data Science.



**Above:** Disaster Challenge winner Lydia Wardale with CEO Andrew Gissing.

# Research data management

The establishment of a bushfire and natural hazards data catalogue spanning Natural Hazards Research Australia, the Bushfire and Natural Hazards CRC and Bushfire CRC, will provide researchers and end-users with the ability to easily search and locate previous research datasets.

This project has completed a proof-of-concept, which is a metadata exchange and initial research data management framework – now being tested for ease of use, navigability and implementation. FrontierSI, the University of NSW, RMIT University and NGIS came together to develop the proof-of-concept metadata exchange and research data management framework.

This preliminary stage of the project produced two key outputs:

- proof-of-concept research data catalogue website based on an open-source data management system used by many governments. It has been developed to allow researchers and agency staff to initially discover and locate datasets for bushfire research (to be extended to other hazard data), analysis and decision making. While the catalogue does not store the datasets themselves the catalogue will provide a line-of-sight to the location of each dataset.
- research data management framework providing recommendations for data management and governance procedures for both the Centre, research providers and end-users regarding search and discovery, security, licensing and access. The framework has also guided the data catalogue's design and provides a foundation for improvement and standardisation of data governance procedures within the centre and with external research providers and end-users.

The next stage will scale-up the data catalogue's development and implementation of the research data management framework with data from the Centre's bushfire projects relating to the 2019–20 Black Summer bushfires. This will then be extended to all Centre bushfire data, followed by data from all other hazards.

This project received investment from the Australian Research Data Commons through the Bushfire Data Challenges program. The Australian Research Data Commons is funded by the National Collaborative Research Infrastructure Strategy.

# Research-informed strategic advice

The Centre provides trusted research-based advice and insights to inform the efficient planning and decision making of government, communities, emergency services and the business sector.

Going to the heart of the Centre's mission to support better decision-making by working with partners and the community on research that saves lives and protects communities and the Centre's vision of an Australian community that is safer, more resilient and sustainable in the face of natural hazards.

## Thought leadership

### Be Ahead of Ready

To inspire bigger bolder thinking across the disaster resilience sector, the Centre led research and consultation to identify big ideas to drive a resilient safe and sustainable future. The project provided a unique opportunity to engage with more than 300 stakeholders from a wide variety of sectors, including emergency management agencies and authorities, local, state and Commonwealth government, not-for-profit organisations (community and First Nations organisations), insurance and banking organisations, and research. Stakeholders were asked to think outside their sector and comfort zones to identify the big ideas that will positively change our future.

A final report was launched at the Natural Hazards Research Forum 2024 in May, alongside panel discussions focusing on ideas explored in the report. Ideas were focused around:

- better and faster decisions
- better warnings including personalised warnings and engagement and global warnings
- resilient infrastructure
- resilient homes and communities
- workforce capability
- investment informed by the true costs of disasters
- dynamic measurement of risk and resilience
- public-private partnerships to deliver innovation

The Centre will continue the *Be Ahead of Ready* conversation with aim of igniting debate and sparking new thinking to build safe, resilient and sustainable communities.

*The impacts of climate change are happening, there has never been a more important time for research. Natural Hazards Research Australia's Be Ahead of Ready initiative is critical to promote big thinking to inform research and innovation to ensure that communities can be safe and resilient in future decades.*

**Ian Dinham**, President, Floodplain Management Australia



**Left:** Brendan Moon, Coordinator-General for Emergency Management, NEMA, launched Be Ahead of Ready.

## Assisted relocations

In collaboration with Suncorp Insurance, the Centre developed *Assisted relocations: a community-centred approach*, a discussion paper refining the outcomes of a roundtable discussion of more than 40 senior executives and experts from government, research, community and corporate sectors. The roundtable in Canberra included keynote speeches from Commonwealth Minister for Emergency Management, Senator the Hon. Murray Watt and international expert in landscape design, Prof Gavin Smith from North Carolina State University.

Distributed to Centre Participants and promoted digitally for public access, the discussion paper sparked a wider conversation in the national media.

Underlining the importance of the national conversation around assisted relocations, Prof Smith shared his expertise and experience with the NSW Reconstruction Authority, NSW local governments, the Queensland Reconstruction Authority, Department of Public Works and Energy and the Office of the Inspector General of Emergency Management.

*Climate impacts are here now. Communities need to be made aware of the risks through hazard risks mapping of areas exposed to climate disasters as suggested by Natural Hazards Research Australia and Suncorp. Every step we take to help communities prepare for now unavoidable climate impacts secures a safer future and builds resilience, protecting people and country.*

**Letter to Editor**, The Age, 5 December 2023

*This event was excellent. You expertly brought together diverse views and experiences to enrich the thinking I particularly enjoyed the format of encouraging comments from pre-selected participants rather than a traditional panel. The format meant that it was easier afterwards to engage directly with speakers. The paper itself has been useful input into our National Plan.*

**Roundtable participant**



**Left:** Prof Gavin Smith speaking at the round table discussion



## Strategic Advice

Throughout the year, evidence-informed advice from key Centre staff was sought by stakeholders.

### Strategic Review and Policy

- Membership of Independent Peer Review Panel for Flood Hazard Mitigation Methodology for the NSW Reconstruction Authority
- Participation in NSW Treasury project to develop cost-benefit analysis tools for natural hazard mitigation arising from the NSW Flood Inquiry
- Participation in NEMA's National Disaster Risk Profile Expert Reference Group to develop national natural hazards risk profile
- Participation in the National Disaster Ready Fund Assessment Panel to allocate funding under the Commonwealth Government's Disaster Ready Fund
- Participation in the Australian Fire Danger Ratings System Program Board
- Participation in Australian Rainfall and Runoff Project Control Group to update climate change considerations
- Steering Committee, NSW Bushfire and Natural Hazards Centre
- Participation in the national and South Australian Climate Change Risk Assessments
- Participation in NEMA consultation on the Disaster Ready Fund
- Advice to NSW Reconstruction Authority on State Risk Assessment
- Advice to SA SES on national flash flood warning proposal
- Advice to the Australian Climate Service on local government flood risk analysis
- Participation in Cyber and Infrastructure Security Centre (CISC) 2024 Critical Infrastructure Annual Risk Review

### Submissions and Reviews

- Submission to Independent Review of Commonwealth Disaster Funding and subsequent workshop
- Submission to Department of Home Affairs Alternative Commonwealth Capabilities for Crisis Response Discussion Paper and subsequent workshop
- Submission to Australian Climate Service Review and meetings with the independent panel
- Submission to Department of Climate Change, Energy, the Environment and Water for the National Adaptation Plan Issues Paper
- Submission to Department of Infrastructure, Transport, Regional Development, Communications and the Arts on the draft National Urban Policy for Australia
- Submission to Queensland Inspector-General Emergency Management for the 2023–24 Severe Weather Season Review
- Submission to Victorian Legislative Assembly Environment and Planning Committee regarding climate change adaptation
- Participation in review of NEMA capacity building and engagement activities
- Board Chair and CEO met with Robert Glasser and Gill Savage in relation to the Independent Review of National Natural Disaster Governance Arrangements
- Input into Department of Home Affairs' Critical Infrastructure Annual Risk Review

### Conference and event participation

Centre Board and staff were highly sought after to organise or participate at sector forums, conferences and workshops.

- Higher Risk Weather Season Summit hosted by NEMA
- Land Use Planning Roundtable hosted by the Insurance Council of Australia and Building Council of Australia
- NSW Telecommunications and Power Resilience Forum hosted by Essential Energy
- AFAC Research Committee Strategic Workshop hosted by AFAC
- Disaster Resilience Workshop hosted by the Independent Voice of Strata Owners
- Organising committee and speakers, 7th International Fire Behaviour and Fuels Conference
- Program committee, AFAC24 Conference
- Program committee, AFAC Lessons Management Forum
- Program committee, Disaster and Emergency Management Conference
- Editorial Board, Australian Journal of Emergency Management
- Participant, NEMA National Space Weather Exercise
- Participant, First Nations Community of Practice
- Participant, Queensland Disaster Research Alliance
- Participant, Queensland Disaster Management Research Advisory Panel
- Participant, Resilient Sydney and Community Deliberative Workshop
- Participant, WA Interagency Bushfire Operations Committee Research Group
- Participant, AdaptNSW forum
- Participant, Insurance Council of Australia Annual Conference



- Participant, Investor Group in Climate Change Summit
  - Address by Centre CEO Insurance Council of Australia at the National Press Club
  - National and Victorian finals, Resilient Australia Awards 2023
  - Participant, Catastrophe and Reinsurance Symposium
  - Participant, ARPC Cyclone Risk Insurance Seminar
- Centre research projects, findings, outcomes and research-informed advice were widely presented at sector conferences, workshops and meetings.
- Board of the Royal Automobile Club of Tasmania
  - AFAC Council and AFAC collaboration groups
  - Keynote presentation at the Australian Community Engagement and Fire Awareness Conference
  - Keynote presentation at the Dam Breach Life Loss Assessment Workshop (US)
  - Keynote presentation, Canadian Wildfire Innovation Symposium
  - Keynote and plenary presentations at the AFAC 2023 Conference
  - Keynote presentation at the Emergency Management Spatial Information Network Australia (EMSINA) workshop
  - Keynote presentation at the Connected for Smarter Faster, Emergency Response Industry Breakfast
  - University of Western Sydney Environmental Health Course
  - Northern Territory Emergency Management Committee
  - Tasmania State Emergency Management Committee
  - WA Interagency Bushfire Operations Committee Research Group
- Fire and Rescue Victoria Strategic Advisory Committee
  - Asia Pacific Coroners Conference
  - Science-industry workshop on severe convective storms
  - Emergency Media and Public Affairs (EMPA) national conference
  - Hosted EMPA webinar on the NSW/QLD post flood research
  - Inspector-General Emergency Management (IGEM) Queensland Disaster Management Research Forum
  - NSW Hunter, Central Coast, Mid Coast Councils Floodplain Management Roundtable
  - Keynote presentations and workshops, Floodplain Management Australia Conference 2024
  - Disaster and Emergency Management Conference 2023
  - Keynote presentations, Fire Summit 2024, Forestry Australia
  - AFAC Annual Senior Leaders Cohort 2023
  - Department of Foreign Affairs and Trade (DFAT) Australia Awards Fellowship Conference (UTS)
  - NSW State Disaster Mitigation Plan industry briefing
  - Emergency Services Foundation Emergency Management Conference
  - National Indigenous Resilience Summit
  - Victorian Rural Youth Sector Conference
  - Disaster Resilient Australia-New Zealand School Education Network (DRANZSEN) National Forum
  - Australian Disaster Resilience Conference
  - Fire Protection Australia Conference
  - National Health and Safety Conference
- Panel discussion, Australian National University (ANU) Relocating Australian Communities
  - Northern Australian Fire Managers Forum 2024
  - NSW RFS Research, Innovation & Technology Consultative Committee
  - Emergency Management Spatial Information Working Group (EMSIG)
  - Disaster Relief Australia Conference
  - Bushfire risk with Hasluck community meeting and with the Hon. Tania Lawrence MP
  - NSW Hot Spots Advisory Committee
  - Australian Meteorological and Oceanographic Society Conference
  - Understanding Risk Global Forum, Himeji, Hyogo, Japan
  - International Association of Wildland Fire, 7th International Fire Behaviour and Fuels International Conference
  - CLRMG Workshop with Burrendies Aboriginal Corporation and Southeast Aboriginal Focus Group
  - NSW SES Community Risk Assessment Research Utilisation Workshop
  - A ngu Pitjantjatjara Yankunytjatjara (APY Lands) Cultural Knowledge Sharing
  - Queensland Disaster Research Meeting 2024
  - Community Forum, Ayr North Queensland
  - Community Forum, Tenterfield NSW
  - Queensland Department of Housing, Local Government, Planning and Public Works (DHLGPPW) Disaster Recovery Program meeting
  - Emergency Services Foundation Learning Network meeting
  - International Association for Society and Natural Resources Conference



## Strategic Engagement

Demonstrating the significant, wide-ranging impact and value of Centre research to decision makers is key to ensuring the Centre's vision of safer, more resilient and sustainable communities.

Throughout the year, Centre Chair Iain MacKenzie and CEO Andrew Gissing met with Commonwealth, state and territory members of parliament to showcase the benefits of evidence-based natural hazards planning, response and recovery. Meetings included: Minister for Emergency Management, Senator the Hon Murray Watt; Deputy Federal Leader of the Nationals, Senator Perin Davey; Minister for Financial Services and Assistant Treasurer, the Hon Stephen Jones MP; Senator Tony Sheldon; Member for Macquarie Susan Templeman MP; Member for Hasluck Tania Lawrence MP and Member for Gippsland the Hon Darren Chester MP.



**Right:** Chair Iain MacKenzie and CEO Andrew Gissing met with key parliamentarians with responsibilities for natural hazards and emergency management including, from top, Senator Murray Watt, Susan Templeman, Senator Tony Sheldon, and Tania Lawrence.

# Communications

Communications activities are shaped by the Centre's *Strategic Plan 2021–2031*: undertake leading research; create knowledge networks; build partnerships; create a national research capability; provide a trusted and independent voice; and translate research into action.

## Media

The Centre is frequently sought for comment by a range of regional, national and international media outlets. The Centre's CEO and subject matter experts position the Centre as a trusted, knowledgeable source to provide media comment that supports agency partners.

Through the Australian Science Media Centre (SciMEX), the Centre is a key promoter of Australian science placing it and natural hazard research in prominent view of science journalists around Australia and internationally. Collaboration with SciMEX included participation in a February media briefing regarding research on concurrent and consecutive natural hazards and the challenges of warnings. Expert opinion was provided to international media outlets highlighting the Centre's position as a global authority on natural hazards research. The *Debunks* podcast produced by *Cosmos*, ran a special bushfire series featuring Centre research and researchers. International coverage included the BBC World Service.

In December a CEO opinion piece about heatwave risk, impacts, research and ways forward was published in the *Canberra Times*. The piece was syndicated throughout the Australian Community Media mastheads, including the *Illawarra Mercury* (NSW), *Newcastle Herald* (NSW), the *Central Western Daily* (Orange, NSW), the *Daily Liberal* (Dubbo, NSW), the *Daily Advertiser* (Wagga Wagga, NSW), the *Northern Daily Leader* (Tamworth, NSW), *The Courier* (Ballarat, Vic), *The Advertiser* (Bendigo, Vic), *The Standard* (Warrnambool, Vic), the *Border Mail* (Albury/Wodonga, NSW/Vic), the *Examiner* (Launceston, Tas) and *The Port News* (Port Macquarie, NSW).

Flooding in many parts of Victoria in January meant the Centre was sought to explain the dangers of driving and recreating in floodwater, as well as the difficulties and possible solutions some locations face with flooding. Coverage included *The Age*, *Sydney Morning Herald*, ABC online and ABC Local Radio Goulburn Murray and Central Victoria.

Local and project-specific media campaigns were undertaken in Victoria, SA and NSW to assist in recruiting flood-affected resident to share their experiences with researchers in March and May, while research findings on how people use bushfire maps to inform their actions during a bushfire were reported back to areas that had participated in the research in Victoria, Tasmania, ACT and NSW during May.

The appointment of Prof Cheryl Desha as Science and Innovation Director in April led to a prominent interview on ABC Radio National Breakfast with Patricia Karvelas.

The Natural Hazards Research Forum in May was covered by ABC Radio Adelaide, with significant media interest in keynote speaker Dr Sally Potter from GNS (New Zealand) resulting in articles in *The West Australian*, *The Canberra Times*, *The Illawarra Mercury*, *The Bendigo Advertiser* and *Cosmos*. The launch of the Centre's *Be Ahead of Ready* initiative in May led to the CEO appearing on ABC Local Radio in Northern Queensland and South East NSW to discuss how technology can advance disaster risk reduction and emergency management.

Throughout the past year, the Centre and Centre researchers appeared in the media 215 times.



Above: An excerpt from flood research in *Canberra Times*.





## Industry-focused publications

A range of communications products are regularly developed to suit the needs of Centre Participant, partners and the public. These include publications, reports, briefing papers, videos, webinars, case studies and tools for operational people in partner organisations.

The Centre distributes a monthly emailed newsletter to subscribers in Participant and research organisations, all levels of government, not-for-profits and the general public. During the reporting period, the Centre's newsletter was read 13,485 times, an average of 1,123 views per edition.

*Hazard Notes* are accessible research briefing papers published to [naturalhazards.com.au](http://naturalhazards.com.au) and distributed to an extensive subscription base that includes staff in Participant organisations, federal, state and local government, SMEs, volunteers at rural fire brigades and SES units, researchers and PhD students. They are also widely shared on social media. Three *Hazard Notes* were published in this period and were downloaded 4,980 times, an average of 1,245 times per edition.

Centre staff sit on the Editorial Advisory Board and the Editorial Committee of the *Australian Journal of Emergency Management*, published by AIDR, regularly contributing content based on Centre research.

The Centre also regularly contributes research-based content to many well-known and widely circulated external publications and newsletters, including:

- Fire Australia magazine
- Asia Pacific Fire magazine
- Brigade magazine (CFA)
- Bush Fire Bulletin (NSW RFS)
- Phoenix magazine (Victoria SES)
- AFAC newsletter
- AIDr newsletter
- Collaborative Research Australia newsletter
- Wildfire magazine for the International Association of Wildland Fire

## Website

The Centre's website is a rich library of natural hazards research, linking current projects with research carried out through the previous Bushfire and Bushfire and Natural Hazards CRCs. [www.naturalhazards.com.au](http://www.naturalhazards.com.au) curates the Centre's research portfolio and related activities, including publications, news and events and is the main public-facing communications tool.

Table 9: Centre website

Page views	Website users
159,456	127,172



## Social media

Social media amplifies the Centre's traditional media activities, providing a useful platform to reach individuals and groups different to the Centre's established networks, including the broader public, regional communities, volunteer brigades and units, local government, politicians and international researchers.

The Centre has an engaged audience across LinkedIn (7,285 followers), Twitter (1,345) and Facebook (757). Throughout the reporting period, these platforms achieved 363,762 impressions and 23,439 engagements.

## Videos

Short, timely online videos were produced to promote and summarise Centre events, such as conferences and webinars, and included the overview summaries of the Natural Hazards Research Forum, the National Indigenous Resilience Summit and the Disaster Challenge. Research outputs were also highlighted in video including SES *Fit for Task* and the 2019–20 Black Summer bushfires projects. All were posted to YouTube, the Centre's website and social media platforms. 60 videos produced during the reporting period, compared with 34 for the previous 12 months, with 7,980 unique views and a watch time of 572 hours.



@Natural Hazards  
Research Australia



@Natural Hazards  
Research Australia



@HazardsResearch



@HazardsResearch





## Events

The Centre’s annual calendar of engagement activities fosters greater collaboration between researchers, government and the emergency management sector and supports the needs of communities across Australia.

This includes events that are hosted by the Centre, as well as participation in and contribution to a large number of events externally hosted throughout the emergency management and disaster risk reduction sector. In total, more than 10,000 people were directly reached by these events.

The Centre was the Research Industry Partner for the AFAC23 annual conference in Brisbane, and a supporter of the Queensland Disaster and Emergency Management Conference; Victorian Emergency Management Conference; Cooperative Research Australia Collaborate Innovate 2023; National Indigenous Disaster Resilience Summit; 7th International Fire Behaviour and Fuels Conference; Floodplain Management Conference 2024; Disaster and Emergency Management Conference 2023;; North Australia Fire Managers Forum; Fire Australia Conference; and the Forestry Australia Fire Summit 2024.

The following table includes the Centre’s own Natural Hazards Research Forum and other sector related conferences where the Centre is either a Sponsor, Supporter or Partner.

The table on page 57 under Strategic Advice lists participation by the Centre in all known sector activities.

Knowledge-sharing forums include the free public monthly Hazardous Webinars series covering Centre research projects and relevant issues. Industry training courses include project-related research and utilisation sessions for industry personnel, while workshops include one-off gatherings on sector and project related issues. Additionally, individual projects held meetings between researchers and end-users, online and in person.

**Table 10:** Total Centre-hosted and supported events, training opportunities

Event type	Number of events	Number of attendees (in person and online)
Conferences	12	8,221
Knowledge-sharing forums	26	3,582
Industry training courses	10	431
Workshops	42	1,152



**Above:** The then Federal Minister for Emergency Management, the Hon Murray Watt, visited the Centre’s stand at the AFAC conference in Brisbane.



# NATURAL HAZARDS RESEARCH FORUM - 2024

WELCOME TO KARRNA COUNTRY  
**KUMA KARRNA**  
 "ONE BLOOD"  
 KARRNA LANGUAGE

We do a Smoking Ceremony so that our Ancestors can recognise our scent on Country and protect us. It also is a cleansing smoke to keep our spirits strong and healthy.



**MACHELLIA**  
 "Thank You NAKKARA"  
 "SEE YOU SOON"  
**CLIFFY WILSON**

**HEALTHCARE EXPENDITURE**

- 2019: 97% → 31%
- 2020: 97% → 31%
- 2021: 97% → 31%
- 2022: 97% → 31%
- 2023: 97% → 31%
- 2024: 97% → 31%



**BRENDAN MOON**  
 COORDINATOR GENERAL, NEMA

"If you think you can't do it with the resilience that these choices are based on science and fact we will get a long way down the track in delivering what needs to be done into the future"

**Be ahead of Ready!**

**PROVOKE INSPIRE CHALLENGE BE INVOLVED!**

**CHOICES FOR NATIONAL CAPABILITY**

**GROW**  
**NATIONAL CAPABILITY IN SCIENCE AND RESEARCH**

**THOUGHT LEADERSHIP**  
 Doing the same is not enough. Small changes would get us there.

**THINK BIGGER BOLDER**

**DIVERSITY OF PEOPLE IDEAS**

**DO DIFFERENTLY FOR THE CHANGE**



**ANDREW GISSING**  
 NHRA CEO

**AUSTRALIA'S CURRENT CHALLENGES**

- Increased frequency and severity of natural hazards.
- Early warning systems to overcome public apathy and meet needs.
- Communities across Australia are resilient BUT ARE NOT READY FOR A CLIMATE CHANGED WORLD.

To Create Change:

- Scale systems to be able to respond and recover across the Nation.
- Locally-led recovery with capacity support from State/Federal Gov.
- Economic investment into Risk & Resilience.



**THE CENTRE**  
 Collaboration with and across the sector and End-user Focused by allowing people to put forward research ideas.

**USE OF RESEARCH FOR IMPACT!!**

**CURRENT FOCUS**  
 # Trucks  
 # Air Support  
 # Volunteers

**DON'T FORGET THE INSURANCE SECTOR!!!**

**FUTURE FOCUS:**  
 Research and critical choices for impact

## KEYNOTE #6 FUTURE URBAN PLANNING POLICY IN A NATURAL HAZARDS CONTEXT

Prof Barbara Norman - Chair of Urban Policy Forum



"If we continue to build in places we shouldn't... who is going to pay for recovery?"

### PANEL DISCUSSION

**BRENTON BEEK GREENING ADELAIDE**  
 "Cooler, Greener + wilder"  
 Using natural systems to adapt and mitigate the impacts of a changing climate.



Focus on the whole chain and policies that enable the process across all orgs in the chain.



Better resourced councils are leading globally (but we can afford it).

**GOOD URBAN PLANNING**

Stop building in dumb places!

## HER EXCELLENCY THE HONOURABLE FRANCES ADAMSON GOVERNOR OF SOUTH AUSTRALIA

I acknowledge the Kurna Elders, Leaderships and people and that we med on their land.

Everyone here is encouraged to **THINK BIG + INNOVATE!**  
 When disaster strikes we are all affected and need dynamic information - found in places like the NHRA - to respond to the growing intensity of natural hazards.  
 From cities to local trees, and communities we must adapt and learn **FROM EXPERIENCE AS MUCH AS EXPERTS!**



# BIG, FUTURE THINKING AT NHRF24

Almost 300 representatives from research, industry, government and the community sector were challenged to think big to meet Australia's future disaster challenges at the third annual Natural Hazards Research Forum.

The Forum, hosted by the Centre in May in Adelaide, aimed to *Provoke, Inspire, Challenge, Be Involved* by focusing on research utilisation, collaboration and transformative thinking backed by research.

Attendees came from all states and territories with more than two thirds representing Centre Participant organisations. One third of attendees were researchers, another third were local, state and Commonwealth government and agencies, with the remainder from related emergency management, industry and not-for-profit organisations ensuring diversity of people, experiences and ideas. Part of the Forum was streamed live.

The event launched the Centre's Be Ahead of Ready initiative to the sector, leading to lively discussion, debate and sharing of ideas and outcomes amongst delegates and speakers during and outside sessions, as well as setting the tone of big, bold, future thinking for the Forum.

Following a smoking ceremony and welcome to Country by Kuarna man Cliffy Wilson, Mr Lee Odenwalder MP, Member for Elizabeth, opened the Forum on behalf of the South Australian Government.

**Brendan Moon**, Coordinator-General for Emergency Management, National Emergency Management Agency provided the opening keynote address with a thought-provoking presentation on *Changes, challenges, choices*. Keynote addresses took place across the three days of the NHRF24 program, including:

**Dr Sue Keay**, Partner and Director FutureWork Group – *AI, robotics and emergency management*;

**Prof Andy Koronios**, CEO and Managing Director SmartSat CRC – *Beyond the stratosphere: the role of space technologies in natural hazard management*;

**Dr Justin Fidock**, Program Leader National Security, Defence Science and Technology Group Australian Department of Defence – *Large language models and trusted autonomous systems for community resilience and safety*;

**Brett Loughlin**, Chief Officer South Australian Country Fire Service – *Big thinking: innovation in our sector, or smaller thinking that could make a difference*;

**Dr Sally Potter**, Senior Social Scientist GNS Science New Zealand – *Personalised warnings for future natural hazards*; and

**Prof Barbara Norman**, chair Urban Policy Forum advising the Australian Government University of Canberra – *Future urban planning policy in a natural hazards context*.

To create a visual representation of the themes and big ideas of the Forum, a graphic artist captured the action of many sessions.

Delegates heard 75 keynote and research presentations around the themes big thinking; risk informed decision making; situational awareness; resilient communities and Country; early – and mid-career researchers; workforce; and resilient built environments.

These presentations were followed by panel and workshop sessions, providing an opportunity for greater exploration of the themes, with expert and industry panels providing additional in-depth perspectives and conversations to equip delegates to implement research-backed practices in their fields of work.

The impact of natural hazards on First Nations communities and approaches to enabling stronger Indigenous-led research were highlighted throughout the program and a pre-Forum roundtable.

The Forum was also an important opportunity to bring the Centre's postgraduate and early career researchers together, with the launch of the Early – and Mid – Career Academic and Practitioner Network, as well as a pre-Forum half-day workshop that focused on networking, links to industry and highlighting the pathways from researcher to practice.

Her Excellency, the Honourable Frances Adamson AC, Governor of South Australia closed the Forum with a call-to-action to think big and innovate.

In his closing remarks, Mr Gissing stressed that while big, bold thinking is needed to meet the future needs of Australia's natural hazards landscape, the path will not be easy.

"I encourage you all to be brave. To take the learnings and discussions from this week to your organisations, researchers, practitioners and leaders," Mr Gissing said.

"I'm blown away by the passion and energy in the room. If we encourage each other to take this energy back into our own workplaces, in our own context, we can share this passion to bring about safer, more sustainable and resourced communities," Mr Gissing said.

Delegate highlights included:

→ **Networking** – there was a buzz between sessions and at social events with connections made and relationships strengthened, as well as continuing the conversations from sessions. The executive breakfast with Dr Sally Potter and external events, such as breakfasts hosted by the Australasian Women in Emergency Network and Fire to Flourish, provided opportunities to connect with people with similar interests.

*"The views I heard opened my mind to the work that is needed to make a collaborative, supportive network of everyone involved in emergency management," Attendee.*

→ **Challenge** – delegates noted the candid discussion of big ideas, obstacles and points-of-view pushed them to explore differing themes and viewpoints.

*"The conversation about how to bring the sector along in future discussions about AI and tech, as well as the need to provide more balance perhaps with social innovation commentary and perspectives was fascinating and challenging," Attendee.*

→ **Content quality** – presenters did an excellent job in synthesising their research and practice.

*"The presos were just right and the audience were engaged from the first word," Attendee.*

**Left:** All the talks and debate at the Natural Hazards Research Forum were captured by artist Dayna Hayman. For the full set go to <https://www.naturalhazards.com.au/2024-natural-hazards-research-forum-recordings-photos-presentations-and-posters>



# Highlights of the Centre's event participation and support

## Conferences

### Local research, global impact

The global fire science community gathered to discuss the latest research, practices and future themes at the 7th International Fire Behaviour and Fuels Conference held concurrently in Canberra Australia, Boise Idaho, and Tralee Ireland in April.

The Fire Behaviour and Fuels conference was hosted by the International Association of Wildland Fire (IAWF), the professional membership association for wildland fire professionals, with Natural Hazards Research Australia the main sponsor.

Across the three venues, 11 keynote speakers and 363 presentations took place around the theme *Fuel, Fire and Smoke: Evolving to Meet Our Climate Challenge*, with Australasian delegates treated to more than 100 research presentations from colleagues, peers, research students and industry leaders.

Several Centre-funded researchers and students featured in the program, and Centre Communications Director David Bruce was on the global conference organising committee. Key themes tackled included: risk modelling; fuel management; emerging tech and approaches; cultural perspectives; human dimensions; and weather and climate.

### Planning for flood resilience

Flood professionals and community members from across Australia and internationally gathered in Brisbane for the 2024 Floodplain Management Australia Conference in May.

The Centre ran two pre-conference workshops on the first day and supported several researchers to speak in the main program.

FMAConf24 was hosted by Floodplain Management Australia (FMA), the peak national body for flood risk practitioners.

Hosted by the Centre, Prof Gavin Smith from North Carolina State University presented the opening keynote sharing his lessons from large-scale American buyouts and relocation programs after severe floods and hurricanes. His international perspective and first-hand experience provided invaluable insight to the diverse delegates.

Centre researchers A/Prof Mel Taylor, Macquarie University, NSW DCCEEW, Dr Carla Mooney, the Bureau and Dr Darryl Stellmach, University of Tasmania spoke on the post event flood research in Queensland, New South Wales and Tasmania.

Presenting her project on disaster insurance as an opportunity for risk reduction was Centre researcher Prof Paula Jarzabkowski, UQ while Dr Minna Saaristo, Environmental Protection Authority Victoria presented findings from the flood contamination sampling and analysis project, detailing contaminants of emerging concern.



**Left:** Booths at major sector events provided a central place for networking and sharing research, including at the Floodplain Management Conference in Brisbane.



### AFAC23 conference

Hosted by AFAC, the Centre was again Industry Supporter of the sector's annual conference in Brisbane in August. The CEO delivered a keynote address and the Centre's research program was strongly promoted through an engaging booth in the exhibition space. More than 3,000 emergency personnel attended, with over 200 trade exhibitors.

### Disaster and Emergency Management

The Disaster and Emergency Management Conference (DEMC) was held on the Gold Coast in July 2023, with the Centre as a supporting partner and on the program committee. During the same month the Emergency Management Conference (EMC) was held in Melbourne with the Centre a supporting partner. These conferences are important sector forums for Queensland and New South Wales, and for Victoria, Tasmania and South Australia. Centre research featured on each program.

At both conferences, Centre staffed booths that provided a central point for networking and meeting with conference delegates, of which there were more than 500 at each event.

### Emergency Media and Public Affairs Conference

The Centre supported this annual conference in Canberra in June through sponsorship and representation on the conference committee.

Neil Munro (CFA/Safer Together), pictured below, presented the *Schools in Fire Country* program, sharing how a child-centred approach to disaster risk reduction is empowering upper primary school kids to take charge of bushfire planning in their schools, homes and communities.

Community understanding, perceptions and use of maps during active bushfires was the focus Dr Erica Kuligowski, RMIT University and Dr Paula Dootson, QUT, presenting findings from the broader *Predictions in public* project.

**Below, left:** The 7th International Fire Behaviour and Fuels conference was held concurrently in Canberra, Australia, Ireland and the United States, in April.



**Below, right:** Neil Munro spoke to the Emergency Media and Public Affairs conference about Schools in Fire Country.



## Knowledge sharing forums

### Fire in the North

More than 60 fire management professionals from across northern Australia gathered in north Queensland to discuss common issues and research opportunities in June.

Three days of the North Australia Fire Manager's (NAFM) forum included talks on prescribed fire, risk identification, recovery, cultural fire, invasive grasses and other hazard fuels, heat management, and research planning for the region.

The forum was hosted by the QFES and Queensland Parks and Wildlife, with support from the Centre.

Nicola Moore, Centre Node Research Manager presented an overview of research underway relevant to northern Australia and outlined the process of getting new research funded through the Centre.

The forum ended with a field trip to Wambiana Station, a working cattle station and long-term research site on landscape, fire and grazing near Charters Towers. The meeting marked a rebirth for NAFM underpinned by Centre support, with the intention to hold an annual meeting and collaboration within 12 months on matters of fire and hazards management throughout the north of Australia.

### Moungibi (Burketown) Indigenous Emergency Management Forum

A group of Indigenous community leaders, emergency services and Centre researchers gathered in remote northern Queensland in September to strengthen local partnerships between First Nations communities and emergency management services.

Approximately 40 people were in Moungibi (Burketown), in the Gulf Region of Queensland, co-hosted by the Northern Australian Indigenous Land and Sea Management Alliance (NAILSMA), the Carpentaria Aboriginal Land Council Aboriginal Corporation and Gunggalida Garawa Traditional Owners. More than 20 Indigenous representatives from communities spanning the Kimberley, south-east Western Australia, Northern Territory and north Queensland, senior emergency management from QFES, NT Police, Fire and Emergency Services and Bushfires NT, DFES from WA, local government and other agency representatives were involved.

The research contingent was represented by the Galiwin'ku Research Group, NAILSMA, ANU and the Centre. Centre Node Research Managers Nicola Moore and George Goddard took the opportunity to listen to and learn from the First Nations representatives and participated in discussions around the Centre projects.

### Indigenous-led research

The inaugural National Indigenous Disaster Resilience Summit held in Brisbane in August brought together emergency management practitioners, community leaders, organisations, non-government representatives and researchers from across Australia and New Zealand.

The Summit was hosted by Monash University's Fire to Flourish program and supported by the Centre, along with AIDR, Bigibilla Indigenous Consultants and Jagun Alliance.

The Centre sponsored several Indigenous researchers to attend, while several Centre staff attended to learn from the First Nations practitioners, researchers and community members, listen to the conversations about how to best facilitate Indigenous disaster resilience and document the event.



### Board and stakeholder engagement

The Board hosted stakeholder events in Darwin, Sydney, Canberra and Melbourne throughout 2023–24. These events were an opportunity for representatives from federal and state government departments, emergency service agencies, research institutions, the private sector and not-for-profits to learn first-hand about the Centre, its vision and mission, and the impactful research being undertaken.

Each event has its own local flavour, with the April Canberra event featuring an addresses from the NEMA Coordinator-General National Emergency Management Agency, Brendon Moon and Commissioner Australian Capital T Emergency Services Agency (ACT ESA), Wayne Phillips. Following this was an inspiring keynote delivered by Commonwealth Chief Nursing Officer, Adj Prof (Practice) Alison McMillan PSM.

Researcher Prof Jason Sharples, UNSW shared insights from his research into extreme fire behaviour science and Centre PhD scholarship holder, Fadia Isaac from FedU shared her PhD research on sleep, trauma and recovery after hazards.

### Innovation Workshop with AFAC Council

At the invitation of the AFAC Council, the Centre led a future-thinking for the sector innovation session in May. Futurist and business leader, Dr Catherine Ball (below) prompted AFAC Council members, the leaders of Australia's fire, land and emergency service agencies, to consider the intersection of technology, the environment and people meet to find innovative ways to make communities safer and more resilient to future natural events.



**Right:** Dr Catherine Ball challenged sector leaders on future thinking in Canberra in May.

## Webinars

### Celebrating First Nations Research

This all-First Nations webinar held during NAIDOC Week in July was MC'd by the Centre's Reconciliation Working Group Chair Tammy Small, UOW, with panelists Oliver Costello, Board member and Jagun Alliance and Meagan Considine, Brungle-Tumut Local Aboriginal Land Council, speaking about their work, meaningful inclusion of First Nations peoples and the way ongoing First Nations research builds on the teachings of Elders. 172 people attended, with 85 replays.

### Supporting community-led recovery

This July webinar showcased the findings from the *Community-led recovery: evidence, dimensions and supports for Community Recovery Committees* project to 104 attendees. Researchers Dr Colin Gallagher and Hannah Morris, UoM presented the findings and were joined by Melanie Bloor from Resilient Uki in northern New South Wales. As a community participant in the research, Melanie shared her firsthand experience of the research and the usefulness of the tools it has developed. 264 replays of the webinar have been recorded since it was published.

### PhD research showcase

Designed to give a platform for PhD researchers to share research findings, this webinar in September featured Rebecca Ryan, UOW, Fadia Isaac FedU, and Cameron Atkinson, UTAS. Each explained their PhD research, progress so far and how their findings could be used to 53 attendees, with 75 replays of the webinar.

### Principles of culturally safe research

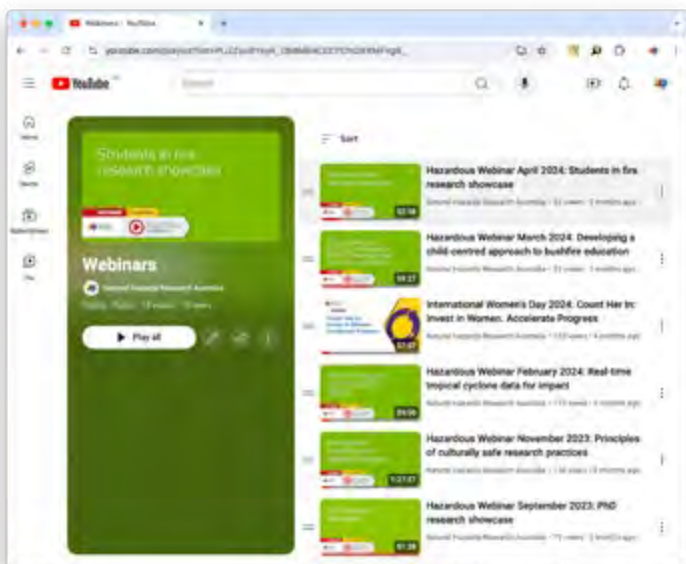
This webinar in November launched a valuable new resource aid on cultural land management research. *The Principles and protocols for cultural land management governance and research* summarises relevant collaborative principles, processes and protocols for agencies and researchers. Authors Oliver Costello, Bundjalung man, Centre Board member and Director of the Jagun Alliance Aboriginal Corporation, and Dr Tim Neale, Centre researcher from Deakin University, led the webinar. A key premise of the webinar was to learn from other countries and their experiences, with the Canadian perspective from Dr Amy Cardinal Christianson (a Métis woman from Parks Canada and member of the Centre's International Research Advisory Panel) and Alex Zahara (Canadian Forest Service). 72 people attended and 155 additional views were recorded post-webinar.

### Real-time cyclone data

The latest research highlighting the benefit of real-time tropical cyclone data collection was showcased in a webinar in February to 58 attendees. Attendees heard from Dr Matthew Mason, UQ, Dr David Henderson, James Cook University and end-user Francesca Kirby from the Australian Reinsurance Pool Corporation, about how real-time tropical cyclone data is collected and how this data is informing critical housing and insurance outcomes for people living in cyclone-prone areas. Matthew, David and Francesca explained findings and their use from the *Streamlining SWIRLnet data acquisition, analysis, storage and dissemination procedures* project. This webinar was viewed 168 times after it was published.

### Counting her in

An expert panel gathered on the eve of International Women's Day to discuss the ongoing challenges facing women in the emergency sector, as well as share what the research is highlighting as the way forward. Co-hosted with Gender and Disaster Australia, 55 attendees heard from Dr Tegan Larin, Monash University, Kate Brown (NSW Department of Planning, Industry and Environment), Stephanie Andrade, AFAC and AIDr and Loriana Bethune from Gender and Disaster Australia. Tegan, Kate, Stephanie and Loriana highlighted how research can inform constructive and sustainable conversations and action within the emergency and disaster sector, as well as noting the gap in research addressing non-binary community members. This webinar has been watched back 177 times.





### Blueprint for child-centered approach to bushfire education

*Schools in fire country*, an innovative, participatory bushfire education program enabling place-based teaching and learning in upper primary school classrooms in Victoria, was showcased in March's webinar to 85 people. The webinar featured Neil Munro (Safer Together/Country Fire Authority), Dr Briony Towers (Leadrrr), Leigh Johnson (Principal, Harkaway Primary School), Caragh Robinson (Department of Education, Victoria) and Scott Purdon (Teacher, Chewton Primary School) who discussed how research was translated into an effective school-based program. This webinar was viewed 24 times after it was published.

### Firey PhDs

April 2024's webinar celebrated the new research faces and topics in Australia's fire landscape with a *Students in fire research showcase*. The webinar heard about three PhD research projects from Suki Jaiswal, UNSW, on bushfire smoke and eye health; Harikesh, USC, on remote sensing and machine learning to predict forest fire spread; and Douglas Radford, UoA, on collaborative and adaptive fire risk-reduction. Each explained their PhD research, progress so far and how their findings could be used to 16 attendees, with 47 replays of the webinar.

### PhD research showcase

Designed to give a platform for PhD researchers to share research findings, this webinar in September featured Rebecca Ryan, UOW, Fadia Isaac FedU, and Cameron Atkinson, UTAS. Each explained their PhD research, progress so far and how their findings could be used to 53 attendees, with 75 replays of the webinar.

## Workshops

The Floodplain Management Association conference featured two Centre workshops. The morning workshop sessions began with *The data is in – How can we use research to shape change?* with Centre researchers A/Prof Mel Taylor, Macquarie University/NSW DCCEEW, Dr Carla Mooney, the Bureau, and Dr Darryl Stellmach, UTAS.

A/Prof Mel Taylor presented the findings of the post-event flood research conducted in Queensland and New South Wales. Mel demonstrated how the findings provide insights for agencies, government departments and recovery bodies to use for planning for community preparedness, response and recovery.

Dr Carla Mooney shared her research on preparing systems, people and public messaging to reduce the impact of flash floods. Carla's research showed the gap between people's perceived understanding of flood readiness, versus their actual preparedness.

Dr Darryl Stellmach's research on community preparedness through the experiences of the Tasmania State Emergency Service flood warning systems is working to improve future flood warning systems and community disaster preparedness programs.

All three researchers also presented in the conference main program.

Prof Gavin Smith, hosted by the Centre from North Carolina State University, ran the afternoon workshop on assisted buyouts.



**Left and below:** Prof Gavin Smith led a workshop and a keynote presentation on community-led relocations for flood risk reduction at the Floodplain Management conference in Brisbane.



# Commitment to reconciliation

The Centre is committed to promoting reconciliation within the organisation and throughout the natural hazards research community where possible. Through the development of a Reconciliation Working Group and *Reconciliation Action Plan*, the Centre is implementing reconciliation in its processes, programs and partnerships.

## Reconciliation Working Group

This management-level group met twice during the reporting period.

The group's chair was the Centre's Senior Communications Officer, Bethany Patch until 13 October when Node Research Manager George Goddard assumed the role. Current Working Group members include CEO Andrew Gissing; Science and Innovation Director Professor Cheryl Desha; Board members Oliver Costello, Bundjalung man, Executive Direct of the Jagun Alliance, and Sandra Whight, National Aerial Firefighting Centre; staff representative Friedo Ligthart; and First Nations member Bhiemie Williamson, Euahlayi man and Research Fellow, Monash University. We would also like to acknowledge all the working group member who contributed to the governance and delivery of the RAP over this reporting period:

- Ricky Archer, NAILSMA, now National Parks
- Tammy Small, UOW
- Prof Deb Bunker, Centre Chief Science Officer
- Dr Kat Haynes, the Centre, now Department of Climate Change, Energy, the Environment and Water NSW
- Nick Mahony, the Centre, now Building 4.0 CRC
- Beth Patch, the Centre and former Chair of the RAP working group, now Fire to Flourish

## Reconciliation Action Plan (RAP)

The Centre's *Reflect RAP* was published in September 2022 and launched in October 2022. It outlines the Centre's plan for embedding First Nations recognition within partnerships, programs and processes

The Reconciliation Action Plan was extended for six months to December 2023 and concluded with 56 of the 63 deliverables completed and another seven partially completed. Deliverables achieved during this reporting period include:

- The Centre committed \$2,055,250 to First Nations-related research projects in addition more than \$32,000 of procurement from First Nations suppliers since the RAP started. These projects included:
  - *Connecting Indigenous people and the emergency management sector – effective partnerships* (led by North Australian Indigenous Land and Sea Management Alliance)
  - *Cultural land management research and governance in south-east Australia* (led by Jagun Alliance and Deakin University)
  - *Scoping operationalisation for Aboriginal land management* (led by NSW Department of Planning and Environment)
  - *Healing Country through Wolgalu/Wiradjuri-led land management* (led by Brungle-Tumut Cultural Natural Resource Managers and the UOW)
  - *Cross-cultural relationships in natural resource management: understanding the nature and experiences of partnership and collaboration* (postgraduate research led by Deakin University)

- A number of others are approved and are in establishment phase:
- *Effect of cultural burning on soil health* (proposed by South Australia's Department of Environment and Water)
- *Disaster resilience in Indigenous communities* (proposed by the Australian Institute for Disaster Resilience)
- *Lived experiences of First Nations emergency and land management and resilience personnel* (proposed by AFAC)
- The Centre hosted a webinar to celebrate NAIDOC week, showcasing First Nations researchers on 6 July 2023.
- The Centre hosted a second webinar on Principles of culturally safe research practices to launch the *Principles and protocols for cultural land management governance and research*. This featured contributions from Indigenous and non-Indigenous researchers from Australia and Canada and has been developed into an online resource to support researchers in undertaking culturally safe collaborations with First Nations stakeholders.
- The Centre ran a workshop with several First Nations and non-Indigenous stakeholders to establish principles for a scholarship supporting First Nations students to pursue a career in natural hazards research. The principles were drafted, circulated for review and submitted to the Centre's board for approval.
- All staff attended an on-Country training day at Corranderk in Victoria in October, with a report on cultural safety training impacts and future needs developed.



Since the Reflect RAP period finished the Centre has continued to pursue the outstanding deliverables and continues to do so. Achievements since the closure of the RAP include:

- Modifying our Research Services Agreements to enable strong provision for the integrity of Indigenous Cultural Intellectual Property (ICIP).
- The establishment of web page with resources to support researchers and sector stakeholders to collaborate with First Nations rights-holders in a manner consistent with the *Principles and protocols for cultural land management governance and research*.
- The establishment of the First Nations Knowledge Network, designed to connect the research working on First Nations focussed research with the Centre to share knowledge and opportunities and help inform the development of a First Nations Strategy.

## First Nations Strategy and Pathways Working Group

The Reflect RAP concluded shortly after the Voice Referendum result in October 2023. The membership of the working group changed extensively during that time, prompting the group to reflect on what Reconciliation means post-Referendum.

Subsequently the group developed a proposal to form a Pathways Working Group to help inform the development of a First Nations Strategy. The working group put forward this proposal and prioritised it over the development of another RAP as it would help the Centre, which is positioned to make considerable contributions towards Reconciliation, better articulate the outcomes it is trying to achieve with First Nations peoples.

The proposal and Terms of Reference for the group was accepted in April 2024 and the Centre has started developing a recruitment process for the Pathways Group and a consultation process for the development of the First Nations Strategy.





## School bushfire safety

A Centre research-based primary school bushfire initiative was recognised nationally by taking out the 2023 Resilient Australia National School Award.

Harkaway Primary School backed up their state level win at the 2023 Victorian Resilient Australia Awards with the national prize, presented at a ceremony in Perth in November.

The school was recognised for a range of activities, including the establishment of a student led bushfire safety committee and the development of a 'Bushfire Safety Manifesto' – both outcomes of a Bushfire and Natural Hazards CRC research project led by Dr Briony Towers (Leadrrr) and the late Prof Kevin Ronan (CQU).

The Award also recognised Harkaway Primary School's contribution to Schools in Fire Country, a Centre project in collaboration with Safer Together. Led by Neil Munro (CFA) and Dr Towers, Schools in Fire Country enabled agencies, experts and educators to collaborate on the development and implementation of a new research-informed bushfire education program.

Centre research was also a finalist in the overall national award, for the Community-led recovery: evidence, dimensions and supports for Community Recovery Committees project.

The research team of Prof Lisa Gibbs, Dr Colin Gallagher, Dr Kate Brady and Hannah Morrice from UoM addressed the knowledge gap around Community Recovery Committees to develop practical tools and resources to better support Community Recovery Committees.

## Fire research honoured

A significant honour from the Australian Academy of Science was awarded to Centre researcher Dr Hamish Clarke, UoM.

The 2024 Frederick White Medal recognises Dr Clarke for his dedication to advancing Australian bushfire science. Dr Clarke works on three projects for the Centre and his research explores all things bushfire science, ranging from prescribed burning to the impacts on communities, driven by real-world applications.

In addition to his contributions to bushfire research, the award recognises Dr Clarke's excellent skills as a science communicator. Hamish makes science accessible to the public as a freelance writer, as well as speaking at public events and on the radio. He co-founded *Science at the Local* ten years ago to talk about science at pubs in the Blue Mountains.

Additionally, Dr Clarke was awarded an Australian Research Council Mid-Career Industry Fellowship to further enhance current bushfire risk mitigation measures and bridge the gap between research and practice.

## Sleep and mental health

Fadia Isaac, (pictured below, middle) clinical psychologist at FedU and Centre Postgraduate Research Scholar, won Cooperative Research Australia's Early Career Researcher Competition.

Four finalists presented at the Innovate Collaborate 2023 conference, held in Adelaide in July, each giving a five-minute presentation on the practical application of their research, with Fadia's presentation of her Online cognitive-behavioural intervention for treatment of insomnia and nightmares in bushfire survivors project taking out the winning spot and a \$5,000 prize.

Fadia's study is an online, self-paced sleep intervention trial called Sleep Best-i, developed for treatment of sleep disturbances such as insomnia, nightmares or sleep trauma in bushfire survivors.

"The hope is that Sleep Best-i will give individuals increasing self-governance when it comes to their mental health and sleep patterns," said Fadia.





## Communications and engagement

Emergency Media and Public Affairs (EMPA) recognised two Centre research projects with awards at its national conference in June.

The research category was awarded to the *Community experiences of the 2022 Australian floods – Queensland and New South Wales* project, comprising researchers A/Prof Mel Taylor, Macquarie University/DCCEEW, A/Prof Fiona Miller, Macquarie University, Prof Kim Johnston, QUT, A/Prof Anne Lane, QUT, Dr Barb Ryan, University of Southern Queensland (USQ), A/Prof Rachel King, USQ, Dr Harriet Narwal, Macquarie University, Madeleine Miller, Macquarie University, Dr Dipika Dabas, USQ and Helga Simon, Macquarie University, with support from Michael Carroll, QFES, and Heather Stuart, NSW SES.

The community engagement category was awarded to the *Schools in Fire Country* project, comprising Dr Briony Towers (Leadrrr), Neil Munro (CFA/Safer Together), Harkaway Primary School, the Department of Energy, Environment and Climate Action.

**Below:** A/Prof Mel Taylor, accepted the EMPA research award from Jeremy Hillman, EMPA Co-chair and Joe Buffone, Deputy Coordinator General at NEMA.



## Flood research

Macquarie University recognised their researchers A/Prof Fiona Miller, A/Prof Mel Taylor, Dr Harriet Narwal, Madeleine Miller and Helga Simon with the Macquarie University Faculty of Arts 2023 Research Engagement Highly Commended Award for their work on the Centre's *Community experiences of the 2022 Australian floods – Queensland and New South Wales* project.

## Communicators

Centre researcher A/Prof Mel Taylor and Communications Manager Nathan Maddock were awarded EMPA Fellowships at the 2024 national conference. The Fellowships recognise their long-standing dedication to EMPA and emergency communications in Australia.



# Appendix 1 Milestones

## Progress against Biennial Research Plan 2023–24 milestones

Milestone	Agreed end date	Actual / anticipated end date	Current % complete	Progress comments – work undertaken and impact of any delay
<b>Biennial Research Plan 2024–26 drafted and endorsed by Centre Board</b>	30 June 2024	30 June 2024	100%	Centre Board endorsed the Biennial Research Plan after stakeholder consultation in June 2024.
<b>All funded research complying with Centre’s research data framework. Online data catalogue is available, populated and utilised</b>	30 June 2024	30 June 2024	70%	Funded research complies with research data framework. Proof of concept data catalogue completed. Project planning for next phase complete. Recruitment underway for Digital and Data Manager to progress next phase.
<b>Outcomes, findings and insights from post-disaster research projects shared in a timely manner</b>	30 June 2024	Ongoing	100%	Findings of community experiences of 2022 flooding have been extensively communicated. Further post-flooding research is underway in VIC, SA and Tas.
<b>The Centre engages with relevant national and international research initiatives</b>	30 June 2024	Ongoing	100%	Activities have included: → Exchange with NZ National Science Challenge → International webinar on culturally appropriate research practices including Canadian researchers → Centre has maintained regular dialogue with the Queensland Disaster Research Alliance and the NSW Bushfire and Natural Hazards Research Centre → Continued discussions with US and NZ to establish an international community of practice on assisted relocation → Partner in the FirEurisk project
<b>October 2023 research project investment round complete and approved by the Centre’s Board</b>	31 December 2023	31 December 2023	100%	Investment round completed
<b>Research projects approved for development before 30 June 2023 awarded by 31 December 2023</b>	31 December 2023	31 December 2024	95%	
<b>Research projects to be mapped into programs of work with a clear narrative. Programs governed by Translation and Implementation Panels and supported by research networks where practicable</b>	31 January 2024	31 January 2024	100%	Research projects mapped into programs of work. Translation and Implementation Panels to be piloted in 2024/25
<b>Research projects approved for development before 31 December 2023 awarded by 30 June 2024</b>	30 June 2024	31 December 2024	90%	



Milestone	Agreed end date	Actual / anticipated end date	Current % complete	Progress comments – work undertaken and impact of any delay
<b>April 2024 research project investment round complete and approved by the Centre's Board</b>	30 June 2024	30 April 2024	100%	Investment round completed
<b>Monitoring and evaluation framework implemented to provide systematic demonstration of the Centre's impact</b>	31 January 2024	Ongoing	100%	Evaluation framework approved by the Board in July 2023. Enhanced monitoring of research portfolio implemented and case studies to illustrate research impact collected and reported.
<b>Scholarship and work placement program integrated into end-user driven core research program and contribute to research impact</b>	30 June 2024	30 June 2024	100%	Expression of Interests for core research projects encourage collaborative approaches including the placement of researchers within end-user organisations. Scholarships mapped within programs.
<b>Award of at least one scholarship to a First Nations recipient</b>	30 June 2024	31 January 2025	80%	Scholarship design approved by NHRA Board after extensive co-design with First Nations stakeholders. Resolution of Indigenous Cultural and Intellectual Property terms have delayed the awarding of the scholarship.
<b>Early Career Research Fellowships awarded</b>	30 June 2024	30 June 2024	100%	2 awarded
<b>Disaster Challenge Held</b>	30 June 2024	19 October 2023	100%	A successful Disaster Challenge was completed in 2023. The 2024 Disaster Challenge is now underway.
<b>Research network established</b>	30 June 2024	15 May 2024	100%	Early- and Mid-Career Academic and Practitioner Network launched
<b>Opportunities to utilise research through education and training programs in consultation with participants and stakeholders are identified</b>	30 June 2024	30 June 2024	100%	Opportunity analysis presented to the Education and Training Committee
<b>Annual Natural Hazards Research Forum</b>	30 June 2024	16 May 2024	100%	
<b>Regular series of research translation and engagement events delivered with high participation and positive feedback for example workshops and webinars.</b>	30 June 2024	30 June 2024	100%	90 research related events

# Appendix 2 Projects

Project name	Research provider	Research theme/s	Summarised outcomes – targeted or completed
<b>Best practice for tracking and responding to potentially traumatic event exposure</b>	University of Melbourne	Communities and workforces of the future; Evidence-informed policy, strategy and foresight	<p>This project will determine best practice in tracking fire and emergency service workers' exposure to potentially traumatic events, and organisational responses to them. It will support Australian fire and emergency service agencies to assess their current practice against international best practice and select suitable psychosocial risk management systems that include tracking cumulative exposure to potentially traumatic events and organisational responses.</p> <p>The overall and long-term desired outcome of this project is that the psychological health and safety of fire and emergency service workers is strengthened and improved through the appropriate and most effective use of best practices and fit-for-purpose psychosocial risk management systems by their agencies.</p> <p>An assessment of whether it is favourable and feasible for the Australian emergency services sector to collectively share the development of a new psychological wellbeing and safety risk management system.</p>
<b>Connecting Indigenous people and the emergency management sector – effective partnerships</b>	North Australian Indigenous Land and Sea Management Alliance	Communities and workforces of the future; Sustainable, safe and healthy natural landscapes	<p>This project has strengthened the collective Indigenous understanding and position on engagement in emergency management in northern Australia, providing a stronger and better-informed foundation for future work practice and partnerships. In September 2023 a forum was held in Mounqibi (Burketown), Queensland that brought together Traditional Owners and land managers, agencies and government from across northern Australia. The outcome of this workshop was a Joint Statement of Intent and exploring potential further projects that can provide evidence of the value of investment into local Indigenous Ranger programs on cultural land management, building community capability for emergency management and other community outcomes.</p>
<b>Emergency management volunteering: more than just words</b>	Victoria University	Communities and workforces of the future	<p>This project will move the emergency management sector past discussing challenges for emergency management volunteering and the need for change in the sector, and into practical, tangible action to tackle the challenges, guided by a National Emergency Volunteer Sustainability Blueprint.</p> <p>Phase 1 – Design will provide the blueprint for undertaking Phase 2 – Action. The blueprint will provide tangible and actionable guidance for volunteer-involving organisations in the emergency management sector, and the sector, to make changes to improve the sustainability of emergency management volunteering into the future.</p>
<b>Schools in Fire Country</b>	Leadrrr	Communities and workforces of the future	<p>Built on the findings from the Bushfire and Natural Hazards CRC's Child-centred disaster risk reduction project to design, trial and evaluate a pilot community-centred, place-based participatory program for upper primary school students and refine an approach for scaled implementation in high-risk locations across Victoria. Developed in partnership with CFA management, local brigades and school communities, as well as the broader emergency management sector, particularly Safer Together delivery partners such as the Department of Energy, Environment and Climate Action (DEECA). A three-phase learning model and a comprehensive set of teaching and learning modules was trialled at Harkaway Primary School in 2022, demonstrating that when quality, research-backed resources and localised support are provided, the contributions that students and teachers can make to bushfire risk management are wide-ranging and profound. This was further tested and validated at Chewton Primary School in 2023, along with Newstead Primary School and Heathcote Primary School in 2024. Harkaway Primary School plans to run the program again in late 2024. A \$650,000 grant from NEMA's Disaster Ready Fund is now enabling the program to be trialled in schools around Victoria.</p>





Project name	Research provider	Research theme/s	Summarised outcomes – targeted or completed
<b>Evaluating the Resilient Homes Fund</b>	University of Queensland	Resilient built environment; Evidence-informed policy, strategy and foresight	This project is evaluating Queensland’s Resilient Homes Fund, addressing four dimensions of resilience (physical, financial, social, and emotional) by assessing buy-back, retrofit and house-raising, to demonstrate the success factors and lessons learnt for each as they link to the four resilience dimensions. The project is addressing these two questions: <ul style="list-style-type: none"> <li>→ How does a resilient reconstruction program enhance the physical and financial resilience of homeowners and communities?</li> <li>→ What are the key components of successful implementation of a resilient reconstruction program?</li> </ul>
<b>Integrated solutions for bushfire-adaptive homes</b>	CSIRO	Resilient built environment; Resilient communities	This project will provide a better understanding of the causes of the failure rates of homes. It will explore: <ul style="list-style-type: none"> <li>→ What measures would best reduce failure rates?</li> <li>→ Understand social levers that could be better utilised to influence and support communities to better protect homes from bushfires.</li> </ul>
<b>Modelling impacts of natural hazards on interconnected infrastructure networks</b>	University of Queensland	Resilient built environment	This research is improving the ability to estimate direct costs of infrastructure damage and to assess the financial benefits of infrastructure betterment in the context of current and future climates. This includes the capability to estimate infrastructure restoration timeframes to inform emergency management planning and risk assessment.
<b>Cultural land management research and governance in south-east Australia</b>	Deakin University	Sustainable, safe and healthy natural landscapes; Resilient communities	This research has strengthened collaborative governance and research involving Indigenous land and fire managers and state, territory, and local government agencies. It was built on and enhanced existing partnerships and relationships between Indigenous land management organisations, Traditional Owner groups and university-based researchers and creating opportunities to generate new and/or future partnerships and relationships. A key development is the Principles and protocols for cultural land management governance and research and the companion guide for use. These resources summarise relevant collaborative principles, processes and protocols for agencies and research institutions and are intended to act as a starting point for local and in-depth conversations.
<b>Healing Country through Wolgalu/Wiradjuri-led land management</b>	University of Wollongong and Brungle-Tumut Local Aboriginal Land Council	Sustainable, safe and healthy natural landscapes; Evidence-informed policy, strategy and foresight	This project will run on-Country activities to revitalise and share cultural knowledge and to develop resources that tell Wolgalu/Wiradjuri histories and knowledge of Country. The project will better understand what Wolgalu/Wiradjuri Caring for Country looks like today.
<b>Operationalising Aboriginal land and sea management</b>	Department of Climate Change, Energy, the Environment and Water NSW	Sustainable, safe and healthy natural landscapes; Evidence-informed policy, strategy and foresight	This project is providing a foundational understanding necessary for implementing landscape Aboriginal land and sea management. The foundational understanding will provide government support for implementation and develop an accompanying research program to document learning and problem solving along the lines of a living lab model.
<b>Be Ahead of Ready</b>	Aither	Operational response and innovation; Communities and workforces of the future	To inspire bigger bolder thinking across the disaster resilience sector, this research and consultation identified big ideas to drive a resilient safe and sustainable future. The project provided a unique opportunity to engage with more than 300 stakeholders from a wide variety of sectors, including emergency management agencies and authorities, local, state and Commonwealth government, not-for-profit organisations (community and First Nations organisations), insurance and banking organisations, and research. Stakeholders were asked to think outside their sector and comfort zones to identify the big ideas that will positively change our future. The final report was launched at the Natural Hazards Research Forum in May 2024.

Project name	Research provider	Research theme/s	Summarised outcomes – targeted or completed
<b>Bushfire risk at the rural–urban interface</b>	University of Tasmania	Operational response and innovation; Resilient communities	<p>This project is:</p> <ul style="list-style-type: none"> <li>→ improving the understanding of how community led/centred action can be engendered and supported within communities living at the rural-urban interface to reduce risks in and around the asset protection zone.</li> <li>→ identifying key site and vegetation characteristics that affect bushfire behaviour within the rural-urban interface, including garden plant flammability and garden arrangement/landscaping.</li> <li>→ developing informed fire behaviour modelling that captures interface and garden fuels, fire spread and ember production in rural-urban interface zones.</li> <li>→ the identification and evaluation of potential mitigation measures for stopping and reducing the spread of fire into the rural-urban interface.</li> </ul>
<b>Community risk assessment</b>	University of Sydney	Operational response and innovation; Communities and workforces of the future	<p>This research developed a better understanding of the value of having a systematic approach to community-based risk that takes advantage of the latest computational and risk modelling advances. Working closely with the NSW State Emergency Service, the research reviewed current risk assessment processes to understand the challenges and needs across the emergency services sector, including insights from other relevant sectors. The results will inform future multi-hazard, compound and cascading community risk assessment approaches.</p>
<b>Decision making in emergency management</b>	CQUniversity	Operational response and innovation; Communities and workforces of the future	<p>This research is developing:</p> <ul style="list-style-type: none"> <li>→ high capacity for effective and appropriate crisis decision making in the Australian and New Zealand emergency management sectors across all levels</li> <li>→ decision-making capacity to be supported by well designed and implemented training and learning products that build on existing programs and tools</li> <li>→ a common, national approach to decision making across services and multi-agency training to support cross-agency decision making.</li> </ul>
<b>Developing an integrated predictive capability for extreme rainfall and inundation</b>	Bureau of Meteorology	Operational response and innovation	<p>This project is developing a prototype predictive capability, designed in collaboration with stakeholders and supported by social scientists, to improve forecasts of extreme rainfall and inundation and the communication of risk to emergency management.</p> <p>The capability will be a multi-disciplinary collaboration between meteorological, hydrological and radar research teams. This includes:</p> <ul style="list-style-type: none"> <li>→ enhanced use of ensemble numerical weather prediction</li> <li>→ quantitative rainfall estimation from STEPS radar nowcast application</li> <li>→ development of a prototype probabilistic inundation model</li> <li>→ case study analysis building on a related Centre flash flood project</li> <li>→ investigation of potential improvements to current forecast approaches using combinations of the above forecast applications</li> <li>→ assessment of the value in integrating the applications in a single predictive service model.</li> </ul>

Project name	Research provider	Research theme/s	Summarised outcomes – targeted or completed
<b>Sector partner engagement to enhance severe weather impact prediction</b>	Collaborative Consulting Co	Operational response and innovation; Situational awareness	This project explored the potential utility of exposure and impact forecasting for severe weather, specifically severe thunderstorms and large-scale winds. The project sought to understand the exposure and impact information that emergency management sector partners require to better support their decision making in preparing for and responding to severe weather to mitigate the impact for communities. Throughout the research many sector partners indicated that as exposure and impact forecasting is still a new concept, they are yet to fully turn their minds to impact forecasting information to support decision making during severe thunderstorms and large-scale wind events. However, the sector indicated significant interest and appetite to better understand exposure and impact-based forecasting generally and how it can be used to better support decision making across all hazards. The research will help steer further research projects that will be of most benefit for emergency response agencies, acknowledging there is strong interest in exposure and impact forecasting from a wide range of sector partners and industry stakeholders. The research formed the basis of a submission by the Centre to the Queensland Inspector-General Emergency Management's 2023-24 Severe Weather Season Review.
<b>Fire ember transport</b>	Bureau of Meteorology	Operational response and innovation; Situational awareness	This project developed a software interface between the development version of Spark Operational and the ember transport parameterisation model. <ul style="list-style-type: none"> <li>→ Develop code to calculate the fire properties that are required by the ember transport parameterisation.</li> <li>→ Insert code in Spark to call the ember transport parameterisation.</li> <li>→ Modify code to supply meteorological data to the ember transport parameterisation as necessary.</li> <li>→ Develop code to pass new spotfire ignitions back to Spark.</li> </ul>
<b>Identifying and defining landscape dryness thresholds for fires</b>	University of Melbourne	Operational response and innovation	This project is improving metrics for identifying bushfire risk, guiding suppression tactics and supporting prescribed burning operations. This will include having quantitative detail describing the metrics, constraints, limitations and potential applications. The outcomes will include improved accuracy of fire simulation systems and fire danger ratings systems, added value to seasonal forecasts and better interpretation of landscape condition monitoring systems, leading to enhanced community safety, better preparedness and reduced fire impacts.
<b>Identifying water sources for aerial firefighting</b>	Frontier SI, Geoscience Australia	Operational response and innovation; Situational awareness	A collaboration with the National Aerial Firefighting Centre, Geoscience Australia and FrontierSI. Researchers delivered a prototype workflow for a spatial product whose primary use is identifying the locations of accessible water bodies with increased accuracy, so that aerial firefighters can more quickly and effectively extinguish fires. This prototype can now be used by NAFC and GA to improve the accuracy of location data for aerial firefighting.
<b>Long-range flood outlook for strategic preparedness</b>	Bureau of Meteorology	Operational response and innovation	This project is building a suite of national probabilistic long-range flood outlook and inundation products as a proof-of-concept for evaluation and testing. The products will be generated using computationally efficient flood inundation mapping, cutting edge statistical methods and state of the art climate, hydrology and earth observation data.

Project name	Research provider	Research theme/s	Summarised outcomes – targeted or completed
<b>Maintenance of the Australian Flammability Monitoring System</b>	Australian National University	Operational response and innovation	The Australian Flammability Monitoring System (AFMS) is a near real-time data service that provides satellite-derived information on live fuel moisture content (LFMC). LFMC is closely related to curing in grasslands and serves as an indicator of flammability in forests. The AFMS supports fire risk management and response activities, such as hazard reduction burning and positioning of firefighting resources. The current service is operated as a pre-operational service by ANU. The goal of this project is to be hosted by Geoscience Australia in their Digital Earth Australia infrastructure.
<b>SES fit for task</b>	Human Performance Science	Operational response and innovation; Communities and workforces of the future	Backed by more than a decade of research measuring the minimum physical fitness required by SES members to do their job safely and effectively, this research was launched nationally at the AFAC23 conference in Brisbane in August 2023. The program promotes the safety, health and wellbeing of SES members across Australia, reduces the risk of injury while performing required tasks and builds a culture of wellbeing and safety of SES members. The program also ensures SES members' ability to safely assist when deployed to support other states and territories during major emergencies. Since launching implementation has rolled out nationally – pilot trials are underway in Victoria, the Northern Territory, the Australian Capital Territory, Queensland, South Australia, New South Wales and Tasmania, with stakeholder consultations in Western Australia.
<b>Fire coalescence and mass spotfire dynamics</b>	University of New South Wales	Operational response and innovation	Investigating the role of dynamic fire propagation in the escalation of the 2019–20 south-east Australian bushfires. The aim is to better understand the role that vorticity drive lateral spread, and other modes of dynamic fire propagation, play in the escalation of bushfires to extreme levels including an in-depth cases study of one of the extreme bushfires that occurred during Black Summer.
<b>Why fly? How do we know that aerial operations are effective and efficient?</b>	University of Wollongong and CSIRO	Operational response and innovation	<p>The aims of this project are to:</p> <ul style="list-style-type: none"> <li>→ understand and build the existing user profile of Australia's aviation fleet across different landscapes</li> <li>→ understand the profile of the purposes for which the fleet is deployed and how effective that purpose has been.</li> </ul> <p>The project will provide a knowledge base to:</p> <ul style="list-style-type: none"> <li>→ justify the use of resources – this is why these particularly aircraft were acquired</li> <li>→ inform future funding requests – this is why we need this particularly type of aircraft</li> <li>→ improve operational decisions – this is why particular aircraft should or should not be used for a task.</li> </ul>
<b>Awareness, education and communications for compound natural hazards</b>	Deakin University, University of Tasmania	Resilient communities; Operational response and innovation	<p>Through case studies in Victoria, Queensland and NSW, this project has gathered data on the communication needs of community members in relation to compound natural hazards. It has developed a co-designed framework of good practice to guide communication with communities. This co-design will ensure the framework it is fit for purpose and immediately useful to emergency preparedness, management and recovery agencies.</p> <p>The framework will:</p> <ul style="list-style-type: none"> <li>→ improve shared understanding of the threats posed by compound disasters</li> <li>→ inform community engagement programs and agency capacity to ensure the public understands compound disasters, associated risks and how to prepare for them</li> <li>→ demonstrate the need to provide integrated community engagement and warning systems to develop awareness of the risks associated with compound disasters</li> <li>→ enhance communications planning in the context of disaster recovery.</li> </ul>



Project name	Research provider	Research theme/s	Summarised outcomes – targeted or completed
<b>Community-led recovery: Evidence, dimensions, and supports for Community Recovery Committees</b>	University of Melbourne	Resilient communities; Communities and workforces of the future	<p>This research has provided guidance and tools to Community Recovery Committees, building on previous work conducted after the 2019-20 Black Summer bushfires. The research explored four case studies in four different states across regional, urban, interface and remote communities that had experienced either a flood or bushfire, along with surveying disaster recovery workers. This research has improved coordination between agencies and groups working in recovery after a disaster, helped Community Recovery Committees understand how they are positioned within their community and assisted agencies to better understand the role, dynamics and challenges facing Community Recovery Committees. The research has:</p> <ul style="list-style-type: none"> <li>→ Developed a shared understanding of the roles of Community Recovery Committees</li> <li>→ Tested and validated the self-assessment tool built for Community Recovery Committees that was developed in Phase 1</li> <li>→ Measured representativeness of CRC membership using a social network approach, to help inform future recovery policy.</li> </ul>
<b>Increasing disaster resilience – creating the next version of the Australian Disaster Resilience Index</b>	University of New England	Resilient communities	<p>This project is producing a revised version of the Australian Disaster Resilience Index (ADRI 2) with updated datasets to inform key Commonwealth activities such as the development of a national natural hazards risk assessment which NEMA will undertake.</p>
<b>Natural hazards and resilience in complex urban systems</b>	RMIT University	Resilient communities; Resilient built environment	<p>This project will lead to a greater understanding of the multidimensional disaster impacts arising from natural hazard events for communities located in major urban areas in Australia, and how these impacts may change over time under the influence of climate change and rapid urbanisation.</p>
<b>Understanding the resilience of lifelines for regional and remote communities</b>	RMIT University	Resilient communities; Resilient built environment	<p>This research will:</p> <ul style="list-style-type: none"> <li>→ increase knowledge about Australia's lifeline characteristics, interconnections, vulnerabilities, strengths, needs and opportunities for improving resilience, of relevance to practitioners and researchers</li> <li>→ understand the primary research needs and opportunities around lifeline resilience in Australia to strategically inform future work at the Centre and other organisations.</li> </ul>
<b>Capturing uncertainty in bushfire spread</b>	University of Wollongong	Situational awareness	<p>This research developing:</p> <ul style="list-style-type: none"> <li>→ a Bayesian ROS model for forest (and grass a second priority), giving fire behaviour analysts an additional, powerful tool to understand expected ROS probabilistically (which currently does not exist).</li> <li>→ ROS database that could be regularly updated and shared with fire agencies and researchers.</li> <li>→ quick access to the history of ROS available to fire behaviour analysts to understand how a particular fire sits in the context of previous fires.</li> </ul>

Project name	Research provider	Research theme/s	Summarised outcomes – targeted or completed
<b>Detecting fire plumes with mobile radar</b>	Bureau of Meteorology	Situational awareness; Operational response and innovation	<p>This research tested the capability of using mobile radar to detect fire plumes during tests on prescribed burns. Tests were conducted in Western Australia in late 2022 and a workshop convened in May 2023 with stakeholders from the Bureau of Meteorology, Monash University, Department of Biodiversity, Conservation and Attractions WA, the Department of Fire and Emergency Services WA, CFA, NSW Rural Fire Service, the Department of Environment and Water SA, AFAC, CSIRO and the University of Queensland. Outcomes are:</p> <ul style="list-style-type: none"> <li>→ Development of operating procedures and approaches for the safe location and operation of a mobile radar</li> <li>→ requirements for robust operational radar deployment practices</li> <li>→ data set to be managed in the Centre’s data catalogue</li> <li>→ strengthening researcher and practitioner networks through cross-agency and cross-jurisdiction collaboration.</li> </ul>
<b>Predictions in public: understanding the design, communication and dissemination of predictive maps to the public</b>	RMIT University, Queensland University of Technology, Deakin University, Swinburne University	Situational awareness; Resilient communities	<p>This project is developing evidence-based principles that will inform a nationally consistent approach to the future design and communication of predictive bushfire and incident maps. The first phase of the project was completed in 2023, focused on understanding current levels of comprehension and use of maps for public information and warnings through a national survey and case studies of previous fire locations in Victoria, Tasmania, NSW and the ACT. Subsequent phases are developing principles for the standardised use of predictive maps within the Australian Warning System, as well as the development of practical outputs to ensure the use of the project’s findings in the design of future bushfire and predictive maps.</p>
<b>Streamlining SWIRLnet data acquisition, analysis, storage and dissemination procedures</b>	University of Queensland	Situational awareness	<p>The Surface Weather Information Relay and Logging Network are six portable weather stations in Queensland that are strategically positioned in advance of landfalling cyclones to capture research-grade wind data to provide an understanding of near-surface wind speeds during a cyclone, enable observations of wind speed to be directly utilised in the assessment of building standards performance and assist in raising risk awareness for the community. Centre input has automated and streamlined the collection and dissemination of data. These advancements have led to a better way for end-users to receive and use the real-time data, and a more automated way to analyse the data.</p>
<b>Translation of observed and modelled extreme bushfire behaviours to improve fire prediction and fireground safety</b>	Bureau of Meteorology, Curio	Situational awareness; Learning from disasters	<p>This project optimises the translation and utilisation of research outcomes from the previous Modelling fire weather interactions using the ACCESS-Fire model project through the development of professional development learning modules. The modules focus on providing professional development information for fire meteorologists, decision support meteorologists, fire behaviour analysts and other practitioners to evaluate the potential of extreme fire behaviour risk and provide operational guidance and fire weather intelligence.</p> <p>The project has developed three modules:</p> <ul style="list-style-type: none"> <li>→ Introductory module</li> <li>→ Fire-Generated Vortices module</li> <li>→ Low-Level Jets and their fire plume interaction module</li> </ul>
<b>What makes a good fire simulator?</b>	University of Melbourne	Situational awareness; Evidence-informed policy, strategy and foresight	<p>This project is undertaking an engagement process to better understand what makes a good fire simulator. Research findings can be used to evaluate current practice and use, justify changes to simulators, guide the development of new versions of simulators, justify new simulation methods of work and aid in interpreting predictions and outputs</p>

Project name	Research provider	Research theme/s	Summarised outcomes – targeted or completed
<b>Australian emergency law blog</b>	Dr Michael Eburn	Evidence-informed policy, strategy and foresight; Learning from disasters	This blog is a discussion forum for the laws that apply to, or affect Australia's emergency services and emergency management sector. It was developed from research funded by the Bushfire and Natural Hazards CRC and is a popular educational tool that unpacks the legal principles that affect emergency services and management, as well as developments in case law and legislation that impact the sector. The blog consistently ranks in the top three 'Best Australian law blogs and websites' and is listed in the 'Global top 200 law blogs'.
<b>Utilisation of transformative scenarios in a climate-challenged world</b>	Collaborative Consulting Co	Evidence-informed policy, strategy and foresight	This research utilisation project will further develop the translation and utilisation of the Transformative scenarios in a climate-challenged world resources with the development of professional development modules, and user-friendly train-the-trainer applications. I
<b>Research data management</b>	Frontier SI	Evidence-informed policy, strategy and foresight; Learning from disasters	The project will establish a research data management initiative for sharing research data as the outcome of bushfire research undertaken through Centre projects, and where practical, from projects previously undertaken by the Bushfire and Natural Hazards CRC.
<b>Storing and sharing qualitative data</b>	Altometer	Evidence-informed policy, strategy and foresight; Learning from disasters	The key outcome of this project is a strong foundation and clear pathways for the Centre and its researchers to implement the effective collection, use, curation and sharing (where feasible) of qualitative social research data.
<b>Community experiences of the 2022 Australian floods – Queensland and New South Wales</b>	Macquarie University, Queensland University of Technology, University of Southern Queensland	Learning from disasters; Situational awareness	<p>The research has provided vital context to assist emergency management organisations, government departments, local government, community organisations and community members to better understand the complexities of community experiences before, during and after emergencies.</p> <p>The results are already informing strategies to improve flood safety and policy across Australia. NSW State Emergency Service (NSW SES) is using the research to inform the planning of future flood response coordination and informs community engagement around flood preparedness. With findings that 70 percent of Hawkesbury-Nepean residents not acting on evacuation warnings during the 2022 floods as they believed the risk did not directly affect them, the NSW SES and NSW Reconstruction Authority jointly developed the Future Flood campaign to raise awareness of the risk in flood prone areas.</p> <p>The Queensland Fire Department (QFD) (formerly Queensland Fire and Emergency Services) captured the research's main findings in its Central Repository Framework within the Lessons Management Unit, ensuring insights and learnings will be embedded in its future planning and operations.</p> <p>The findings also informed an external review of the 2022 flood response commissioned by the Insurance Council of Australia.</p> <p>Since its completion in 2023, substantial investment in a series of activities to translate this research into practice was undertaken by the Centre to aid its use and implementation by end-users.</p>
<b>Community experiences of the 2022 Australian floods – Tasmania</b>	University of Tasmania, Macquarie University	Learning from disasters; Situational awareness	Building on the research in other states, this research is exploring community experiences of the Tasmania State Emergency Service flood warning system, as well as community preparedness for flood. Supported by the Tasmania SES, this research will inform improvements to the flood warning system and community disaster preparedness programs.

Project name	Research provider	Research theme/s	Summarised outcomes – targeted or completed
<b>Community experiences of the 2022 Australian floods – South Australia, Victoria and south-western New South Wales</b>	RMIT University, Macquarie University, Monash University	Learning from disasters; Situational awareness	Building on the research in other states, this research will provide an in-depth understanding of the community lived experience before, during and following flooding to assist future planning and engagement. Through a survey and in-depth interviews, the impacts of flooding and how they were prepared for will be explored in six different locations. The research will focus on: <ul style="list-style-type: none"> <li>→ how people responded in areas impacted with moderate and longer lead times for floodwater arriving</li> <li>→ the experiences of First Nations peoples</li> <li>→ the experiences of those who are culturally and linguistically diverse.</li> </ul>
<b>Fire case studies</b>	Bureau of Meteorology	Learning from disasters; Situational awareness	This project builds upon on the Bureau's reputation for preparing high-value case studies by developing a defined methodology. The project is delivering two case studies of the New South Wales Lake Conjola/ Currowan fire (2019) and Wooroloo fire in Western Australia (2021) to explore the meteorological conditions that led to extreme fire behaviour.
<b>Flood contamination sampling and analysis – regional Victoria</b>	Environment Protection Authority Victoria	Learning from disasters; Sustainable, safe and healthy natural landscapes	Undertaken in partnership with the Environmental Protection Authority Victoria and the Victoria SES after flooding in 2022, the research collected samples of floodwaters from regional locations around Victoria to understand the level of risk to human health and the environment. Findings demonstrated that chemical contaminants and microbial signatures responded in distinct and varied ways when compared to measures of rainfall, water flow and water level. This demonstrates that flood posed a risk of contaminant and microbial exposure to people and the environment from the beginning to the end of the sampling window, with different contaminants posing stronger risks on different days. The work underlines the importance of rigorous and timely monitoring to conserve environmental values and human health. This study provided further evidence that it is unsafe to enter floodwaters with respect to contaminant exposure.
<b>Flash flooding case studies to improve predictions and the communication of uncertainty</b>	Bureau of Meteorology	Learning from disasters; Situational awareness	This project will help us to better understand how to prepare systems, people, and public messaging and warnings to reduce the impact of flash floods and enhance community resilience.
<b>Colonial load and cultural conflict</b>		Communities and workforces of the future; Evidence-informed policy, strategy and foresight	The project outcomes are targeted to identify systemic and behavioural drivers of colonial load and cultural conflict for First Nations staff and volunteers and develop recommendations for interventions based on identified gaps to improve participation of First Nations people.
<b>Communicating flood risk</b>		Resilient built environment; Resilient communities	Identify improved methods of communicating flood risk to inform decisions community members make on a floodplain. It will review Australian and international approaches to communicating natural hazard risk and examine community and stakeholder views of understanding existing terminology and risk communication methods. This research will be used to co-develop and test a model for risk communication with stakeholders.
<b>Insights into temporary and emergency accommodation</b>		Resilient built environment	This project analyses and addresses the increasing challenges in emergency and temporary housing during and after a disaster. The project aims to provide national guidance on the design and implementation of temporary housing from the research and resources developed.
<b>Evaluating and monitoring for impact: developing a framework for risk prevention programs</b>		Operational response and innovation	This program aims to inform the monitoring and evaluation of community education programs in the emergency services sector. Identified strategies successes and challenges will bring structure and rigour to the evaluation of education programs across the sector, significantly contributing to the evolution of best practice through learnings and formalised documentation.



Project name	Research provider	Research theme/s	Summarised outcomes – targeted or completed
<b>Disaster resilience in Indigenous communities</b>		Resilient communities; Communities and workforces of the future	This project will have positive impacts for Indigenous communities and the emergency management and disaster resilience sector more broadly, through the following outcomes: <ul style="list-style-type: none"> <li>→ An evidence-based policy framework for guiding Indigenous disaster resilience policy and practice across Australia</li> <li>→ Building trusting relationships between Indigenous communities and peak organisations</li> <li>→ An Indigenous disaster resilience community of practice</li> <li>→ New evidence and authoritative guidance as a knowledge base regarding Indigenous peoples and disaster resilience</li> <li>→ Recognition of the critical roles Indigenous community organisations play in disaster resilience</li> <li>→ Increased confidence in Indigenous communities to respond to disasters.</li> </ul>
<b>Support integration of Recovery Capitals in service plans for communities with different levels of social disruption</b>		Resilient communities	This utilisation project will develop research previously undertaken at the Bushfire and Natural Hazards CRC, the Recovery Capitals project, which was used to develop the Community Disaster Content Matrix. This project aims to utilise the frameworks to understand the extent of exposure to disaster-driven social disruptions, and Recovery Capital-related support needs of communities.
<b>Understanding intangible flood costs and impacts</b>		Resilient communities; Learning from disasters	This research will develop a better understanding of the true costs of flooding, with social impacts considered at short and longer timeframes. It will lead to improved decision making and a better case for flood mitigation investment through enhanced knowledge of the true extent of flood costs. This will occur via a robust evidence base and methodology to estimate the costs of flooding.
<b>Bushfire information database – scoping study</b>		Evidence-informed policy, strategy and foresight; Learning from disasters	This scoping study will provide an evidence base and recommendations that can be used to support the development of a National Bushfire Information Database.
<b>Understanding and managing the impact of smoke in the eyes of Australian bush firefighters</b>		Communities and workforces of the future	This project will provide improvements to safety of firefighters on the ground especially during large bushfires, reduction in smoke-related eye discomfort for firefighters, improved readiness and recovery of workforce during bushfire disasters and improved confidence of the workforce with possibly greater retention.
<b>Safety of alternative and renewable energy technologies</b>		Resilient built environment; Operational response and innovation	The project aims to investigate the risks related to fire propagation within and between stationary energy storage systems (from household to commercial scale) due to external factors related to bushfire, heatwaves, storms, and floods (such as fire impingement, temperature extremes, impact/shock, and water ingress) that are not considered in current best practice standards.
<b>Conserving and reconnecting floodplains to mitigate flood risk</b>		Sustainable, safe and healthy natural landscapes	This project will address key knowledge gaps towards implementing nature-based flood risk mitigation strategies in the Australian context. Nature-based solutions can offer effective and environmentally sensitive flood mitigation alternatives, ensuring meaningful stakeholder involvement and community engagement. Conserving and reconnecting floodplains through nature-based strategies can provide shared benefits, such as increasing biodiversity, and improving water quality and community wellbeing.
<b>Effect of cultural burning on soil health</b>		Sustainable, safe and healthy natural landscapes	This project will provide a quantitative assessment of how soil physical and chemical properties respond to cultural burning and hazard reduction burns.

Project name	Research provider	Research theme/s	Summarised outcomes – targeted or completed
<b>Improved incorporation of fire mosaics into landscape</b>		Sustainable, safe and healthy natural landscapes	<p>The project will be undertaken as a collaborative partnership between Indigenous and non-Indigenous fire experts, with the aim of producing outputs of utility and benefit to all end-users.</p> <p>The current project will produce information and tools that will have practical application to fire management, as well as being foundational for subsequent work.</p> <p>Aims of the project are:</p> <ul style="list-style-type: none"> <li>→ Build a shared understanding of the objectives of 'mosaic burning':</li> <li>→ Define key attributes of mosaics and develop metrics and methods for standardised characterisation of mosaics at various scales and appropriate for different objectives (ecological, cultural, hazard reduction).</li> <li>→ Provide a framework for further work to key address key knowledge and capability gaps regarding managing fire mosaics, including developing approaches to determining and assessing mosaics-related objectives.</li> </ul>
<b>Hazard workshops for evacuation modelling</b>		Operational response and innovation	Evacuation is a critical risk mitigation to protect and preserve life in contexts where there is residual risk. This research will develop a national roadmap for evacuation modelling design and development through a series of workshops to identify research gaps and consolidate learnings to improve evacuation decisions and support tools.
<b>Predicting prescribed burning and low intensity forest fire behaviour</b>		Operational response and innovation	The expected outcome of this research is the developed quantification/ model to enable accurate predictions of the full range of forest fire behaviour. It is expected that by accurately predicting the full range of a forest fire behaviour this will improve operational response, firefighter safety, understanding of risk and situational awareness, mitigating and improving community safety and ensuring future workforce have fit-for-purpose tools for operational and prescribed burning decisions.
<b>The value and benefit of emergency services: how do we measure success?</b>		Operational response and innovation	This project aims to identify performance measures to support emergency response agencies to optimise policy and regulatory framework and streamline governance, plans and efforts, with a focus on fire and rescue services. The project will determine relevant, measurable meaningful measures that effectively demonstrates the value of the services delivered to the community.??
<b>Adaptation for heatwave resilience</b>		Resilient communities; Situational awareness	<p>This research will:</p> <ul style="list-style-type: none"> <li>→ Improve communication of heatwave risk to agencies, the public and the media.</li> <li>→ Enable a better understanding of the full costs and impacts of extreme heat events to allow agencies and health departments to better plan, prepare and respond to heat events, as well as informing possible future business cases for investment in heatwave resilience. Only once the full costs are known can we properly invest to reduce risks.</li> <li>→ Enable timely notification of mortality estimates will assist in enhancing emergency and community responses, and enable better understanding of spatial and temporal distribution, and nature of the risk.</li> <li>→ Increase the understanding of the impacts of extreme heat associated with electricity disruption will enable improved planning for the future adaptation of infrastructure.</li> </ul>

Project name	Research provider	Research theme/s	Summarised outcomes – targeted or completed
<b>Effectiveness of land use planning flooding controls on buildings</b>		Resilient communities; Learning from disasters	This project is identifying the effectiveness of land-use planning flooding controls on buildings impacted by the 2020, 2021 and 2022 floods in NSW. This research will lead to improved community resilience via land use planning through the provision of an evidence base to assist in refining the planning system and the processes that support the implementation of flood conditions.
<b>Priming next generation capabilities in multi-hazard public information and warnings</b>		Situational awareness	This project will improve national capability for public information and warnings in a range of ways. It will enhance emergency agencies' understanding of their communities' hazard and emergency communication needs, preferences and capabilities, improve the reach of public information and warnings, inform the design and utilisation of warnings systems, strengthen public trust in emergency agencies and their authority to issue public information and warnings, and provide the evidence base and principles to inform the next generation of public information and warnings technology platforms, including mobile applications.
<b>Managing earthquake risk: unreinforced masonry buildings database</b>		Situational awareness	This project aims to reduce the risk posed by unreinforced masonry buildings to people during an earthquake. The research will develop a national database of unreinforced masonry buildings through new technology and techniques to better understand and mitigate earthquake risk.??
<b>Assisted relocations after flood</b>		Evidence-informed policy, strategy and foresight	This project will build disaster management capability by identifying lessons learnt from existing large-scale assisted relocation programs and how they can be applied in the delivery of the Resilient Homes Fund and the Recovery and Resilience Package and similar programs. It will also outline how these learnings may be applied to accelerate effective post-disaster adaptation program development in other regions.
<b>Understanding the resilience of Australia's Energy Networks to storms – severe convective wind impacts</b>		Evidence-informed policy, strategy and foresight	This project will provide the necessary focus on severe wind events enabling network services providers at a National Electricity Market and the Wholesale Electricity Market level to gain a deeper understanding of their risk and impacts. It is also expected this work will set the foundations for several future natural hazard research projects as well as provide a consistent view and common approach across network service providers when evaluating severe wind risks.

# Appendix 3 Publications

## Academic publications

### Published journal articles

1. Ali H M, Ranse J, Roiko A & Desha C (2024) Developing a Healthcare Transformational Leadership Competency Framework for Disaster Resilience and Risk Management.
2. Atkinson, C F (2024) Cheap, quick, and rigorous: Artificial intelligence and the systematic literature review, *Social Science Computer Review*, 42(2): pp.376–393.
3. Bearman C, Hayes P & Thomason M (2023) Facilitating teamwork in emergency management: The team process checklist, *International journal of disaster risk reduction*, 97.
4. Bowman D M & Sharples J J (2023) Taming the flame, from local to global extreme wildfires. Australia rethinks strategies after 2019 to 2020 bushfires, *Science*, 381(6658): pp. 616–619.
5. Buffone J, Hogan-Doran D & Gissing A (2024) Responses. *Australian Journal of Emergency Management*, 39(2).
6. Bukhari S M, Zafar M H, Abou Houran M, Qadir Z, Moosavi S K & Sanfilippo F (2024) Enhancing cybersecurity in Edge IIoT networks: An asynchronous federated learning approach with a deep hybrid detection model, *Internet of Things*, 27.
7. Cooley S, Fletcher M S, Lisé-Pronovost A, May J H, Mariani M, Gadd P S & Heijnis H (2024) Rainforest response to glacial terminations before and after human arrival in Lutruwita (Tasmania), *Quaternary Science Reviews*, 329.
8. Heinrich V J, Stewart E J, Liggett D, Carrasco J F, Dawson J, Lamers M, Ljubic G J, Jeuring J & Thoman R (2024) The Use of Weather, Water, Ice, and Climate (WWIC) Information in the Polar Regions: What Is Known after the Decadelong Polar Prediction Project?, *Weather, Climate, and Society*, 16(3) pp:369–387.
9. Holtrop D, Soo C, Gagné M, Kragt D, Dunlop P D & Luksyte A (2024) Exploring Volunteer Turnover Reasons, Intentions, and Behavior, *Group & Organization Management*.
10. Isaac F, Toukhsati S R, Klein B, Di Benedetto M & Kennedy G A (2023) Differences in anxiety, insomnia, and trauma symptoms in wildfire survivors from Australia, Canada, and the United States of America, *International journal of environmental research and public health*, 21(1): pp. 38.
11. Isaac F, Toukhsati S R, Klein B, Di Benedetto M & Kennedy G A (2024) Pre-existing depression, anxiety and trauma as risk factors for the development of post-traumatic stress disorder symptoms following wildfires, *Psychiatry Research Communications*, 4(2).
12. Keegan S, Reis K, Roiko A *et al.* (2024) Exploring resilience concepts and strategies within regional food systems: a systematic literature review, *Food Security*, 16: pp.801–825.
13. Khan S I, Qadir Z, Munawar H S, Nayak SR, Budati A K, Verma K D & Prakash D (2024) UAVs path planning architecture for effective medical emergency response in future networks, *Physical Communication*, 63.
14. Lamers M, Ljubic G, Thoman R, Carrasco J, Dawson J, Heinrich V J, Jeuring J, Liggett D & Stewart E J (2024) Tailored Investments Needed to Support Weather, Water, Ice, and Climate Services in the Polar Regions, *Bulletin of the American Meteorological Society*, 105(3), pp:E645–E650.
15. Mason M S (2024) SWIRLnet observations during Tropical Cyclones Jasper (2023) and Kirrily (2024).
16. McNeilly Smith R, Tavares S, Stevens N (2023) Urban design and planning for extreme heat: an empirical study of built environment professionals' perceptions in South East Queensland, Australia, *Cities & Health*, pp:1–13.
17. Meadows M, Jones J & Reinke K (2024) Vertical accuracy assessment of freely available global DEMs (FABDEM, Copernicus DEM, NASADEM, AW3D30 and SRTM) in flood-prone environments, *International Journal of Digital Earth*, 17(1).
18. Mohammadi M, Jafari H, Etemadi M, Dalugoda Y, Ali H M, Phung H, Ahmadvand A, Dwirahmadi F, Barnes P & Chu C (2023) Health Problems of Increasing Man-Made and Climate-Related Disasters on Forcibly Displaced populations: A Scoping Review on Global Evidence, *Disaster medicine and public health preparedness*, 17.
19. Padamsey K, Wallace R, Liebenberg A, Cross M & Oosthuizen J (2024) Fighting fire and fumes: risk awareness and protective practices among Western Australian firefighters, *International Journal of Wildland Fire*, 33(4).
20. Peace M, Ye H, Greenslade J & Kepert J D (2023) The Destructive Sir Ivan Fire in New South Wales, Australia; Simulations Using a Coupled Fire—Atmosphere Model, *Fire*, 6(11): pp.438.
21. Qasim A, Tjondronegoro D, Desha C, Reis K & Dwirahmadi F (2024) Using secondary data from mobile phones to monitor local food market access during disasters: an Australian case study, *International Journal of Digital Earth*, 17.
22. Radford D A, Maier H R, van Delden H, Zecchin A & Jeanneau A (2023) Efficiently Estimating Patterns in Wildfire Burn Probability, *EGU General Assembly Conference Abstracts*.
23. Radford D A, Maier H R, van Delden H, Zecchin A C & Jeanneau A (2024) An efficient, multi-scale neighbourhood index to quantify wildfire likelihood, *International Journal of Wildland Fire*, 33(5).
24. Rai A K, Kumar V, Patel S, Beg Z & Gaurav K (2024) Bootstrap Reduced Major Axis (BRMA) to optimize the satellite derived discharge rating curves, *River Research and Applications*.
25. Rogers N J, Adams V M & Byrne J A (2023) Factors affecting the mainstreaming of climate change adaptation in municipal policy and practice: a systematic review, *Climate Policy*, 23(10): pp.1327–1344.
26. Ryan R, Dosseto A, Lemarchand D, Dlapa P, Thomas Z, Simkovic I & Bradstock R (2023) Boron isotopes and FTIR spectroscopy to identify past high severity fires, *Catena*, 222.
27. Sos J, Penglase K, Lewis T, Srivastava P K, Singh H & Srivastava S K (2023) Mapping and monitoring of vegetation regeneration and fuel under major transmission power lines through image and photogrammetric analysis of drone-derived data, *Geocarto International*, 38(1).
28. Taylor M, Miller F, Johnston K, Ryan B, Lane A, King R, Narwal H, Miller M, Simon H & Dabas D (2023) Learning from the experiences of residents: January to July 2022 floods, *Australian Journal of Emergency Management*, 38(3): pp. 27–30.
29. Telfer S, Reinke K, Jones S & Hilton J (2024) Fuel Drivers of Fire Behaviour in Coastal Mallee Shrublands, *Fire*, 7(4): pp. 128.
30. Toner J, Desha C, Reis K, Hes D & Hayes S (2023) Integrating Ecological Knowledge into Regenerative Design: A Rapid Practice Review, *Sustainability*, 15.
31. van Delden H, Vanhout R, Jeanneau A, Radford D A, Maier H R & Zecchin A C (2023) Development and use of an integrated modelling approach to simulate dynamic risk profiles and support risk reduction strategies, *EGU General Assembly Conference Abstracts*.
32. Wang Y, Desha C, Caldera S & Beer T (2024) Roles of Urban Green Spaces for Children in High-Density Metropolitan Areas during Pandemics: A Systematic Literature Review, *Sustainability*, 16.
33. Wille J D, Alexander S P, Amory C, Baiman R, Barthélemy L, Bergstrom D M & Zou X (2024) The extraordinary March 2022 East Antarctica "heat" wave. Part I: observations and meteorological drivers, *Journal of Climate*, 37(3): pp.757–778.
34. Wille J D, Alexander S P, Amory C, Baiman R, Barthélemy L, Bergstrom D M & Zou, X (2024) The extraordinary March 2022 East Antarctica "heat" wave. Part II: impacts on the Antarctic ice sheet, *Journal of Climate*, 37(3), pp:779–799.
35. Woodland S, Hassall L & Kennedy-Borissow A (2024) Youth theatre and the climate crisis in Australia: the role of 'unmediated liveness' in performing recovery, resistance, and survival, *Research in Drama Education: The Journal of Applied Theatre and Performance*, 29(2): pp.382–391.





## Book Chapters

1. Gissing A (2024) Flood emergency planning- planning and capability requirements, *Research Handbook on Flood Risk Management*, pp. 165-180, Edward Elgar Publishing.

## Others (including Research reports)

1. Translation of observed and modelled extreme bushfire behaviours to improve fire prediction and fireground safety – Project Summary
2. Translation of observed and modelled extreme bushfire behaviours to improve fire prediction and fireground safety – Learning evaluation plan
3. Translation of observed and modelled extreme bushfire behaviours to improve fire prediction and fireground safety – Project Evaluation Report
4. Predictions in Public – Project summary
5. Predictions in Public – Literature review report
6. Predictions in Public – Work package 3 report
7. Predictions in Public – Work package 4 report
8. Predictions in Public – Work package 5 report
9. Predictions in Public – 2024 NHRA Final report
10. Predictions in Public – NHRA Evaluation report
11. Predictions in Public – 2024 – The National Community Survey Report (Work Package 9)
12. Predictions in Public – AFAC interviews report
13. Predictions in Public – Project Summary
14. Connecting indigenous people and the EM sector – Effective partnerships – NHRA Final Report
15. Connecting indigenous people and the EM sector – Effective partnerships – Evaluation Report
16. Cultural land management research and governance in Southeast Australia – Project Summary
17. Cultural land management research and governance in Southeast Australia – Poster
18. Cultural land management research and governance in Southeast Australia – Hazard Note
19. Cultural land management research and governance in Southeast Australia – Principals and Protocol Guide sheet
20. Cultural land management research and governance in Southeast Australia – Contributions to Jagun Alliance submission to Department of Home Affairs' Alternative Commonwealth Capabilities for Crisis Response: Discussion Paper review.
21. Cultural land management research and governance in south-east Australia 2024 – NHRA Final Report
22. Community-led Recovery: Evidence, dimensions, and supports for Community Recovery Committees – project summary
23. Community-led Recovery: Evidence, dimensions, and supports for Community Recovery Committees – evaluation report
24. Community-led Recovery: Evidence, dimensions, and supports for Community Recovery Committees – Utilisation report
25. Identifying water sources for aerial firefighting – AFAC 2023 conference poster
26. Identifying water sources for aerial firefighting – Final project report.
27. Identifying water sources for aerial firefighting – Evaluation report.
28. Understanding the resilience of lifelines for regional and remote communities – Case study flyer
29. Understanding the resilience of lifelines for regional and remote communities – Project summary
30. Understanding the resilience of lifelines for regional and remote communities – Stakeholder Advisory Group meeting presentations
31. Awareness, education and communication for compound natural hazards – 1 x project flyer
32. Enhanced decision-making in emergency management – Literature review 1
33. Enhanced decision-making in emergency management – Literature review 2
34. Enhanced decision-making in emergency management – Literature review 3
35. Enhanced decision-making in emergency management – EMNoTS training materials into Fire and Rescue NSW
36. Bushfire Risk at the rural-urban interface – Plain language statement
37. Bushfire Risk at the rural-urban interface – Plant flammability catalogue based on garden flammability experiments.
38. Community risk assessment project – Literature Review
39. Community risk assessment project – Catalogue of the existing community risk assessment tools
40. Community risk assessment project – Final Report
41. Community risk assessment project – Evaluation Report
42. PE-2022-01 – NHRA communications product
43. PE-2022-02 – Flood contamination sampling and analysis – regional Victoria – Final Report
44. Detecting fire plumes with mobile radar – 2024 Final Report.
45. Mobile radar fire plume project Western Australia Report
46. Community experiences of the January–July 2022 floods in New South Wales and Queensland: Final Report: Policy-relevant themes

## Student Posters

1. Akhtar S A, Curnin S, Brooks B & Stellmach D, Exploring the role of Emotional Intelligence in Trust Building within High-Reliability Environments; Natural Hazards Research Forum 2024 poster presentation.
2. Atkinson C F, Computational-Based Approaches to Critical Infrastructure Research; Natural Hazards Research Forum 2024 poster presentation.
3. Cooley S, Fletcher M S, Drysdale R & Hellstrom J; Natural Hazards Research Forum 2024 poster presentation.
4. Davis B, Reid A, Ho S & Rogers B, On The Edge of Transformation: Transforming Disaster Resilience Education in Schools; Natural Hazards Research Forum 2024 poster presentation.
5. Hassan A, Moinudin K & Accary G, Understanding junction fire physics and scaling laws in order to mitigate the consequences of this severe wildfire event; Natural Hazards Research Forum 2024 poster presentation.
6. Hua Q & Gadd P, Is climate change alone sufficient to reduce the capacity of Pencil Pine to respond to fire?; Natural Hazards Research Forum 2024 poster presentation.
7. Isaac F, Klein B, Toukhsati S R, DiBenedetto M & Kennedy G, Bushfires, Sleep & Trauma: Psychological Treatment for Insomnia, Nightmares and Post-Traumatic Stress Disorder; Natural Hazards Research Forum 2024 poster presentation.
8. Liu J, Freudenberger D & Lim S, Advancing Fire Severity Analysis: Object – Based Image Classification with Landsat 8 on Kangaroo Island; Natural Hazards Research Forum 2024 poster presentation.
9. Metcalfe O, Sangha K, Russell-Smith J, Poelina A, Carracher L & Costanza R, An ecosystem services economy can build a Forever Economy with and for Martuwarra Living Waters; Natural Hazards Research Forum 2024 poster presentation.
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