



bushfire&natural
HAZARDSCRC



2017-2018

A YEAR IN REVIEW

SOUTHERN AUSTRALIA SEASONAL
BUSHFIRE OUTLOOK 2017



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Prof Vivienne Tippett. Queensland University of Technology, speaking at Science at the Shine Dome 2018. Photo: Australian Academy of Science



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Australian Government
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Bushfire and Natural Hazards CRC Report 2018:416

October 2018



Dr Adam Leavesley, ACT Parks and Conservation Service, speaking at our annual conference. Photo: Bushfire and Natural Hazards CRC

EXECUTIVE SUMMARY





EXECUTIVE SUMMARY

ACHIEVEMENTS

The reporting period covers the fifth year, beyond the halfway point, of the Bushfire and Natural Hazards CRC's eight-year funding period. Accordingly, it marked an appropriate point to monitor ongoing progress and to plan future options for natural hazards research.

The primary activities of have been:

Reviewing centre operations, governance, and research quality and progress

Delivering utilisation opportunities

Bringing together researchers, partners and broader stakeholders through a calendar of events, conferences and workshops

Building the capacity of the sector through postgraduate research and mentoring

Establishing national research priorities for natural hazards emergency management

Developing options beyond this funding period to transition to an ongoing research centre.

These activities culminated in a visible display of progress, achievements and vision at the CRC's *Research Driving Change - Showcase 2017* event in the first week of July 2017.

In late 2017 the CRC released a publication that reviewed the activities of the first four years of the CRC. This was circulated to all senior stakeholders with an interactive version online: <https://www.bnhcrc.com.au/sites/default/files/managed/achievements/2017/>

The conduct of research and data gathering across all projects and postgraduate work was reinforced by outputs including:

- 4 book chapters
- 82 journal papers
- 47 refereed conference papers
- 34 reports for end-users



Dr Richard Thornton launches the Southern Australian Seasonal Bushfire Outlook 2017 to a packed media conference. Photo: Bushfire and Natural Hazards CRC

EXECUTIVE SUMMARY



North Australia Fire Managers Forum 2018, Townsville. Photo: Bushfire and Natural Hazards CRC

REVIEWS

The International Science Advisory Panel conducted a review of the science quality of the suite of CRC projects at the request of the Research and Utilisation Committee in July 2017 and again in March 2018.

On each occasion the panel reviewed the quality of the current research teams with a view to ensuring that only good to high quality rated teams continued to be active. The panel's reports were considered by the independent review panel.

The panel concluded that there were some particularly outstanding projects in progress, specifically those led by:

- Prof Holger Maier (University of Adelaide) on mitigation decision support systems

- Prof Kevin Ronan (CQUniversity) on child centred disaster risk reduction
- Prof Vivienne Tippett (Queensland University of Technology) on effective multi-channel communication
- Dr Marta Yebra (Australian National University) on remote sensing.

It also found that approximately two-thirds of the projects were operating at very good or excellent standard, and that very few projects were operating at fair or poor standard.

In May 2018, an independent review of the achievements, the governance and management of the CRC over its first four and a half years was completed. Commissioned by the CRC Board, the review was carried out to ensure that the CRC

understands what it is doing well and not so well, to ensure that steps can be taken to improve the way the CRC operates. The review was also asked to consider plans for the CRC beyond the current funding period.

In general, the independent review panel confirmed that the CRC is progressing well with its research, utilisation and outreach activities and is on the right track to defining its longer-term future. [The Board formally responded in detail to the review report in September 2018.]

Led by Prof Mary O'Kane, AC and including Euan Ferguson, AFSM and Dr Tracey Arklay, the review panel heard from staff, researchers, end-users and PhD students on current work and on future directions.



EXECUTIVE SUMMARY

APPOINTMENTS

The Board of the CRC welcomed Mark Crosweller, AFSM, as a Director to replace Katherine Jones, PSM, who stepped down earlier in 2018. Mark heads the National Resilience Taskforce, in the Department of Home Affairs in the Commonwealth Government and has an extensive background in emergency management and emergency response at both a federal and state level.

CRC Research Director, Dr Michael Rumsewicz, left the CRC in October 2017. Michael was instrumental in the successes of the CRC since 2013, overseeing the development and implementation of the research program, and more recently the refresh process. Michael's energy, dedication, insight and advice will be missed around the CRC, and we all wish him well in his new endeavours.

Subsequently, Dr John Bates was appointed to the position of Research Director, leaving the role of Director of the Australian Institute of Disaster Resilience (AIDR). John has had an extensive career in business development and research utilisation in academic organisations and is an active SES volunteer.

COLLABORATION OPPORTUNITIES

A multi-hazard focus presents opportunities for the CRC to continue to increase the scope of its collaborations and research links. This is evident in several ways, and includes:

National Research Priorities

The launch of *National research priorities for natural hazards emergency management* was the culmination of an extensive series of workshops with end-user stakeholders and other relevant groups to explore major issues across hazards, resilience and the community.

The workshops identified the critical issues that could be addressed by research. They were mostly conducted in collaboration with organisations that are major representative stakeholders, including AFAC and the Bureau of Meteorology. The priorities were considered and noted by the Council of Australian Governments' Australia-New Zealand Emergency Management Committee in June 2017. They are now being drawn upon to influence the future research program of the CRC.

National institute

The Australian Institute for Disaster Resilience consolidated a partnership between the CRC, AFAC, the Australian Red Cross and the Department of Home Affairs during this reporting period. The Institute was formed to deliver products and services around Australia that have been developed by, and for, the emergency management sector. Knowledge is a core component of its role, with the CRC leading the drive through the *Australian Journal of Emergency Management*, the Knowledge Hub website and a series of events.

United Nations International Strategy for Disaster Reduction

The CRC is the national coordinator for a United Nations-backed committee that promotes and supports disaster risk reduction research programs and activities around the world. This Integrated Research on Disaster Risk National Committee for Australia is sponsored by the United Nations International Strategy for Disaster Reduction, the International Council for Science and the International Social Science Council.

Several researchers are in prominent roles, including Prof Kevin Ronan who represents the CRC at IRDR workshops and meetings, and Prof John Handmer who is on the Scientific Committee. The CRC hosted a public forum at Customs House in Sydney for the UN International Day for Disaster Reduction on 13 October 2017.



Research Driving Change - Showcase 2017. Photo: Bushfire and Natural Hazards CRC

EXECUTIVE SUMMARY

AWARDS

CRC excellence

The Bushfire and Natural Hazards CRC Outstanding Achievement in Research Award went to the CRCs *Economics and strategic decisions* cluster, led by Prof Holger Maier from the University of Adelaide and Ed Pikusa of the Department of Environment and Water SA.

With the support and guidance of a large group of end-users from a range of partner organisations, this cluster of four CRC projects is an outstanding example of the collaborative process that the CRC is all about. The research is based on the premise that to reduce both the risk and cost of natural disasters, an integrated approach is needed to consider multiple hazards and a range of mitigation options. Multiple CRC partners, along with local and state governments, have been engaged in the entire process, from direction on the hazards to include and feedback on process, to advice on how the modelling will be used when complete and by whom.

The cluster incorporates findings from several other CRC projects too - including work on the economic, social and environmental benefits of prescribed burning, the vulnerability of buildings to hazards, and research into improved warnings, community engagement, education, volunteering and community resilience.

CRC recognition

Our Special Recognition Award this year went to PhD student and project leader Steve Sutton. A great ambassador of the CRC, Steve's CRC PhD is being undertaken at Charles Darwin University. Steve has a long history with the Northern Territory, both in fire management and now as a researcher. Steve's PhD is looking at social and cultural aspects of the Indonesian island of Simeulue that led to remarkably low levels of casualties in the 2004 Indian Ocean Boxing Day tsunami.



Ed Pikusa and Prof Holger Maier received the CRC's Outstanding Achievement in Research Award from Dr Richard Thornton on behalf of the *Economics and strategic decisions* cluster. Photo: Bushfire and Natural Hazards CRC

In addition to his PhD work, Steve has led a project that has developed training in bushfire and other hazards skills for Indigenous communities in northern Australia. The training units have been developed specifically for the needs of remote northern communities - they are sensitive to language and cultural variations and draw upon local knowledge and contexts.

Steve has also been prominent and engaging in his advocacy of the CRC and his research in various places including presentations at conferences, workshops, and across social media platforms.

Queens Birthday honour

Prof Vivienne Tippet was recognised for her efforts

and contributions to science with a Queen's Birthday Medal of the Order of Australia.

The OAM recognised Prof Tippet's contribution to medical education where she has worked for over 10 years as a researcher in the area of pre-hospital care. Prof Tippet leads the *Communication and warnings* cluster for the CRC, which covers risk and warnings research for natural hazards. She leads the *Effective risk and warning communication during natural hazards* study.

Prof Tippet is the Head of the Discipline for Paramedicine in the Faculty of Health at Queensland University of Technology and the Director of Research for the School of Clinical Science.



EXECUTIVE SUMMARY

Australian honour

Former Bushfire CRC CEO Gary Morgan was recognised for his significant service to the community with an Australia Day honour. Becoming a member of the Order of Australia (AM), Gary was awarded for his significant service to the community through emergency response organisations, and to forest and fire research and management.

Gary was the CEO of the Bushfire CRC from 2007 until it wound up in 2014. Prior to this he was the Chief Fire Officer at Victoria's Department of Sustainability and Environment, from 1996 to 2005. He has continued with the CRC in short-term research consultancy, including conducting a review of traffic management strategies during emergencies.

Economics on ice

Project leader Dr Veronique Florec was one of 80 international scientists selected to join an all-female international expedition to Antarctic in early 2018. The expedition was part of the Homeward Bound program, which aims to heighten the impact of women with a science background.

Dr Florec leads the CRC's *Economics of natural hazards* project, focusing on applying economic analysis to the management of natural hazards such as bushfires and floods, to help decision makers get better value for money from public investments in hazard mitigation.

Animals prize

CRC research on how to best plan for animals in an emergency took out the inaugural Emergency Media and Public Affairs (EMPA) research award.

Led by Dr Mel Taylor from Macquarie University, the *Managing animals in disasters* project received the award at EMPA's annual conference, in June 2018. The project was recognised by EMPA as leading research that advances emergency communication

by improving community resilience, increasing the effectiveness of communication during emergency response and enabling agencies to better support communities recovering from an adverse event.

The research team has identified best practice approaches to animal emergency management, enabling emergency management agencies to obtain the data they need to make better informed decisions on planning and targeting of resources.

Emergency warnings high praise

Highly commended by EMPA was CRC research on emergency warnings and flood fatalities. Led by Prof Vivienne Tippet (Queensland University of Technology) and Dr Katharine Haynes (Macquarie University) this research is shaping public warnings and information campaigns that prepare and protect communities from flood, fire, heatwave and other natural hazards in Australia. Insights have combined to equip emergency service agencies around Australia with better-targeted long-term public safety campaigns, as well as urgent warning messages delivered to at-risk populations in the face of imminent natural hazards.

Blown away by research

CRC PhD student Korah Parackal was a finalist for an award that recognises both his research and his communication skills.

Korah, from James Cook University, was one of six finalists in the CRC Association's Showcasing Early Career Researchers competition, held in May at the CRC Association's annual conference in Sydney.

By making the finals, Korah demonstrated that he can convey the aims of his research clearly and effectively, with a 30 second video describing his research on strengthening rooves to withstand cyclones. He gave a five-minute presentation on his research at the conference.

Flood forecast project

CRC PhD student Ashley Wright was recognised for his excellent contributions to flood research by Monash University. Ashley won the Eric Laurenson Medal, which is awarded annually to a recent PhD graduate of Monash University who has written an excellent thesis, communicated their research findings to industry and has research utilisation potential in water science, engineering or management.

Ashley's project, *Improving flood forecast skill using remote sensing data* has used data gathered from historic rainfall to investigate how to reduce the damage caused by floods and improve flood forecasting.



Dr Mel Taylor (Macquarie University) with the EMPA Award.
Photo: EMPA



RESEARCH

The reporting period covers the fifth year of the CRC's eight-year funding period, where priorities for the research program were to consolidate ongoing progress, and to define pathways forward.

The conduct of active research and data gathering across all projects and postgraduate work was reinforced by outputs including:

- 4 book chapters
- 82 journal papers
- 47 refereed conference papers
- 34 reports for end-users

The research program (the full program is online www.bnhcrc.com.au/research) broadly takes in the policy objectives of the COAG-endorsed National Strategy for Disaster Resilience and is structured around three themes:

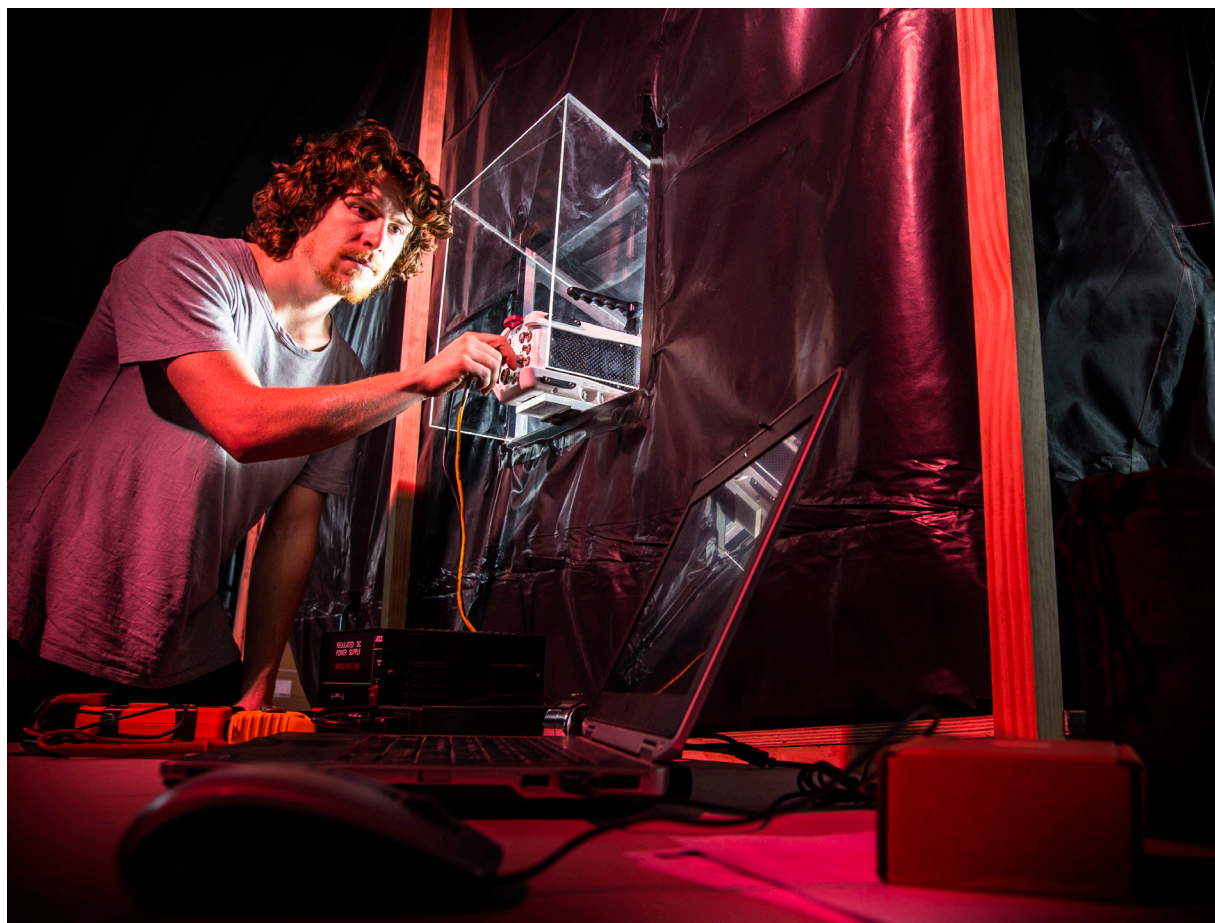
- Policy and economics of hazards
- Resilience to hazards
- Understanding and mitigating risks

Research outputs are increasingly appearing in peer-reviewed journals, and project team members present invited keynote speeches at international conferences. All reports are on the CRC website.

Consequently, the CRC remains on target to achieve its research outputs.

All 2016-17 Commonwealth Output Milestones have been completed. For the 2017-18 Commonwealth Output Milestones (59 in total), a total of 45 have been completed, 14 are in progress. The majority of these delayed milestones are for PhD student completions and these students are now in the final stages of their studies. The in-progress milestones are all expected to be complete by the end of June 2019.

The Centre also conducts research in addition to the science funded through the Cooperative Research Centres Programme. This complementary research is undertaken through consultancies and other programs. This consultancy research is mainly



Alan Green (University of Wollongong) testing his science to mitigate against bushfires. Photo: University of Wollongong

with its existing partners, with a large program undertaken for the Department of Environment, Land, Water and Planning Victoria. Short duration projects to meet the near-term needs of Centre partners are also funded through the Tactical

Research Fund, while funding for quick response is made available to collect perishable data after a natural hazard.

» SEE APPENDIX 1



RESEARCH

ACHIEVEMENTS

Research showcase

Emergency managers and policy makers from across Australia gathered in Adelaide in July for *Research Driving Change - Showcase 2017*. The event highlighted the practical research outcomes of the first four years of research through the CRC, with case studies and utilisation examples from across the research program presented by partners of the CRC.

The Showcase featured two days of learnings and case studies of how the emergency management industry is using the results of CRC research. How these findings are being put into practice across the sector was highlighted, with end-users also speaking about what works in directing research and how to make it easier to absorb the findings into operations and policy.

Topics covered included bushfire and severe weather modelling, emergency warnings and risk communication, teamwork in high pressure situations, the economics of mitigation, volunteering, engineering and the built environment, supporting Indigenous communities in northern Australia and disaster policy.

A series of panels featuring industry leaders shared their insights on how CRC research is influencing their business, how to get the best value from investment in research and where science will lead emergency management in Australia next.

Importantly, the next stage of the science was also discussed, with new projects pointing to exciting new directions in catastrophic event planning, land use planning, flood risk communication, predicting impacts on the built environment along the coast, diversity and wellbeing in emergency services, and mental health.

National research priorities

The CRC launched a set of priorities for national



Kate Brady, Australian Red Cross, speaking at *Research Driving Change - Showcase 2017*. Photo: Bushfire and Natural Hazards CRC

research into natural hazards. Now available online for broader discussion, the priorities arose from national workshops with the emergency management sector that led to their consideration by the peak Australia-New Zealand Emergency Management Committee.

This was the first time such a future-thinking exercise has been undertaken on natural hazards research in Australia. The CRC steered the extended process, which began with a review of its entire research agenda when it reached the halfway point in its funding life in late 2016.

Four key themes were consistently raised by the sector at the workshops:

- shared responsibility and community engagement
- communicating risk and understanding the benefits of mitigation
- climate change
- predicting hazards more accurately, leading to better warnings.

The publication of these priorities is intended as a beginning of the process, not an end. As new themes and research priorities are identified in coming years, they will be included in the priorities document, and published on the Bushfire and Natural Hazards CRC website.

RESEARCH



Dr Katherine Hayes, Macquarie University, speaking at a joint Australian/NZ workshop in Wellington, 2018. Photo: Bushfire and Natural Hazards CRC

The CRC has developed a suite of publications on national research priorities:

1. *National research priorities for natural hazards emergency management – issues, priorities, directions*
2. A summary of workshop outputs supporting the statement on national research priorities for natural hazards emergency management
3. A series of information guides for future research activities, individually themed around a workshop topic.

The National research priorities for natural hazards emergency management are online at www.bnhcrc.com.au/nationalpriorities.

PARTNER RESEARCH LINKS

Cyclone

Incident management research from the CRC helped the Queensland Fire and Emergency Services assess operations during Severe Tropical Cyclone *Debbie*, which occurred early in 2017.

QFES used findings and expertise from the *Improving decision-making in complex multi-team environments* project to inform future preparation, response and recovery. The research team of Dr Christine Owen (University of Tasmania) and A/Prof Chris Bearman (CQUniversity) supported QFES in an effective review of activities that took place across the seven QFES regions after *Debbie*, as well as facilitating debriefing workshops.

Flood

The CRC released a report that examined the cost-benefit of recent Launceston flood mitigation work. It was the first time the CRC had applied various parts of the research program to demonstrate how the CRC could pull together a solid synthesis highlighting the benefits of mitigation measures. The report was widely circulated and referenced nationally, and was well received by Tasmanian partners.

Fire

The CRC and the New South Wales Rural Fire Service released a joint report on community preparedness and responses to large fires in NSW in early 2017. This was widely promoted to the public by both organisations, with various media organisations picking up the key messages.

Hazard exercise

The CRC delivered an exercise for a severe cyclone for the NT Territory Emergency Management Committee. This committee is chaired by the Police Commissioner and Chief Minister's department and includes the CEOs of all major departments in the NT Government. The CRC developed, delivered and evaluated the exercise and assisted with the follow-up.

» PUBLICATIONS – SEE APPENDIX 2 FOR A FULL LIST OF PUBLICATIONS.

INTERNATIONAL RESEARCH LINKS

Fire and Emergency New Zealand agreed in January to contribute NZ\$300,000 to the CRC for further engagement with the research program. CRC and New Zealand researchers met in Wellington in May for a workshop on unpacking complexity, which discussed areas of mutual research interest currently underway and with future potential.

Following that workshop, two PhD scholarships targeting New Zealand fire issues were made available. They are currently being advertised. Discussions are ongoing to ensure that New Zealand derives other benefits from its membership of the centre.

The CRC maintains other international links:

- A Memorandum of Understanding with the Coastal Resilience Centre of Excellence, University of North Carolina
- A Memorandum of Understanding with the US Forest Service, Department of Interior and Bureau of Land Management
- A Memorandum of Understanding with the Association for the Development of the Industrial Aerodynamics (Portugal)
- A Memorandum of Understanding with the Natural Hazards Research Platform (New Zealand)
- The National Committee for the Integrated Research on Disaster Risk program - a research program co-sponsored by the International Council for Science, the International Social Science Council, and the United Nations International Strategy for Disaster Reduction. This is a global, multi-disciplinary approach to dealing with the challenges brought by natural disasters, mitigating their impacts, and improving related policy-making mechanisms



RESEARCH

- The US National Fire Protection Association, including participation by the CRC in the NFPA annual meeting and project initiatives
- An International Science Advisory Panel
- Many of the CRC's core projects have links to international partners. » (SEE APPENDIX 3)

END-USER INVOLVEMENT

The CRC has 39 active research projects with integrated project teams of researchers and end-users, established to ensure the projects continue to be informed by, and remain focused on, the needs of the partner organisations. Ongoing and active engagement between researchers and end-users is considered crucial to the success of each project.

In September 2017, the fourth Bushfire and Natural Hazards CRC – AFAC Conference was held in Sydney, New South Wales. The Research Forum of the conference, organised by the CRC, attracted 330 registrants from academia and emergency services agencies across Australia, New Zealand and internationally, including many project end-user representatives.

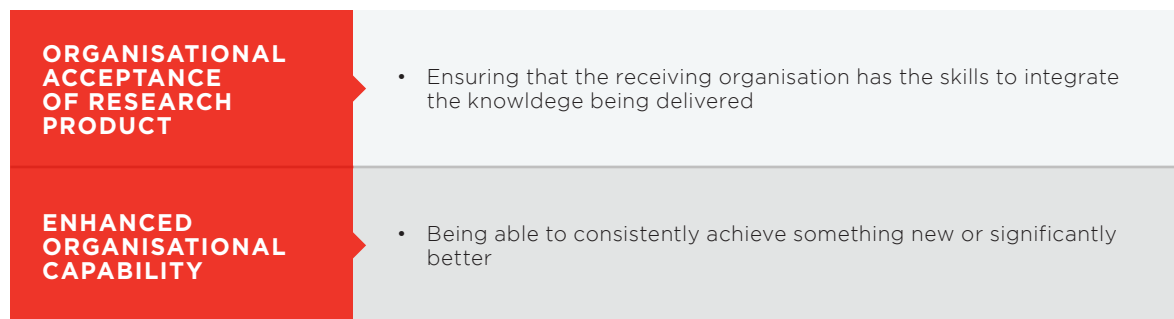
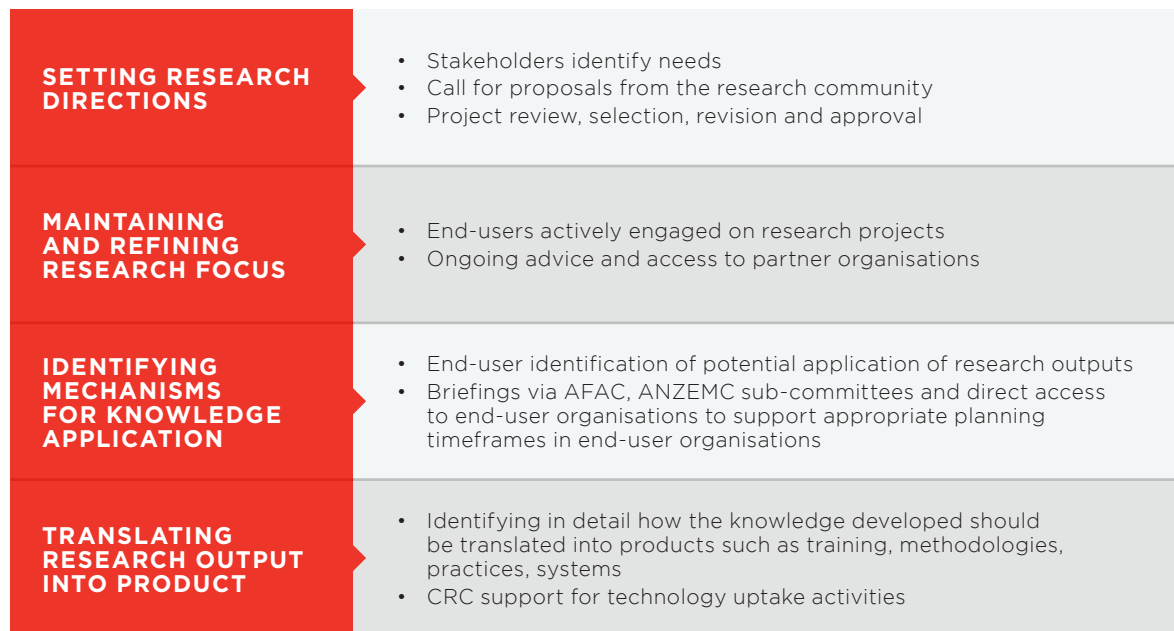
In October 2017, a Research Advisory Forum was held in Melbourne and in April 2018 another was held in Sydney. Around 120 people attended each forum, with roughly half being researchers and half end-user representatives. These two-day events provided the opportunity for CRC partners, project leaders and end-users to gain a complete overview of all the research activities within the CRC, and through workshop activities continue the process of reviewing project progress that shape the future direction of each project.

Many of the integrated project teams also held regular workshops and teleconferences and made use of opportunities to meet informally at conferences and other events to maintain ongoing project communication.



Dr Simon Heemstra, NSW Rural Fire Service, speaking at our annual conference. Photo: Bushfire and Natural Hazards CRC

UTILISATION AND COMMERCIALISATION



The CRC is on target to achieve its utilisation outcomes. There were 19 utilisation milestones for the reporting period, of which 17 have been completed, and two are expected to be completed by the end of June 2019.

RESEARCH TO CAPABILITY

End-user engagement is central to the CRC's utilisation strategy. A model of a research to capability process is depicted at left, together with examples of how the strategy is being enacted within the Bushfire and Natural Hazards CRC. The core business of the CRC is focused on the top four boxes, but at the same time the CRC must be aware of the end-user environment towards which its research is directed (bottom two boxes).

The ideas underpinning the research to capability model have been incorporated into the CRC's research utilisation strategy. This strategy, which aligns with the CRC's overall organisational strategy, details the underlying principles for achieving research utilisation across the five major strategic objectives of:

- Partnership
- Outputs
- Research
- Capability and capacity
- Governance and management.

The strategy makes explicit the need to:

- develop and maintain an appropriate IP register
- develop high level measures to monitor the utilisation of the research
- develop utilisation roadmaps for each project to aid communication with all stakeholders that will potentially use the research.

In order to facilitate discussion and planning between researchers and end-users, the CRC has research utilisation roadmaps.



UTILISATION AND COMMERCIALISATION

A utilisation roadmap is a simple presentation of research utilisation objectives against a project timeline. They are high level and articulate a shared vision of utilisation, outlining opportunities and basic actions necessary for initiating more detailed business plans, including key stakeholders, further investment requirements and a communication strategy. The roadmaps are designed to benefit end-users by facilitating uptake of research outputs, as well as provide the CRC and all stakeholders a common understanding of the steps required for successful uptake.

The CRC is in the final stages of establishing a monitoring and evaluation framework for the utilisation program. This framework is using the utilisation register, quantitative and qualitative research tools and stakeholder analysis to evaluate utilisation. In addition, the CRC is working with project groups to demonstrate good practice in utilisation, providing models for the broader CRC research program.

Specific examples of research utilisation activity include:

- Engagement with multiple state-level organisations interested in implementing the principles developed through CRC research to improve their state and organisational risk framework by helping emergency managers understand their risk ownership and what can be done to reduce that risk. This framework enables risk practitioners and policy makers to act decisively and collaboratively in the present, whilst thinking and planning for the future. A major workshop for end users was held at the 2017 annual conference.
- End-user refinement of a phone-based app for the rapid assessment of fuel levels in Australian forests, improving fire behaviour analysis.
- Utilisation of a decision support system to assist stakeholders evaluate disaster mitigation

investment decisions that consider future scenarios. The Western Australian government is co-investing the development of a model to understand natural hazard risk exposure for Perth. This will allow the government to assist in development and comparison of the costs and benefits of hazard mitigation. There has been interest from the Investor Group in Climate Change – as it grapples with risk management for major investments amid a changing climate and more extreme weather events.

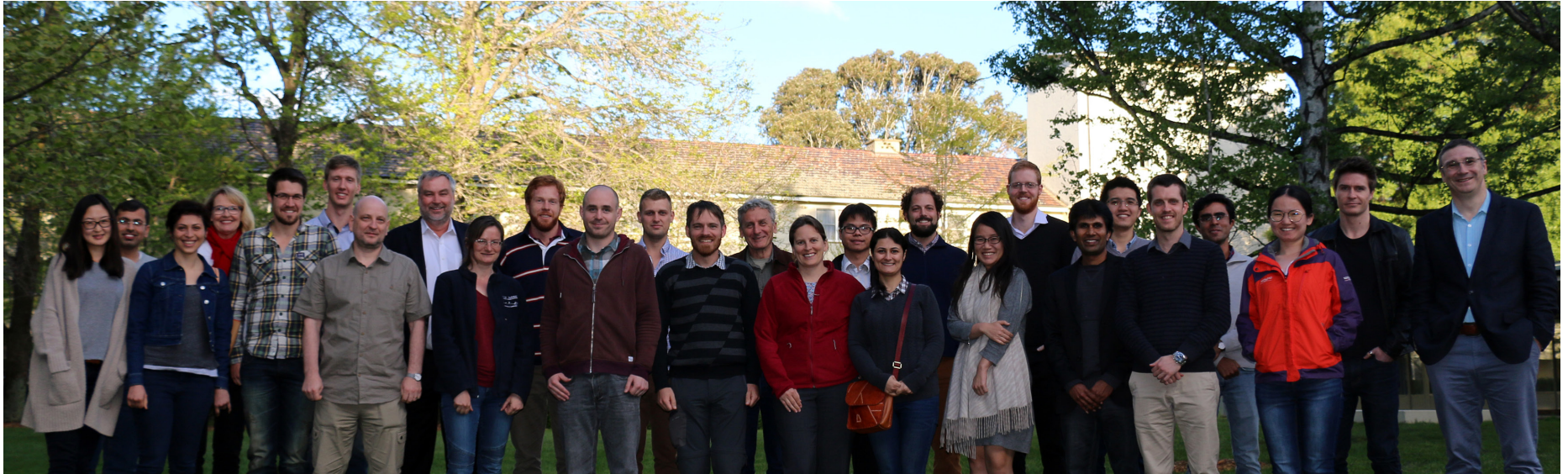
- Development of an Emergency Management Breakdown Aide Memoire and a Team Process Checklist to strengthen teamwork before, during and after emergencies.
- Identification of four key forces reshaping volunteering in the 21st century, and the subsequent incorporation of research in the Communities Responding to Disasters: Planning for Spontaneous Volunteers - Handbook 12, of the Australian Institute for Disaster Resilience.
- Development of a prototype, high-resolution soil-moisture analysis system called JASMIN, and the closely linked Australian Flammability Index, which will result in improvements to the fire danger rating and warning systems, fire behaviour and flood prediction models, and will flow on to public emergency warnings.
- Incorporation of research into the national Handbook on Communications and Warnings, and the companion document, Choosing Your Words. This work aims to ensure everyone that receives information can understand what is being communicated and will know what actions to take.
- Development of an analytical toolkit for coastal managers to better understand beach response to clustered storms and to place this in the context of the geological and oceanographic setting, and land use, for a given part of the

Australian coast.

- The Australian Nation Disaster Resilience Index prototype has been socialised with governments and emergency service organisations across Australia and New Zealand. The ANDRI provides a tool that will enable policymakers to understand at a national level, how resilience across 9 resilience characteristics vary across Australia and provide a means of tracking performance and change over time



EDUCATION AND TRAINING



CRC PhD students at the Research Advisory Forum. Photo: Bushfire and Natural Hazards CRC

The CRC is building a capacity and capability of highly skilled researchers to undertake high quality research in the sector. The CRC is building this capacity by developing a new cohort of researchers through an education program that has attracted postgraduate students to work across a range of natural hazards science projects.

Students are involved as either scholarship recipients or as associate students – both have the opportunity to engage with the industry and gain an understanding of the sector through their involvement with the CRC. All scholarship recipients have end-user sponsors who have indicated that the project has relevance to the industry and their organisation is interested in the outcomes.

At the end of this reporting period the CRC had 93 PhD students (37.2 FTE) – 35 scholarship, 28 completed, 30 associate, more than doubling its

target of providing support to 34 PhD students for the life of the CRC.

The CRC is also on track to meeting the target student completions with 28 students already completing their PhD studies.

To support the students, the CRC runs a variety of events centred on learning and networks. The annual conference and twice-yearly Research Advisory Forums and industry working groups (run by partner organisation AFAC) are key gatherings where students have the opportunity to present their findings. A number of students have also received CRC support to present their research at international conferences.

In 2017/18 students were again trained in presentation skills to promote their research using the Three-Minute Thesis format. This was incorporated into the above events and in the July

2017 *Bushfire and Natural Hazards CRC Research Driving Change - Showcase 2017*.

Eight CRC PhD students had the chance to present their research as part of a three-minute-thesis at the Research Advisory Forum either in Melbourne in November 2017 or in Sydney in April 2018, each in front of 120 partner representatives.

The students attended a workshop in the lead up to the forum where they were given expert advice on presentation skills and how to best present information in a short time.

“The workshop will change the way I undertake any presentation in the future.”

! Darryl Dixon, student



PHD GRADUATES

A round of PhD students graduated this year and shared their research outcomes with the fire and emergency services sector in several forums. They were joined by recent graduates who began their PhD studies with the Bushfire CRC. Some examples are listed below.

BUSHFIRE AND NATURAL HAZARDS CRC GRADUATES

■ Caroline Wenger

Caroline's PhD explored flood management in a

changing climate. Her research identified institutional barriers and investigated whether disaster resilience policies lead to adaptive outcomes. Caroline completed her PhD with the Australian National University.

■ Billy Haworth

Billy's PhD looked at volunteered geographic information (VGI), community engagement and bushfire preparation. VGI refers to the widespread engagement of citizens in the creation of geographic information, often through social media, smartphones and online mapping tools. Billy's

research was conducted through the University of Sydney. He is now a researcher and lecturer in geography and disaster management at the University of Manchester.

■ Yang Chen

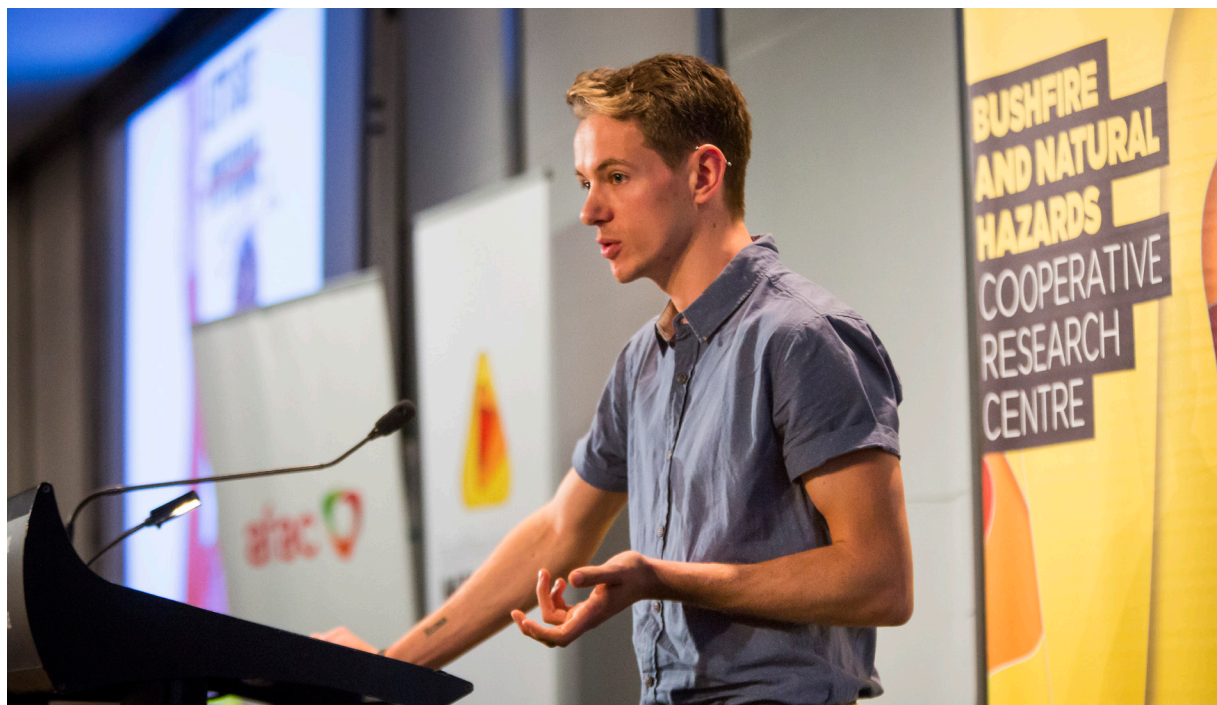
Yang's research investigated the application of the Light Detection and Ranging (LiDAR) technique in quantifying forest fuel properties, including fuel structural characteristics and litter-bed fuel load at a landscape scale. Findings indicate that LiDAR allows a more efficient and accurate description of fuel structural characteristics and estimation of litter-bed fuel load. The results from her study can assist fire hazard assessment, fuel reduction treatment and fire behaviour prediction. Yang's PhD was through Monash University.

■ Melanie Baker-Jones

Melanie's thesis at the Queensland University of Technology examined government accountability for emergency warnings over social media. As well as this specific focus on legal accountability, Melanie's thesis examined the role of governance and regulatory components in the risk management process, investigating the extent to which responsibilities for warning and the use of social media are incorporated into the regulatory system.

■ Dolapo Fakude

Dolapo's research explored integrated response as a process for enhancing emergency management. Her research looked at existing functions within communities that can be utilised for preparedness and response functions with the goal of enhancing resilience. The result was the development of an integrated response framework that combines existing community functions that align with Incident Command System (ICS) structure and function domains of ICS. Dolapo completed her PhD as a CRC Associate Student with the University of Canterbury.



Dr Billy Haworth speaking at our annual conference. Photo: Bushfire and Natural Hazards CRC

EDUCATION AND TRAINING



Dr George Carayannopoulos, University of Sydney, speaking at our annual conference. Photo: Bushfire and Natural Hazards CRC

■ Rachel Quill

Rachel's PhD explored spatial-statistical characterisation of wind fields in complex terrains for bushfire modelling applications. Her research examined data to conclude that statistical approaches can be linked to current physics-based wind modelling methodology. Rachel hopes that the application of these statistical analyses will be used to evaluate the spectrum of wind prediction models used for bushfire modeling over rugged landscapes. Rachel completed her PhD with the University of New South Wales and is currently working as a researcher at the University of Adelaide.

■ Graham Dwyer

Graham's PhD at the University of Melbourne examined how organisations understand and learn from bushfires. His thesis showed how sense-making and learning occurred during public inquiries that followed major bushfires, and how learning has continued in emergency management organisations. Graham now lectures at the Swinburne University of Technology.

■ Philip Stewart

Investigating the changing fire regimes in the Great Sandy Region of south east Queensland, Associate Student Philip Stewart's PhD at the University of Queensland investigated at the past, present and future challenges in the area. Philip investigated the linkages between fire regimes and how they impact the environment, vegetation and population dynamics. His research offers a variety of regime management controls which can be implemented in the future.

BUSHFIRE CRC GRADUATES

■ Grahame Douglas

Grahame's PhD explored bushfire planning with climate change. Grahame's research, undertaken

through the Bushfire CRC at Western Sydney University, explored the application of extreme value analysis to extreme fire weather conditions. Historically, this approach had been restricted to floods, storms, temperature and wind.

■ David Barton

David's PhD investigated the aftermath of the Black Saturday bushfires and examined the notions of loss, grief and attachment. David drew on his own personal experiences as a resident of fire-ravaged Marysville, as well as the experiences of the Marysville community. David began his PhD with the Bushfire CRC and completed it as an Associate Student of the Bushfire and Natural Hazards CRC, based at RMIT University.

■ Mahfuz Sarwar

Mahfuz's PhD looked at reducing grid sensitivity of large eddy simulation based numerical fire model wildland-urban interface fire dynamics simulator. Mahfuz applied a fluid dynamics methodology to assess the performance of eddy viscosity models and their potential as forecasting tools. He found that the models were particularly grid sensitive, with variations in resolution changing the outcomes of the forecasts. Mahfuz completed his PhD at Victoria University.

GRADUATE DESTINATIONS

Many completed students from both the Bushfire CRC and the Bushfire and Natural Hazards CRC are now employed with either end-users or research organisations and are actively contributing to the current research program in their current roles.

These include:

- Dr George Carayannopoulos – University of Sydney
- Dr Steve Curnin – TasWater/University of Tasmania



EDUCATION AND TRAINING

- Dr Veronique Florec - University of Western Australia
- Dr Rachel Quill - University of Adelaide
- Dr Brianna Larsen - Griffith University
- Dr Rene Van der Sant - Melbourne Water
- Dr Grace Vincent - CQUniversity
- Dr Alex Wolkow - Monash University
- Dr Billy Haworth, University of Manchester, UK
- Dr Caroline Wenger, Australian National University
- Dr Graham Dwyer - Swinburne University of Technology
- Dr Douglas Brown - University of Western Sydney, Bushfire Architecture
- Dr Dolapo Fakuade - Otago Civil Defence and Emergency Management
- Dr Vaibhav Gupta - City of Casey
- Dr Josh Whittaker - University of Wollongong
- Dr Briony Towers - RMIT University
- Dr Claire Johnson - Emergency Management Victoria
- Dr Val Densmore - Department of Biodiversity, Conservation and Attractions, WA
- Dr Andrew Edwards - Charles Darwin University
- Dr Adam Leavesley - ACT Parks and Conservation Service
- Dr Felipe Aires - Office of Environment and Heritage NSW
- Dr Martijn van der Merwe - Department of Environment and Water, South Australia
- Dr Mika Peace - Bureau of Meteorology
- Dr Christine Eriksen - University of Wollongong
- Dr Phil Lacy - PF Olsen Australia Forestry
- Dr Karyn Bosomworth - RMIT University
- Dr Tim Prior - Centre for Security Studies, Switzerland
- Dr Lyndsey Vivian - Centre for Australian



PhD student Ashley Wright (right) receives the Monash University Eric Laurenson Medal from Prof Tony Wong. Photo: Monash University

- National Biodiversity Research, CSIRO
- Dr Meaghan Jenkins - University of Wollongong
- Dr Peter Hayes - CQUniversity
- Dr Rowena Morris - Office of Environment and Heritage NSW

- Dr Phil Zylstra - University of Wollongong

» RESEARCH STUDENTS - SEE APPENDIX 4 FOR A LIST OF ALL POSTGRADUATE STUDENTS.



COMMUNICATIONS



Panel discussion at Research Driving Change – Showcase 2017. Photo: Bushfire and Natural Hazards CRC

With the CRC in its fifth year the communications priorities for the centre are well embedded. These include:

- Building public and industry knowledge of how to use the research, through targeted events, publications and in the general media
- Translating research findings into user friendly formats
- Providing training to researchers and postgraduate students to better communicate their work to varied audiences
- Creating and distributing branded publications and products to demonstrate the value of the CRC
- Refining the function and usability of a comprehensive website with access to publications and other research activities
- Expanding a social media presence to reach a wide range of audiences.

In late 2017 the CRC released a publication that reviewed the activities of the first four years of the CRC. This was circulated to all senior stakeholders with an interactive version online: <https://www.bnhcrc.com.au/sites/default/files/managed/achievements/2017/>

EVENTS

In addition to a Research Showcase and a high-profile annual conference, this reporting period saw a lot of activity around raising the profile of the centre, at conferences and other forums across a range of audiences including local government, public affairs, community safety and risk managers.

Showcase: Emergency managers and policy makers from across Australia gathered in Adelaide at the beginning of July to discuss how national research by the Bushfire and Natural Hazards CRC is making communities safer. *Research Driving*

Change - Showcase 2017 highlighted the practical research outcomes of the first four years of research through the CRC, with case studies and utilisation examples from across the research program presented by partners of the CRC. It was sponsored by the Attorney-General's Department, through its Emergency Management Australia section, and the University of Adelaide.

AFAC17 - The CRC and AFAC co-hosted the annual conference in Sydney in September 2017, along with Hannover Fairs Australia. This was the biggest ever CRC annual conference in terms of delegates and trade exhibition. The CRC was prominent throughout the Sydney conference and in particular at the Research Forum, which attracted 330 participants. CRC researchers featured heavily on the program. The full conference attracted more than 3200 people and the CRC handed out many branded promotional items and corporate brochures, engaged with the

COMMUNICATIONS

media and was promoted heavily on social media. The CRC launched the *Season Bushfire Outlook for Southern Australia* at a media conference.

Disaster Reduction Day

Emergency management practitioners and researchers gathered in Sydney on 13 October 2017 for a public forum on reducing the impacts of disasters in Australia. The forum, held as part of the United Nations International Day for Disaster Reduction, saw nearly 50 people hear an expert panel discuss resilience and international, national, state and local perspectives on disaster reduction. Speakers for the day were: Tony Jarrett, NSW Rural

Fire Service; Feargus O'Connor, Office of Emergency Management NSW; Andrew Gissing, CRC and Risk Frontiers; Jessica Raine, Emergency Management Australia; and, Beck Dawson, Resilient Sydney. The forum for International Day for Disaster Reduction was held in conjunction with the Attorney-General's Department and the Australian Institute for Disaster Resilience, with the support of CRC partner Risk Frontiers.

Northern fire

The 20th Northern Australia Fire Managers Forum was held in Townsville on 26-27 June 2018. In what was the largest annual meeting of this group, more

than 65 fire managers and researchers from across the north of Australia discussed the history and future of the forum, plus topics of current interest in the tropical savannas. Among other issues, the meeting compared fire preparations and weather data to produce the annual *Northern Australia Seasonal Bushfire Outlook*. Speakers reflected that the original aims of the Forum 20 years ago were still relevant despite all the changes in the sector. Chaired by the CRC, the forum also included an overnight field trip that viewed fire management issues at a large solar park, defence land, a nature sanctuary, a wetlands forest, a eucalypt forest, and coastal woodlands.

Research Advisory Forums

These attracted more than 120 people to Melbourne in November 2017 in conjunction with RMIT University; and in April 2018 in Sydney hosted by the New South Wales Rural Fire Service. These two-day events provided the opportunity for CRC partners, project leaders and end-users to gain a complete overview of all the research activities within the CRC, and through workshop activities continue the process of reviewing project progress shaping the future direction of each project. The Sydney forum was preceded with a communications skills workshop for postgraduate students.

Connecting with NZ

The connections between Australian and New Zealand research in natural hazards were the focus of a workshop in Wellington in May 2018. CRC researchers discussed a range of current projects with colleagues from New Zealand along with agency partners and policy makers prior to the joint National Emergency Management and Australasian Natural Hazards Management Conference. The CRC hosted the strategic research workshop with the Joint Centre for Disaster Research at Massey University in collaboration with Fire and Emergency New Zealand and QuakeCORE. The unpacking complexity workshop included four panel sessions:



Dr Marta Yebra, the Australian National University, at our annual conference. Photo: Bushfire and Natural Hazards CRC



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disaster resilience education for young people; hazards, culture and Indigenous communities; planning and communicating messages and community understanding and response to warnings and alerts. The workshop allowed for networking and a broad discussion on the social science of emergencies, disasters and resilience, with a plan to follow up on the main issues over the coming year.

EM keynote

Research Director Dr John Bates was a keynote speaker at the Australia and New Zealand Disaster and Emergency Management conference on the Gold Coast in May 2018. Dr Bates spoke about the importance of perspective and how the CRC is driving change in research utilisation, as well as highlighting what the CRC has learned to date, alongside the challenges for conducting research into the future. The conference included presentations from CRC researcher Dr Darja Kragt (University of Western Australia), who presented on her project that is investigating how to sustain volunteering in emergency services. This is the seventh year of the conference and the fourth time the CRC has been directly affiliated with the event.

Shine Dome science

Predict, respond, recover: science and natural disasters - this was the theme for Science at the Shine Dome 2018, the flagship annual symposium for the Australian Academy of Science. The CRC was invited to be a partner for this prestigious event, which was held on 22 May 2018 at the Shine Dome in Canberra as part of a week of activities for Fellows of the Academy and the public. The day provided an opportunity to explore the critical role that science plays in predicting, mitigating, responding to and recovering from natural hazards and extreme weather events. The program featured many CRC speakers including CRC CEO Dr Richard Thornton, who spoke on the need to define the main scientific questions. Other CRC speakers included

Board member Mark Crossweller (National Resilience Taskforce), A/Prof Jason Sharples (University of NSW) and Prof Vivienne Tippet (QUT). The CRC supported two early career researchers to attend, Dr Daniel Smith (JCU) and Dr Rachael Quill (University of Adelaide).

Friends in Parliament

The Parliamentary Friends of Science held a breakfast briefing on natural hazards science at Parliament House Canberra, in May 2018. Several CRC researchers briefed MPs and parliamentary staff on the state of their projects and the potential impacts on local communities. The briefing was part of a regular informal meeting between scientists and MPs on current issues.

Showcase roadshow

Following the success of the *Research Driving Change - Showcase 2017*, smaller, more targeted research showcases were conducted at the request of partners. Key Commonwealth Government representatives and partners were briefed by CRC researchers in October 2017 and again in May 2018 in Canberra. With the aim of helping to embed research into planning, policies and operations, the forum was initiated by the Attorney-General's Department, through its Emergency Management Australia section, as part of its sponsorship agreement with the CRC for the successful *Research Driving Change - Showcase 2017* in July 2017. Similar showcases were conducted for Victorian partners in September 2017 and in the Northern Territory in October 2017. The forums provided an opportunity for people working across the several different areas of government and emergency service agencies to discuss how the research was relevant.

Community engagement

Community engagement was the focus in Coffs Harbour in May 2018 at the Australian Community Engagement and Fire Awareness Conference, run by



Dr Richard Thornton addresses Science at the Shine Dome 2018.
Photo: Bushfire and Natural Hazards CRC

COMMUNICATIONS

the NSW Rural Fire Service. The CRC was a partner in this conference and shared a booth with AFAC and AIDR. The CRC was well represented on the program with Dr Josh Whittaker (University of Wollongong), Dr Melissa Parsons (University of New England), Dr Mel Taylor and Dr Katharine Haynes (both Macquarie University).

Sector issues

Senior management – Chairman Dr Laurie Hammond, CEO Dr Richard Thornton, and Communications Director David Bruce – attended the CRCA annual conference, this year held in Sydney in May. This event is an important one on the calendar each year to discuss key issues across the whole CRC program, and included a dinner where the CRC hosted a table with NSW-based CRC partners as guests.

US fire protection

Research Director Dr John Bates visited the US during June 2018 to attend the annual conference of the US National Fire Protection Association in Las Vegas. Dr Bates participated in a panel on leveraging data to engage at-risk communities around the world. While in the US Dr Bates also visited the US Forest Service fire research lab in Missoula and the Coastal Resilience Centre at the University of North Carolina. The CRC has Memoranda of Understanding with both organisations.

Justice workshop

A workshop in Newcastle in June 2018 wrapped up the *Policies, institutions and governance* project, led by Dr Michael Eburn. Thirty-six people attended to hear about the outcomes of the project on the role that restorative justice can play in policy and management of natural hazards, as an alternative to inquiries and royal commissions.

Media affairs

Members of the communications team represented the CRC in Melbourne at the annual Emergency

Media and Public Affairs conference in June 2018. Attended by around 80 communications and community engagement practitioners, CRC research on community engagement with remote northern Australia communities was presented on by Steve Sutton (Charles Darwin University). The CRC sponsored the event and was represented on the organising committee by Communications Manager Nathan Maddock.

Flooding plains

More than 300 people gathered on the Gold Coast from 29 May to 1 June 2018 at the Floodplain Management Conference to discuss and analyse the latest developments in flood management. The CRC had a booth in the trade display, while several CRC projects presented. This included Dr Tariq Maqsood from RMIT University, who presented findings from his team on how different construction materials cope with being inundated with floodwater and the most cost effective way to mitigate different building types from floods, while Marcus Morgan from the NSW SES spoke on behalf of Dr Katharine Haynes and Dr Matalena Tofa (Macquarie University) on findings from interviews with people who sheltered in place during the floods after ex Tropical Cyclone *Debbie* in northern NSW in April 2017. End-user Andrew Richards also spoke about the work that NSW SES is doing to update its flood warnings, with support from research findings.

Burning questions

August 2017 saw a prescribed burning forum 'The Burning Question', take place in Busselton, Western Australia. The CEO was invited to be a keynote speaker and discussed CRC research on the topic. The CRC also had a booth, which was popular during the forum breaks.

Volunteers in the west

For the fourth consecutive year, the CRC was invited to participate in the Department of Fire



Steve Sutton (Charles Darwin University) at the EMPA conference. Photo: EMPA



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and Emergency Services WA Valuing Volunteers conference. The CRC, AIDR and AFAC shared a booth, which was busy all weekend, with volunteers keen to learn about new research and other activities under way at the national level. The conference was held in Perth in September 2017, with just over 700 volunteers in attendance.

Northern exercise

Northern Territory partners were briefed on the latest CRC research in Darwin on 17 October 2017. Representatives from the NT Fire and Rescue Service, NT Emergency Service, Bushfires NT, Department of the Chief Minister and the Bureau of Meteorology attended.

Weather research

The CRC supported the High Impact Weather Research stream of presentations at the 25th Australian Meteorological and Oceanographic Society and 12th International Conference for Southern Hemisphere Meteorology and Oceanography at the University of New South Wales in February 2018. CEO Dr Richard Thornton opened the session with a short presentation on the CRC research program.

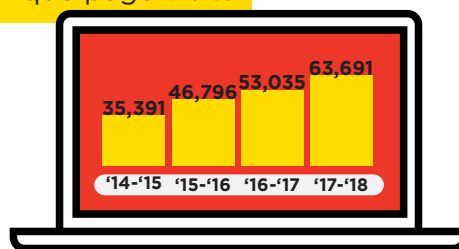
Industry academia impacts

The CRC participated in the three-day *Engaging for Impact -Academia and Industry Co-Creating Our Future* event at RMIT University in February 2018. Along with several other RMIT-linked CRCs across a range of sectors (manufacturing, space technology, environmental remediation) the CRC spoke with industry representatives and other researchers about ongoing work and how they could be involved. The CRC featured RMIT-based research led by Dr Blythe McLennan on sustainable volunteering and by Dr Briony Towers on child centred disaster risk reduction.

WEBSITE

The site is the central repository of all Bushfire and Natural Hazards CRC public documents and statements, with easy access to the outputs of the research program and the profiles of researchers. It has links to all our partners, related research organisations and, importantly, the legacy website of the Bushfire CRC. Development is ongoing, with a major update of design and function released early in the current reporting period (18/19).

63,691
Unique page visits



During the 12 month period the CRC's website had 63,691 site visits, for 242,617 page views. This represents increases of 21 per cent and 24 per cent respectively from the previous financial year. Peak traffic periods were the release of the *Southern Australia Seasonal Bushfire Outlook 2017* on 5 September 2017, 6 September 2017 (the day after release of the bushfire outlook), 28 November 2017 (the day after the release of November 2017's *Hazard News*), 12 February 2018 (release of *Hazard Note 45* documenting research findings on community preparedness, warnings and responses after bushfires in NSW) and the updated *Southern Australia Seasonal Bushfire Outlook 2017/18* on 22 November 2017. Peaks in traffic can also be seen when each edition of *Hazard News* or *Hazard Notes* are released, as these contain snippets of

information, directing users to the website for full details.

The most popular pages outside of the homepage were the *Southern Seasonal Bushfire Outlook 2017* and its updated version, the Research page, Publications page and About Us.



A selection of Hazard Notes

HAZARD NEWS AND HAZARD NOTES

The email management tool Mailchimp is used to send CRC monthly newsletters, *Hazard News*, and plain language research updates, *Hazard Notes*. The subscriber list has grown steadily during the 12 months, from 1,612, to 2,055 an increase of 27%. The open rate during this period is 37%, with 10% clicking on a link within the email. To put this into perspective, the average open rate in Mailchimp for not-for-profit organisations is 22%, while the click rate is just 2%. The CRC is far exceeding these averages.

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Dr Richard Thornton launches the Southern Australia Seasonal Bushfire Outlook 2017. Photo: Bushfire and Natural Hazards CRC

MEDIA

With experts across many disciplines, the CRC is well positioned to provide expert media comment that supports our agency partners.

Peak times centre around the CRC's *Southern Australia Seasonal Bushfire Outlook* and its update (September and November), the Research Forum and annual conference (August - September), major hazard events (mostly bushfires and cyclones over the summer months) and the *Northern Australia Seasonal Bushfire Outlook* (July).

Numerous television, radio and website interviews have focused on the science emerging from various projects. All media mentions are listed on the CRC

website. Media coverage was generated through the efforts of the Communications Team and in conjunction with university and end-user partners in newspapers, TV, radio and web. *The Conversation* website has carried numerous pieces by CRC researchers on their science.

Industry and trade media are key media partners, with the CRC contributing regular articles on the latest research findings and developments in *The Australian Journal of Emergency Management*, *Asia Pacific Fire* (UK-based), *Wildfire* (US-based), and numerous partner agency publications including the biggest two, the New South Wales Rural Fire Service's *Bush Fire Bulletin* and the Victorian Country Fire Authority's *Brigade*. CRC research was also cited in numerous publications by the Climate Council, the Australian Academy of Sciences and the CRC Association.

Fire Australia, a quarterly magazine with a circulation of 6,000, is produced by the CRC jointly with the Fire Protection Association of Australia and AFAC.

The Communications Team is constantly on the lookout for media opportunities and the chance to promote the work of the CRC and the benefits gained by our partners through the use of CRC science.

The single biggest day for media conference was the annual launch the *Southern Australia Seasonal Bushfire Outlook 2017*, held on the first day of the annual conference. This year in Sydney, the CEO hosted the media conference with speakers Dr David Jones from the Bureau of Meteorology, Shane Fitzsimmons, Commissioner NSW Rural Fire Service, Dominic Lane, Commissioner ACT Emergency Services Agency, Board member Craig Lapsley, Commissioner Emergency Management Victoria, Mike Wassing, Deputy Commissioner Queensland Fire and Emergency Services, Chris Arnol, Chief Fire Officer Tasmania Fire Service, Greg Nettleton, Chief

Fire Officer South Australia Country Fire Service and Peter Norman, Superintendent Western Australia Department of Fire and Emergency Services.

The media conference was broadcast live on ABC 24 and Channel Seven, with Channel's Nine and Ten also attending and running stories on their nightly news. Other outlets to attend included the *Sydney Morning Herald*, *The Daily Telegraph*, ABC Radio, 2GB and AAP. With the assistance of the NSW Rural Fire Service, the media conference was livestreamed to communities on both the CRC and RFS Facebook pages.

SOCIAL MEDIA

The CRC regularly engages on social media and sees these channels as key communications tools. An active engagement strategy throughout the year has seen both the popularity and interactivity of the CRC's channels increase over the 12 month period. Collaborating closely with our partners, both research organisations and emergency services, has seen the reach of CRC posts on social media extend considerably.

The CRC uses Facebook, Twitter, YouTube, Linked In and SoundCloud. Our annual conference at the beginning of September is a key time for engagement and generates the most activity and interest. Our seasonal bushfire outlooks for northern and southern Australia (July and September respectively) are also popular. Details about each channel are below.

The CRC uses the social media tool Sprout Social to provide analytics and schedule social media posts.

Individual channel data is below, but combined through Facebook and Twitter, the CRC achieved 20,832 Facebook shares, Twitter mentions and retweets (an increase of 18% from the previous 12 months). Total impressions across our Facebook and Twitter channels was over 2.1 million, a 40% increase.

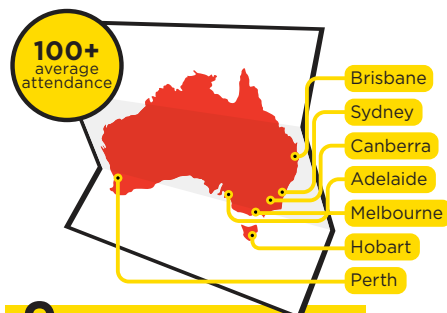


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11,794 followers on social media

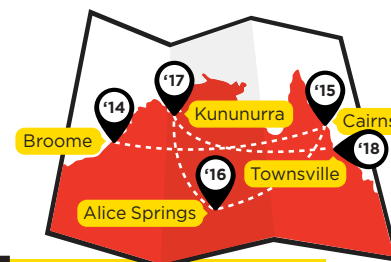
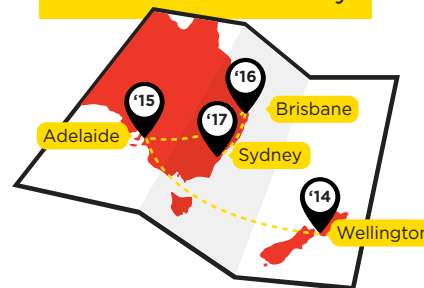


- f** 5,029 likes
- t** 4,629 tweets
- in** 2,136 followers



9 Research Advisory Forums

1583 Attendees @ Research Forum Day



5 North Australia Fire Managers Forums

FACEBOOK

Beginning the 12 month reporting period with 3,590 likes, by 30 June 2018 Facebook likes had grown to 5,029, an increase of 1,439, or 40%.

CRC Facebook posts received 1,478,651 impressions, up 36% from the previous financial year. Of these impressions, 60% were organic and 40% viral. The average impressions per post was 4,694 people (an increase of 34%). There were 4,234 links clicked.

The engagement with the Facebook page is 52% female and 48% male.

These strong figures across likes and, more importantly, impressions and engagement, show that the content posted through Facebook continues to be popular with a growing audience. Posting is strategic, both in terms of content, as well as the day and time it is posted. Popular content includes the annual northern and southern bushfire outlooks for Australia, informative videos, photographs, research surveys, new research announcements and links to media coverage of the CRC.

TWITTER

During 2016-2017 the CRC grew its followers on Twitter from 2,050 to 2,434, an increase of 19%. 606

tweets were posted, an average of 1.7 tweets per day, with 573,479 impressions across the 12 month period (a 28% increase). There were 1,543 link clicks. CRC tweets were retweeted 2,038 times (up 22%), with 2,636 likes (up 36%). This represents a 31% increase in engagement from the previous reporting period. The average reach of each tweet was 874 people (up eight per cent). The CRC was mentioned on Twitter 977 times, an increase of 16%.

Like Facebook, this increase represents an increase in engagement through regular and strategic posting of informative content such the northern and southern bushfire outlooks, videos, photos and links to new research.

The audience of the Twitter page is 65% male and 35% female. In addition, many CRC staff, including the CEO and Research Director, are active on Twitter and reinforce the CRC official postings.

YOUTUBE

The CRC's YouTube Hazard Channel continues to grow, with new videos added from important CRC events, such as our annual conference, the International Day for Disaster Reduction and our *Research Driving Change - Showcase 2017*, as well as project updates for end-users. Twenty eight videos

were added to the channel during the 12 month period, bringing the total number to 105. These videos are embedded on the CRC website, partner websites (including the United Nations' Prevention Web) and shared via other CRC social media platforms.

During the reporting period, a total of 7,700 views were recorded, an increase of 46% from the previous year. An estimated 39,400 minutes were watched, up 82%. The most popular videos were two documentaries that the CRC was involved in: *Black Tuesday* - about the 1967 Tasmania bushfires, and *The Day the Flames Came* - about the 1961 Dwellingup bushfire. Other popular videos included the summary of the International Day for Disaster Reduction and research updates from the *Enabling sustainable volunteering* project.

LINKED IN

The CRC has a large Linked In presence, with 2,711 followers, increasing by 61% over the previous year. More attention was given to this communication channel throughout the year, with the growth showing that the increase in posting is having an impact on the engagement received.

GOVERNANCE

The Bushfire and Natural Hazards CRC is an incorporated not-for-profit public company limited by guarantee. The company, Bushfire and Natural Hazards CRC Ltd was registered in May 2013 and began formal CRC operations on 1 July 2013.

The Governing Board met five times throughout the year, with each meeting held in a different capital city. Each meeting was held in conjunction with either a research showcase or an informal stakeholder partner event to enable the Board to meet with members, end-users, researchers, students and other key stakeholders. The Board is chaired by an independent director, Dr Laurie Hammond.



Back row from left: Commissioner Craig Lapsley, Dr Richard Thornton, Prof Alistar Robertson, Mr Stuart Ellis, Mr Lee Johnson. Front row from left: Ms Kathy Gramp, Ms Naomi Stephens, Dr Laurie Hammond, Ms Katherine Jones, Mr Karl Sullivan. Photo: Bushfire and Natural Hazards CRC

GOVERNING BOARD MEMBERS

NAME	ROLE	KEY SKILLS	INDEPENDENT/ ORGANISATION	APPOINTMENTS/ RESIGNATIONS	ATTENDANCE
Dr Laurie Hammond	Chairman	Governance and strategy	Independent	Appointed August 2013	5 out of 5
Stuart Ellis	Director	Industry based skills	AFAC	Appointed June 2013	5 out of 5
Kathy Gramp	Director	Finance and governance	Independent	Appointed December 2013	4 out of 5
Lee Johnson	Director	Industry based skills	Independent	Appointed December 2013	4 out of 5
Commissioner Craig Lapsley	Director	Industry based skills	Emergency Management Victoria	Appointed December 2013	4 out of 5
Katherine Jones	Director	Industry based skills	Dept of Home Affairs	Appointed November 2015, resigned May 2018	3 out of 3
Mark Crowweller	Director	Industry based skills	Dept of Home Affairs	Appointed May 2018	1 out of 2
Prof Alistar Robertson	Director	Research	Independent	Appointed December 2013	5 out of 5
Naomi Stephens	Director	Industry based skills	Office of Environment and Heritage, NSW	Appointed December 2013	5 out of 5
Karl Sullivan	Director	Industry based skills	Insurance Council of Australia	Appointed November 2015	5 out of 5
Doug Smith	Director	Industry based skills	Queensland Fire and Emergency Services	Appointed November 2016	5 out of 5



GOVERNANCE

COMMITTEE MEMBERS

The Board has two committees that each meet at least twice a year:

- **Audit Risk and Compliance Committee** - oversees corporate governance, audit responsibilities, finance, compliance and risk management.
- **Research and Utilisation Committee** - ensures research conducted meets the strategic aims of the CRC and the needs of end-users, and is responsible for providing strategic advice on the overall development of the CRC's postgraduate program and new educational initiatives. The committee also advises on the strategy for research adoption.

BOARD MEETINGS

DATE	CITY
July 2017	Darwin
September 2017	Melbourne
November 2017	Sydney
March 2018	Adelaide
May 2018	Canberra

NAME	ROLE	KEY SKILLS	INDEPENDENT/ ORGANISATION	COMMITTEES
Kathy Gramp	Chair	Finance and governance	Independent	Audit Risk and Compliance Committee
Lee Johnson	Member	Industry based skills	Independent	Audit Risk and Compliance Committee
Naomi Stephens	Member	Industry based skills	Office of Environment and Heritage, NSW	Audit Risk and Compliance Committee
Prof Alistar Robertson	Chair	Research	Independent	Research and Utilisation Committee
Lee Johnson	Member	Industry based skills	Independent	Research and Utilisation Committee
Stuart Ellis	Member	Industry based skills	AFAC	Research and Utilisation Committee
Dr Rob Webb	Member	Industry	Bureau of Meteorology	Research and Utilisation Committee
Heather Stuart	Member	Industry based skills	New South Wales State Emergency Service	Research and Utilisation Committee
Georgie Cornish	Member	Industry based skills	Country Fire Service, South Australia	Research and Utilisation Committee
Prof Liz Sonenberg	Member	Research	University of Melbourne	Research and Utilisation Committee
Jeremy Fewtrell	Member	Industry based skills	Fire and Rescue New South Wales	Research and Utilisation Committee

GOVERNANCE

RESEARCH PROGRAM LEADERS

For more details on the research leaders, end-users and project aims, see the full Research Program at www.bnhcrc.com.au/research.

NAME	ORGANISATION
Prof Holger Maier	University of Adelaide
Prof Roger Jones	Victoria University
Prof David Pannell	University of Western Australia
Dr Jessica Weir	Western Sydney University
A/Prof Michael Eburn	Australian National University
Dr Katharine Haynes	Macquarie University
Dr Thomas Lorian	Macquarie University
Prof Kevin Ronan	CQUniversity
Dr Melanie Taylor	Macquarie University
Dr Ilona McNeill	University of Melbourne
Prof Vivienne Tippet	Queensland University of Technology
Prof David Johnston	Massey University

NAME	ORGANISATION
A/Prof Chris Bearman	CQUniversity
Dr Tariq Maqsood	RMIT University
Prof Michael Griffith	University of Adelaide
Dr Trent Penman	University of Melbourne
Dr Melissa Parsons	University of New England
Dr Ross Bradstock	University of Wollongong
Dr Karin Reinke	RMIT University
Dr Matthew Mason	University of Queensland
Dr Krishna Nadimpalli	Geoscience Australia
A/Prof John Ginger	James Cook University
Prof Sujeeva Setunge	RMIT University
Prof John Handmer	RMIT University
Dr Michael Jones	University of Wollongong

NAME	ORGANISATION
Steve Sutton	Charles Darwin University
Adj Prof Jeremy Russell-Smith	Charles Darwin University
Dr Scott Nichol	Geoscience Australia
Prof Charitha Pattiaratchi	University of Western Australia
Dr Marta Yebra	Australian National University
Dr Jeff Kepert	Bureau of Meteorology
A/Prof Valentijn Pauwels	Monash University
Dr Imtiaz Dharssi	Bureau of Meteorology
Dr Khalid Moinudolin	Victoria University
Dr Tina Bell	University of Sydney
A/Prof Jason Sharples	University of New South Wales



GOVERNANCE

KEY STAFF

NAME	POSITION/ROLE	TIME
Dr Richard Thornton	Chief Executive Officer	1.0
Dr Michael Rumsewicz	Research Director - to October 2017	1.0
Dr John Bates	Research Director - from October 2017	1.0
David Bruce	Communications Director	1.0
Trevor Essex	Company Secretary/ Business Manager	0.3
Leanne Beattie	Executive Assistant	1.0
Dr Desiree Beekharry	Core Research Program Manager	1.0
Sarah Mizzi	Partnership Development Manager	1.0
Nathan Maddock	Communications Manager	1.0
Vaia Smirneos	Communications Officer (Events) - on maternity leave from March 2018	1.0
Amy Mulder	Communications Officer (Events) - maternity leave position from February 2018	1.0

NAME	POSITION/ROLE	TIME
Dr Matthew Hayne	Research Utilisation Manager	0.5
Loriana Bethune	Research and DELWP Program Manager	1.0
David Boxshall	Research Program Support Officer	1.0

NAME	POSITION/ROLE	TIME
Kelsey Tarabini	Research Utilisation Program Support Officer	1.0
Kate Eagles	Financial Controller	0.3
Anna Nikitina	Finance Officer	0.3
Costa Haritos	Communications Assistant - Intern from February 2018	1.0



CRC staff from left: Costa Haritos, Kelsey Tarabini, Dr John Bates, Aleesha Hui, Amy Mulder, Leanne Beattie, Dr Matthew Hayne, Loriana Bethune, Dr Richard Thornton, David Boxshall, Sarah Mizzi, Nathan Maddock, David Bruce, Dr Desiree Beekharry. Photo: Bushfire and Natural Hazards CRC

GOVERNANCE

PARTICIPANTS

PARTICIPANT NAME	PARTICIPANT TYPE	ABN	ORGANISATION TYPE
Attorney-General's Department, from January 2018 Department of Home Affairs	Essential	92 661 124 436	Australian Government
Bureau of Meteorology	Essential	92 637 533 532	Australian Government
Geoscience Australia	Essential	80 091 799 039	Australian Government
ACT Emergency Services Agency	Essential	77 972 506 632	State Government
ACT Territory and Municipal Services	Essential	37 307 569 373	State Government
Fire and Rescue NSW	Essential	12 593 473 110	State Government
Office of Environment and Heritage, NSW	Essential	30 841 387 271	State Government
NSW Rural Fire Service	Essential	25 003 129 221	State Government
NSW State Emergency service	Essential	88 712 649 015	State Government
NT Fire and Rescue Service	Essential	84 085 734 992	State Government
Queensland Fire and Emergency Services	Essential	93 035 163 778	State Government
SA Fire and Emergency Service Commission	Essential	22 190 872 368	State Government
Tasmania Fire Service	Essential	68 039 681 690	State Government
Country Fire Authority, VIC	Essential	39 255 319 010	State Government

PARTICIPANT NAME	PARTICIPANT TYPE	ABN	ORGANISATION TYPE
Metropolitan Fire and Emergency Services Board	Essential	28 598 558 561	State Government
Department of Environment, Land, Water and Planning, VIC	Essential	90 719 052 204	State Government
Emergency Management Victoria	Essential	32 790 228 959	State Government
Victorian State Emergency Service	Essential	61 279 597 238	State Government
Department of Fire and Emergency Services, WA	Essential	39 563 851 304	State Government
Department of Parks and Wildlife, WA	Essential	38 052 249 024	State Government
Fire Emergency New Zealand	Essential		International
Australian National University	Essential	52 234 063 906	University
CQUniversity	Essential	39 181 103 288	University
Charles Darwin University	Essential	54 093 513 649	University
Deakin University	Essential	56 721 584 203	University
James Cook University	Essential	46 253 211 955	University
Macquarie University	Essential	90 952 801 237	University
Monash University	Essential	12 377 614 012	University
Queensland University of Technology	Essential	83 791 724 622	University



GOVERNANCE

PARTICIPANT NAME	PARTICIPANT TYPE	ABN	ORGANISATION TYPE
RMIT University	Essential	49 781 030 034	University
University of Adelaide	Essential	61 249 878 937	University
University of Melbourne	Essential	84 002 705 224	University
University of New England	Essential	75 792 454 315	University
University of Southern Queensland	Essential	40 234 732 081	University
University of Sydney	Essential	15 211 513 464	University
University of Tasmania	Essential	30 764 374 782	University
University of Western Australia	Essential	37 882 817 280	University
University of Wollongong	Essential	61 060 567 686	University
Western Sydney University	Essential	53 014 069 881	University
Victoria University	Essential	83 776 954 731	University
AFAC	Other	52 060 049 327	Industry
Australian Red Cross	Other	50 169 561 394	Industry
Fire Protection Association Australia	Other	30 005 366 576	Industry
RSPCA QLD	Other	74 851 544 037	Industry
University of Canberra	Other	81 633 873 422	University

PARTICIPANT NAME	PARTICIPANT TYPE	ABN	ORGANISATION TYPE
Volunteering Queensland	Other	46 621 632 398	Industry
Flinders University	Other	65 542 596 200	University



Field trip at the North Australia Fire Managers Forum 2018, Townsville. Photo: Bushfire and Natural Hazards CRC

COLLABORATION

END-USERS AND RESEARCHERS

Integrated project teams of researchers and end-users are in place for every project to ensure the projects are informed by, and remain focused on, the needs of the partner organisations. Ongoing and active engagement between researchers and end-users is considered crucial to the success of each project.

End-user representatives are essential to long-term project success through:

- Framing of research questions, development of a common language within the integrated project team, ongoing review of the research questions, facilitating access to data/information/people to support project goals, identification of potential use of research outputs, and the development of a roadmap taking the research through to utilisation.
- Providing advice to the project, as it develops, on how the research can be made more valuable to end-users.
- The number of end-user participants varies from two to 15 across the projects, totalling 300.

The end-user representatives on projects, wherever possible, involve representation:

- From across states and territories
- From across agencies focused on various hazard emergencies
- From across different types of participants, such as policy departments, operational agencies and non-government organisations.

The spread of representation is important to the long-term success of the CRC in delivering nationally valuable research outcomes.

In addition, some end-users are linked with multiple projects within the CRC, and so provide an important avenue for communication and synergies between projects.

This is further enhanced by the fact that a number of those representatives also meet in forums outside of the CRC, such as AFAC groups, providing further opportunities for cross pollination between projects.

COLLABORATION IN PRACTICE

Examples of collaboration between end-users and researchers include:

National Research Priorities

The launch of *National research priorities for natural hazards emergency management* was the culmination of an extensive series of workshops with end-user stakeholders and other relevant groups to explore major issues across hazards, resilience and the community.

The workshops identified the critical issues that could be addressed by research. They were mostly conducted in collaboration with organisations that are major representative stakeholders, including AFAC and the Bureau of Meteorology.

Research Advisory Forums were held in Melbourne in November 2017 in conjunction with RMIT University and in April 2018 in Sydney hosted by the New South Wales Rural Fire Service. These two-day events provided the opportunity for CRC partners, project leaders and end-users to gain a complete overview of all the research activities within the CRC, and through workshop activities continue the process of reviewing project progress shaping the future direction of each project. Around 120 people attended each forum with roughly half researchers and half end-user representatives.

In addition to these forums, the research groupings have maintained regular close communication through avenues such as face-to-face meetings and teleconferences.

Southern and Northern Australia Fire Managers forums

These meeting for southern fire managers was convened as a teleconference by the CRC and AFAC. Earlier, all the northern Australian fire and land management agencies met in Townsville.

These forums include participation from AFAC, the Bureau of Meteorology, many universities and all fire and land management agencies across the regions. The Bushfire Seasonal Outlooks were formulated and released in conjunction with these forums. These Outlooks are used by fire and emergency service agencies to work with relevant state and federal governments to prepare for the bushfire season.

United Nations International Strategy for Disaster Reduction

The CRC is the national coordinator for a United Nations backed committee that promotes and supports disaster risk reduction research programs and activities around the world.

This Integrated Research on Disaster Risk (IRDR) National Committee for Australia is sponsored by the United Nations International Strategy for Disaster Reduction, the International Council for Science and the International Social Science Council. It was formed to address the major global challenges of natural and human-induced environmental hazards. Through this arrangement there are many opportunities for the CRC to align some of its projects with the international disaster risk reduction strategy. Researcher Prof Kevin Ronan represented the CRC at several IRDR workshops and meetings on the implementation of the Sendai Framework for Disaster Risk Reduction. Researcher, Prof John Handmer, is on the IRDR Scientific Committee.

Science Advice

The CRC International Science Advisory Panel, which provides strategic advice and review of the CRC



COLLABORATION

research program to the Board of the CRC is chaired by Prof Carmen Lawrence of the University of Western Australia and includes Dr Mark Finney of the US Forest Service, Prof Gavin Smith of the University of North Carolina Chapel Hill, and Dr Anthony Bergin, of the Australian Strategic Policy Institute.

National resilience

The Australian Institute for Disaster Resilience, is a partnership between the Australian Government's Department of Home Affairs, the CRC, AFAC and the Australian Red Cross. The Institute delivers products and services around the country that have been developed by, and for, the emergency management sector. The CRC has taken a lead role in the Institute's *Australian Journal of Emergency Management*.

The CRC was invited by the National Resilience Taskforce of the Department of Home Affairs to participate in its Policy Sprint workshop in June 2018 in Melbourne. The invitation only event saw participants from private, public and community sectors exchange knowledge on mitigation and disaster resilience to help develop a five-year national mitigation framework.

The Research Director, Partnership Development Manager and several CRC researchers were engaged with the National Resilience Taskforce to develop a National Disaster Risk Reduction Framework. This taskforce, announced by the Prime Minister in late 2017 and being lead out of the Department of Home Affairs, has been engaging stakeholders since early 2018. The Framework is expected to be sent to Cabinet in late 2018.

National fire danger

The CRC continues to take a leading role in the development of the science behind a new national Fire Danger Rating System, along with government and fire agency partners. Approximately 10 CRC projects are contributing to aspects of an enhanced



Panel session at International Day for Disaster Risk Reduction 2017. Photo: Bushfire and Natural Hazards CRC

Fire Danger Rating System. The Research Director is a member of the National Fire Danger Ratings Board, which reports to the Australia New Zealand Emergency Management Committee.

Staff connections

The CEO is a member of the National Flood Risk Advisory Group, a sub-group of COAG's Australian and New Zealand Emergency Management Committee, which reports to the Law, Crime and Community Safety Ministerial Council. He is a member of the Forest Fire Management Group, a committee of Australian and New Zealand forest management agencies reporting to the Forest Products Committee of COAG; a member of the

International Science Advisory Group for the New Zealand Resilience to Nature's Challenges Centre; a member of the Victoria University Industry Advisory Board for the Centre for Environmental Safety and Risk Engineering (CESARE); a member of the CRC Association Board; and a member of the editorial advisory board of the *International Journal of Wildland Fire*. He also reviews scientific papers for several international journals.

The Research Director is Editor-in-chief of the *Australian Journal of Emergency Management*.

The Communications Director is a Board member on the International Association of Wildland Fire and is Chair of the Editorial Advisory Committee for its magazine *Wildfire*.

COLLABORATION



The Centre's research into natural hazard mitigation encompasses not just our researchers, but our partners and the community, and the benefits are wide-reaching.

APPENDIX 1: ADDITIONAL RESEARCH



COMMISSIONED RESEARCH - 2017/18

TITLE	AGENCY
Develop a decision support system for Western Australia	Department of Fire and Emergency Services, Western Australia
Strategy 2030	Queensland Fire and Emergency Services
Post-bushfire research - Currandooley, Sir Ivan, Carwoola fires	New South Wales Rural Fire Service
Post bushfire research - Reedy Swamp fire	New South Wales Rural Fire Service
National research priorities for energy networks	Energy Networks Australia/S&C Electric
Quantifying catastrophic bushfire consequences	Energy Networks Australia
Community engagement: a framework and tools to support a flood warning system for New South Wales	New South Wales State Emergency Service

RESEARCH FOR THE DEPARTMENT OF ENVIRONMENT, LAND, WATER AND PLANNING, VICTORIA

TITLE
Smoke transportation modelling and smoke emissions modelling
Social values in bushfire management decision making (INFFER) project
Multi-platform analysis and remote sensing
Science based monitoring and reporting
Bushfire climatology project
2009 Black Saturday bushfires reconstruction
Framework for using and updating ecological models to inform bushfire management planning
Landscape fuel moisture forecasting for bushfire risk assessment
Dynamic smoke intelligence using remote sensing and fixed sensors
Community impacts of smoke
Severe fire behaviour characterisation - improved planning responses
Smoke impacts on community health and social perceptions
Science and policy impacts - establishing a MER framework
Risk communications
Provision of data inputs for INFFER
Estimating the social, economic and environmental cost and benefits
Bushfire and fires monitoring data validation and analysis

APPENDIX 1

TACTICAL RESEARCH FUND

TITLE	AGENCY
Re-imaging program evaluation for community resilience	Emergency Management Victoria and the University of New England
Classifying outcomes of inquiries and reviews: what can we learn?	AFAC
Analysis of preventable residential fire fatalities	Metropolitan Fire Brigade, Victoria
A guide to develop bushfire case studies - a case study of cropland fires	Country Fire Authority, Victoria
Risk assessments of non-compliant materials on buildings	Fire and Rescue New South Wales

FUNDS FOR QUICK RESPONSE

TITLE	RESEARCH ORGANISATION
Assessment of post-fire recovery of pencil pine forest after the 2016 World Heritage Area fires	University of Tasmania
Mapping the area of Tathra to study if Mechanical Fuel Load Reduction along with prescribed burning can save houses (in future) at Tathra, NSW	University of Technology Sydney
Disaster waste management in Darwin following Cyclone <i>Marcus</i>	Charles Darwin University

APPENDIX 3: INTERNATIONAL COLLABORATION



INTERNATIONAL COLLABORATION HIGHLIGHTS BY PROJECT

PROJECT	INTERNATIONAL COLLABORATIONS
1. <i>Economics of natural hazards</i>	Collaboration with US Forest Service on public perceptions of bushfire risk and the costs of suppression.
2. <i>Improved decision support systems for optimal natural hazard mitigation</i>	Collaboration with Karlsruhe Institute of Technology/Centre for Disaster Management and Risk Reduction Technology in Germany on earthquake modelling for the decision support system tool.
3. <i>Mapping and understanding bushfire and natural hazards vulnerability and risk at the institutional scale</i>	Collaboration with the UK Climate Impacts Programme.
4. <i>Optimising post-disaster recovery interventions in Australia</i>	Collaboration with the Asian Disaster Preparedness Center.
5. <i>Policies, institutions and governance</i>	Presentations at International Association of Wildland Fire Safety Summit, the UK Alliance for Disaster Research and at the Emergency Planning College, York, United Kingdom.
6. <i>Scientific diversity and uncertainty in risk mitigation policy and planning</i>	Case study with the Alberta Provincial Government exploring the use of science in risk mitigation decision making in the town of Lac La Biche, Alberta, Canada.
7. <i>Using realistic disaster scenario analysis to understand natural hazard impacts and emergency management</i>	Presentation at the 13th Americas Conference on Wind Engineering, Gainesville, Florida.
8. <i>An analysis of building losses and human fatalities from natural disasters</i>	Presentation at the American Association of State Floodplain Managers Conference.
9. <i>Catastrophic and cascading events – planning and capability</i>	Collaboration with University of North Carolina.

PROJECT	INTERNATIONAL COLLABORATIONS
10. <i>Child-centred disaster risk reduction</i>	Presentations to the International Congress of Applied Psychology, Paris; the UN World Conference on Disaster Risk Reduction in Sendai, Japan in 2015; a Research-Practice Workshop in Wellington in 2016; the UNISDR Global Platform on Disaster Risk Reduction in Cancun Mexico in 2017; and the XIX ISA World Congress of Sociology in Toronto, Canada, 2018.
11. <i>Effective risk and warning communication during natural hazards</i>	Collaboration with the Risk Communication and Resilience Research Program at the University of Maryland. Editorial board membership of the Journal of International Crisis and Risk Communication Research, based in the US.
12. <i>Enhancing remote north Australian community resilience</i>	Invitations from two Brazilian institutions to participate in international workshops on prescribed fire management in savanna environments.
13. <i>Community understanding of tsunami risk and warning system</i>	Collaboration with the University of Canterbury on the earthquake scenario workshop project. Presentation at the Building Individual and Organisational Capacity in the Asia-Pacific Region: 4th International Workshop on Psychological Intervention After Disasters 2015 in Taiwan.
14. <i>Factors affecting long term community recovery</i>	Presentation at the Global Risk Forum, IDRC in Switzerland. Collaboration with thy University of Iowa in the field of indicators of disaster resilience.

APPENDIX 3

PROJECT	INTERNATIONAL COLLABORATIONS
15. <i>Diversity and inclusion – building strength and capability</i>	<p>Presentation at the 6th International Conference on Building resilience, Auckland, New Zealand 2016 and at the European Climate Change Adaptation June 2017.</p> <p>Participation in advisory role in the Impressions Project, a multiparty collaboration across UK and European research institutes funded by the European Union. Collaboration with UKCIP at Oxford University.</p>
16. <i>Flood risk communication</i>	<p>Presentation at the 4S and EASST joint conference, 'Science and Technology by Other Means,' 2016, Spain.</p>
17. <i>Improving decision making in complex multi-team environments</i>	<p>Presentations to the Forest and Rural Firefighters Association of New Zealand annual conference and the Society for Decision Making Under Deep Uncertainty annual workshop at the World Bank in Washington DC.</p>
18. <i>Improving the retention and engagement of volunteers in emergency services agencies</i>	<p>Erasmus + Exchange – EU Grant: To discuss inter alia Emergency Service Volunteering (Leadership; Diversity) in Greece.</p>
19. <i>Improving hazard communications increasing residents' preparedness and response planning</i>	<p>Collaboration with Leeds University Business School, United Kingdom, testing interventions that increase intentions to perform behaviours.</p> <p>Collaboration with Columbia University, USA, looking at the relationship between different self-regulatory systems, including promotion and prevention focus, assessment and locomotion, and personality factors.</p>
20. <i>Managing animals in disasters</i>	<p>Presentation at international conferences: the British Animal Rescue and Trauma Care Association in Prague and People in Disasters in Christchurch.</p>
21. <i>Out of uniform - building community resilience non-traditional volunteering</i>	<p>Presentations at the annual conference of the Royal Geographical Society UK and the Annual Conference of the American Association of Geographers.</p>

PROJECT	INTERNATIONAL COLLABORATIONS
22. <i>Resilience of clustered disaster events on the coast-storm surge</i>	<p>Collaboration with Japan Agency of Marine-Earth Science and Technology; and with Geoscience Australia on deep-sea geological research on the Lord Howe Rise, Coral Sea.</p>
23. <i>The Australian Natural Disaster Resilience Index</i>	<p>Presentation at the 5th International Disaster and Risk Conference, Davos, Switzerland in 2015. Presentation at the Binghamton Geomorphology Symposium on 'Resilience in bio-geomorphic systems' in San Marcos, Texas (2017) and at the International Society for River Science in Hamilton, New Zealand, 2017.</p>
24. <i>Improving land dryness measures and forecast</i>	<p>Collaboration with NASA Goddard to use the Land Information system to assimilate satellite derived soil moisture information.</p>
25. <i>Improving the resilience of existing housing to severe wind events</i>	<p>Invited speaker at the University of Florida sponsored workshop for the development of homeowner decision-support tools for mitigation, Tampa, Florida, 2016.</p>
26. <i>Cost-effective mitigation strategy for building-related earthquake risk</i>	<p>Collaboration with the University of Auckland in developing fragility curves for unreinforced masonry buildings with evidence from the recent Canterbury earthquakes.</p>
27. <i>Improving flood forecast skill using remote sensing data</i>	<p>Presentation at the KU Leuven in Belgium, 2016. Keynote at the 7th International Workshop on Catchment Hydrological Modeling and Data Assimilation in Xi'an, China, 2018.</p>
28. <i>Cost-effective mitigation strategy for flood prone buildings</i>	<p>Presentation at the 2016 International Conference on Flood Risk Management and Response Conference, Venice, Italy.</p>
29. <i>Coupled fire-atmosphere modelling</i>	<p>Collaboration on fire weather with the UK Met Office, Leeds University, the European Centre for Medium Range Weather Forecasting, and the South African Weather Service.</p>
30. <i>Delivering effective prescribed burning across Australian ecosystem</i>	<p>Collaboration with Landcare Research, New Zealand.</p>



APPENDIX 3

PROJECT	INTERNATIONAL COLLABORATIONS
31. <i>Mapping bushfire hazard and impacts</i>	Collaboration with the European Forest Fire Information System and the Global Wildfire Information System; the Council of Scientific and Industrial Research, South Africa, Meraka Institute and others.
32. <i>Enhancing resilience of critical road infrastructure</i>	Collaborated in the ANDROID disaster resilience network and with Huddersfield University, United Kingdom. Presentation at the 7th International Conference on Building Resilience, November 2017, Thailand.
33. <i>Fire spread prediction against fuel types</i>	Collaborating with Aix-Marseille University, France, Lebanese University, Lebanon; and the US Forest Service.
34. <i>Optimisation of fuel reduction burning regimes</i>	Keynote speaker at the International Congress on Prescribed Fires in Barcelona, Spain, 2017.
35. <i>Fire coalescence and mass spotfire dynamics</i>	Project X-Fire NZ: Preparing New Zealand for Extreme Fire. Collaboration with the Scion Forest Research (NZ), Missoula Fire Lab (USA), San Jose State University (USA), University of Canterbury (NZ), and UNSW (Australia). Funded by New Zealand Ministry for Business, Innovation and Employment. Project Firewhirl: Vorticity Effects in Wildfires. Collaboration with University of Coimbra (Portugal), University of Science and Technology of China, UNSW (Australia). Funded by European Commission.
36. <i>Fire surveillance and hazard mapping</i>	International conference presentations include: Asian Conference on Remote Sensing; World Engineering Conference on Disaster Risk Reduction; Congress for the International Society for Photogrammetry and Remote Sensing; EARSeL Forest Fire Special Interest Group Workshop; ForestSAT of the Remote Sensing and Photogrammetry Society.

PROJECT	INTERNATIONAL COLLABORATIONS
37. <i>Threshold conditions for extreme fire behaviour</i>	Collaboration University of Edinburgh and Tomsk State University.
38. <i>Improved predictions of severe weather to reduce community impact</i>	Collaboration on fire weather with the UK Met Office, Leeds University, the European Centre for Medium Range Weather Forecasting, and the South African Weather Service.
39. <i>Developing better predictions for extreme water levels</i>	Project leader is the science theme leader for natural hazards in the Indian Ocean region as part of the International Indian Ocean Expedition-II, University of Southampton. Collaborations on tsunami research with Civil and Coastal Engineering Department, University of Florida.

APPENDIX 4: STUDENTS

SCHOLARSHIP STUDENTS

NAME	UNIVERSITY	PHD COMMENCEMENT	PROJECT NAME
Avianto Amri	Macquarie	Jul-14	A cross cultural investigation of child-centred disaster risk reduction and climate change adaptation in Indonesia and Australia
Heather Bancroft	Melbourne	Jun-14	The impact of individual factors and operational organisational resources and demands on mental health outcomes
Shauntelle Benjamin	UNE	Jan-17	Why do people decide to drive through floodwater? Utilising virtual reality to assess motivations and behaviour associated with driving through floodwater
Bill Calcutt	Wollongong	Feb-14	Valuing volunteers - better understanding the primary motives for volunteering in Australian emergency services
Andrew Clarke	CQU	Oct-15	An evaluation of key fire safety messages and their efficacy when applied under varying degrees of stress
Miles Crawford	Massey	Jun-15	How risk informs natural hazard management: a study of the interface between risk modelling for tsunami inundation and local government policy and procedure
Amila Dissanayake	RMIT	Jul-15	Fire resilience of existing composite steel plate girder bridges
James Furlaud	UTas	Jul-15	How do wet eucalypt forests burn: managing Tasmania's most dangerous fuel type
Grigorijs Goldbergs	CDU	Dec-14	Remote sensing of tree structure and biomass in north Australian mesic savanna
Bryan Hally	RMIT	Mar-15	Attribution of active fire using simulated fire landscapes
Matthew Henry	CQU	Jan-16	Comprehensive school safety: developing a framework for the Australian school setting
Mitchell Humphreys	JCU	Feb-16	Wind induced internal pressures in industrial buildings
Sue Hunt	ANU	Feb-14	The National Strategy for Disaster Resilience: getting it right from top to bottom
Fiona Jennings	RMIT	Aug-14	Community volunteering and disaster recovery
Farook Kalendher	RMIT	Jul-13	Synthetic damage curves for concrete girder bridges under flood hazard
Thomas Kloetzke	Queensland	Jul-15	Analysis and simulation of surface wind fields during landfalling tropical cyclones
Roozbeh Hasanzadeh Nafari	Melbourne	Mar-15	Flood damage assessment in urban areas



APPENDIX 4

NAME	UNIVERSITY	PHD COMMENCEMENT	PROJECT NAME
Maryam Nasim	RMIT	Jul-15	Investigation into the behaviour of a U-slab bridge due to flood
Mercy Ndalila	UTas	Feb-15	Pyrogeography of Tasmania: understanding how forest type and bushfire history influence smoke emissions
Korah Parackal	JCU	Mar-15	An analytical technique for determining the redistribution of structural load effects with increasing wind loads
Gabriela Raducan	RMIT	Mar-14	The impacts of bushfires on water quality
Timothy Ramm	UTas	Feb-15	Advancing long-term planning and decision analysis to improve the resilience of communities against changing coastal risk
Mayeda Rashid	CQU	Jul-15	Child-centred disaster risk reduction: achievements, challenges and scope
Graeme Riddell	Adelaide	Feb-14	Methods to develop long term, efficacious risk mitigation policies
Dario Rodriguez Cubillo	UTas	Dec-16	Landscape ecology of fire: lessons from Tasmanian wilderness.
Heather Simpson	Wollongong	Jul-15	Productivity and effectiveness of suppression resources and tactics on large fires
Emma Singh	Macquarie	Jan-14	Network disruptions during long-duration natural hazard events
Michael Storey	Wollongong	Mar-16	Empirical analysis of spot-fire and ember behaviour during extreme fire weather conditions
Steve Sutton	CDU	Jan-15	Cultural drivers of disaster response behaviour and their cross-cultural applicability
Christopher Thomas	UNSW	Sep-15	An investigation of the dynamics of fire-fire interactions using a coupled fire-atmosphere model
Kate van Wezel	CDU	Mar-15	Including women in fire management on Waanyi and Garawa lands
Rahul Wadhvani	Victoria	Nov-14	Refinement of the submodels of pyrolysis and firebrand transport and undertaking experiments to validate those for a physics-based bushfire prediction model
Houzhi Wang	Adelaide	Jan-15	Initiation of biomass smouldering combustion
Rachel Westcott	Western Sydney	Jul-14	The interactions between emergency responders and animal owners in bushfire: improving community preparedness and response outcomes
Mengran Yu	Sydney	Mar-15	Modelling the effect of fire on the hydrological cycle

APPENDIX 4

COMPLETED 2014/15

NAME	UNIVERSITY	PHD COMMENCEMENT	COMPLETION DATE	PROJECT NAME
Steven Curnin	UTas	Jan-12	Jun-15	Spanning boundaries to support effective multi-agency coordination in emergency management
Grace Vincent	Deakin	Feb-12	May-15	Fighting fires and fatigue

COMPLETED 2015/16

NAME	UNIVERSITY	PHD COMMENCEMENT	COMPLETION DATE	PROJECT NAME
George Carayannopoulos	Sydney	Jun-11	Jul-16	Whole of government and crisis management, understanding coordination in a time of crisis
Veronique Florec	Western Australia	Jul-11	May-16	Economic analysis of prescribed burning for wildfire management in the south west of Western Australia
Brianna Larsen	Deakin	Jul-11	Oct-15	Simulated self-paced fire suppression
Phillip Stewart	Queensland	Apr-13	Jan-16	Changing fire regimes of the great sandy region of south eastern Queensland
Rene van der Sant	Melbourne	Jun-11	May-16	Aridity index as a predictor of the hydrogeomorphic response of burnt landscapes
Alex Walkow	Deakin	Jan-12	Dec-15	Sleep restriction across a simulated firefighting deployment: the impact on acute stress response



APPENDIX 4

COMPLETED 2016/17

NAME	UNIVERSITY	PHD COMMENCEMENT	COMPLETION DATE	PROJECT NAME
Cathy Cao	Western Australia	Apr-11	Mar-17	Effective communication of household bushfire risk through web-based geovisualisation: considerations in content, representation and design
Yang Chen	Monash	Aug-13	Jun-17	Modelling forest fuel temporal change using LiDAR
Graham Dwyer	Melbourne	Mar-15	Jun-17	We have not lived long enough: sensemaking and learning from bushfire in Australia
Dolapo Fakuade	Canterbury	Oct-13	Apr-17	Integrated response as a process for enhancing emergency management
Vaibhav Gupta	RMIT	Jul-11	Dec-16	Remote sensing of fire severity in Australian dry sclerophyll forests
Billy Haworth	Sydney	Jan-14	Feb-17	Volunteered geographic information, community engagement and bushfire preparation
Rachel Quill	UNSW	Jul-14	Jan-17	Spatial-statistical characterisation of wind fields over complex terrain for bushfire modelling applications
Caroline Wenger	ANU	Jan-13	Jan-17	Flood management in a changing climate: integrating effective approaches

APPENDIX 4

COMPLETED 2017/18

NAME	UNIVERSITY	PHD COMMENCEMENT	COMPLETION DATE	PROJECT NAME
Melanie Baker-Jones	QUT	Jul-14	Sep-17	Web 2.0 in disaster and emergency: a risk assessment of tortious liability
David Barton	RMIT	Jul-11	Dec-17	Disaster in relation to attachment, loss, grief and recovery: the Marysville experience
Douglas Brown	Sydney	Mar-10	Feb-18	Bushfire risk perception: a study of the perceived vulnerability of domestic architecture in Australian bushfire prone areas
Wasin Chaivaranont	UNSW	Mar-14	Aug-17	How does remotely sensed degree of curing and fuel load vary in grasslands and effect modelled fire spread?
Sarah Hall	Deakin	Mar-14	Sept-17	Sleep and stress in on-call fire and emergency service workers
Alex Holmes	Monash	Mar-15	Nov-17	Improving fire risk estimation through investigating fire intensity, moisture and temperature anomalies
Ryan Hoult	Melbourne	Oct-14	Sept-17	Seismic assessment and design philosophy of reinforced concrete walls in Australia
Charles Newland	Adelaide	Mar-14	May-18	Improved calibration of spatially distributed models to simulate disaster risk
Tetsuya Okada	Macquarie	Aug-12	Oct-17	Post-disaster recovery following recent natural hazard events and risk reduction measures in Australia and Japan
Kamarah Pooley	QUT	May-15	Jul-17	Preventing youth misuse of fire in New South Wales: an empirical evaluation
Sonja Maree van Nieuwenhoven	Melbourne	Mar-15	Jul-17	Planning for bushfires on the rural-urban interface: an analysis of the correlations between house setbacks and house loss as evidence of house-to-house fire spread in the 2009 Victorian bushfires
Ashley Wright	Monash	Mar-14	Dec-17	Improving flood forecast skill using remote sensing data



APPENDIX 4

ASSOCIATE STUDENTS

NAME	UNIVERSITY	PHD COMMENCEMENT	PROJECT NAME
Joji Abraham	Federation	Jan-15	Fire and heavy metals: when wild and controlled fires transform un-rehabilitated mining waste
Anita Amirsardari	Melbourne	Feb-14	Assessing the seismic performance of reinforced concrete gravity moment resisting frames in Australia
Raven Marie Cretney	RMIT	Aug-13	The post-disaster city: Urban crisis, politics and social change in community-led earthquake recovery
Antara Dasgupta	Monash	Jul-15	Towards a comprehensive data assimilation framework for operational hydrodynamic flood forecasting
Darryl Dixon	Charles Sturt	Jun-12	Emergency service exposure to asbestos
Akvan Gajanayake	RMIT	Aug-16	Measuring social, environmental and economic consequences of road structure failure due to natural disasters
Angela Gormley	Sydney	Jan-16	Effects of surface litter by forest classification on fuels and fire behaviour in Hornby Shire
Lesley Gray	Otago	Sep-16	Preparing for the big one: disaster risk reduction for morbid obesity
Sam Hillman	RMIT	Mar-17	The utility of point clouds to estimate fuel hazard
Revathi Krishna	Monash	Mar-16	Coping with disasters by children and families who live in poverty
Diana Kuchinke	Federation	Dec-10	Effects of fire on the woodland birds of western Victoria.
Benjamin Martin	CQU	Mar-15	The role of the emergency management sector in the implementation of children's disaster education
Andrea Massetti	Monash	Mar-16	Remote sensing applied to bushfire
Daniel May	ANU	Mar-15	Taking fire: The political and cultural influence of Indigenous burning in settler societies
Sean Morling	RMIT	Jul-14	Using GIS to predict and mitigate erosion and sediment transfer following a bushfire
Prananda Navitas	QUT	Oct-15	The impact of prior disaster experience and disaster risk perception on adaptive behaviour
Liberty Pascua	Sydney	Jul-16	Precarious places, precarious knowledges: disaster risk reduction education in Australia, the Philippines, and Vanuatu

APPENDIX 4

NAME	UNIVERSITY	PHD COMMENCEMENT	PROJECT NAME
Grant Pearce	Canterbury	Mar-14	New Zealand fire climate severity: relationships between climate circulation, seasonal fire danger and fire occurrence
Nicholai Popov	Wollongong	Feb-13	The impact of leadership development on organisational citizenship behaviour and social capital: an intervention using self-determination theory
Kaitlyn Porter	QUT	Feb-16	What role could pharmacists play in optimising medicine management in humanitarian aid crises
Ismail Qeshta	RMIT	Aug-15	Strengthening of bridge superstructure to enhance resilience under exposure to flood loading
Shahriar Rahman	Macquarie	Apr-16	Development of a stochastic fire effect model in predicting the impacts of fire severity on vegetation
Nick Read	Melbourne	Jan-14	Models for lightning-caused wildfire ignition
Simone Ruane	Curtin	Mar-16	Planning for bushfire risk at the urban bushland interface: a local adaptive governance approach
Mitchell Scovell	JCU	Aug-16	An investigation of the psychosocial factors that influence cyclone mitigation behaviour in homeowners
Ken Strahan	RMIT	Aug-13	Household decision making in bushfire self evacuation
Mittul Vahanvati	RMIT	Jan-12	Post-disaster housing reconstruction as a means of enhancing disaster resilience
Sean Walsh	Melbourne	Jun-16	Combining fire, microclimate and vegetation models to predict the outcomes of hazard management practices at fine spatial resolution
Chathura Wickramasinghe	RMIT	May-15	Multi-resolution, high temporal fire monitoring and intensity mapping using AHI
Yang Zhang	UNSW	Sep-14	Understanding spatial patterns of wildfire occurrence in south-eastern Australia



APPENDIX 5: MEDIA

KEY BUSHFIRE AND NATURAL HAZARDS CRC MEDIA 2017/18

- 2 April 2018, ABC news feature opinion piece by CRC researcher A/Prof Amisha Mehta on the emergency preparedness gap between men and women
- 29 March, *Stock and Land* feature CEO Dr Richard Thornton discussing fires occurring outside of the traditional peak summer months
- 26 March, CEO Dr Richard Thornton explains the difficulties of extinguishing peat fires on ABC Radio Country Hour Victoria
- 23 March, ABC radio south east NSW interviews project leader Dr Michael Eburn about the Tathra bushfire
- 20 March, Research Director Dr John Bates appears on ABC TV News live to discuss research that shows that many people who live in high risk bushfire areas are not sufficiently prepared for a fire
- 19 March, ABC PM features project leader Dr Trent Penman discussing how social media is used to great effect as a warning tool by emergency services
- 20 February, ABC Upper Hunter cover research findings from the 2017 NSW bushfires.
- 13 February, ABC New England cover the 2017 NSW bushfires research findings. Also featured in the *Illawarra Mercury*.
- 11 February, *The Sydney Morning Herald*, *The Age* and the *Brisbane Times* cover the 2017 NSW bushfires research findings. Local papers cover the research in subsequent weeks.
- 19 January, online article by *Australian Geographic* on heatwave preparation interviews researchers Andrew Gissing and Lucinda Coates.
- 6 January, *The Australian* covers the recovery of the local community a year after the Yarloop bushfire in WA, referencing the Southern Australia Seasonal Bushfire Outlook.
- 6 January, opinion piece by Associate Student Dr Graham Dwyer appears in the *Herald Sun*.
- 6 January, online ABC article discusses the mass warnings issued across Victoria in early December for severe weather, featuring project leader Dr Vivienne Tippett.
- 22 December 2017, Research Director Dr John Bates appears on *The Project* discussing understanding fire risk and bushfire preparation.
- 6 December, with the declaration of a weak La Nina, an online ABC article references the Southern Australia Seasonal Bushfire Outlook.
- 30 November, Southern Australia Seasonal Bushfire Outlook featured *the Age*.
- 27 November, Southern Australia Seasonal Bushfire Outlook covered by *Insurance News*.
- 26 November, Southern Australia Seasonal Bushfire Outlook featured by *Perth Now*.
- 23 November, Southern Australia Seasonal Bushfire Outlook covered in the *Herald Sun*, *Adelaide Advertiser*, *The Mercury*, *The NT News*, *The Weekly Times* and many regional newspapers.
- 22 November Southern Australia Seasonal Bushfire Outlook covered by 7 News.
- 9 November, ABC Kimberley reviews the busy fire season, referring to the Northern Australia Seasonal Bushfire Outlook.
- 27 October, ABC Adelaide article discusses fire conditions in South Australia and refers to the Southern Australia Seasonal Bushfire Outlook.
- 24 October, SBS article discusses the potential for a late La Nina in 2017 and how this would affect the fire season, with reference to the Southern Australia Seasonal Bushfire Outlook.
- 13 October, Perth Now discusses the Southern Australia Seasonal Bushfire Outlook.
- 11 October, Radio National Breakfast interview with the CEO on the Southern Australia Seasonal Bushfire Outlook.
- 11 October, *Launceston Examiner* article on CRC economic research on flood mitigation in Launceston, based on *Hazard Note 40*.
- 1 October, Perth Now covers DFES survey on community fire preparation & fire plans, references the Southern Australia Seasonal Bushfire Outlook.
- 25 September, *The Daily Telegraph* covers the NSW fire season and the Southern Australia Seasonal Bushfire Outlook.
- 24 September, the *Sunday Tasmanian* covers the Southern Australia Seasonal Bushfire Outlook.
- 22 September, CEO appears on Network Ten's the Project to discuss the Southern Australia Seasonal Bushfire Outlook.
- 20 September, a Thomson Reuters Foundation feature article on fire risk, particularly in Spain and Portugal, discusses climate change and increasing fire risk. CEO interviewed at length for article and quoted.
- 18 September, *Adelaide Advertiser* reports on the amount of prescribed burning completed in South Australia and cites the Southern Australia Seasonal Bushfire Outlook.
- 16 September, Radio National Country Breakfast features project leader Dr Mel Taylor discussing lessons learnt from research into animals and bushfire plans after the 2013 Blue Mountains bushfires
- 12 September, CEO does a

APPENDIX 5

- prerecord for *The Project* on the *Southern Australia Seasonal Bushfire Outlook*, to air at a later date.
- 12 September, researcher Dr Marta Yebra (ANU) discusses research on monitoring vegetation in near-real time to assess fire risk on ABC Radio 666 Canberra Breakfast.
 - 11 September, CEO appears on ABC Radio's *The World Today* program to explain the *Southern Australia Seasonal Bushfire Outlook*.
 - 10 September, ABC's *Landline* covered the *Southern Australia Seasonal Bushfire Outlook*.
 - 9 September, the *Daily Telegraph* covers the *Southern Australia Seasonal Bushfire Outlook*.
 - 7 September, ABC Radio NSW Country Hour discusses prescribed burning partnership between Indigenous groups and fire agencies, with conference speakers Terrance Taylor (Jigija Indigenous Fire Training Program), Oliver Costello (NSW National Parks and Wildlife Service), Dean Freeman (ACT Parks and Conservation Service) and Scott Falconer (Forest Fire Management Victoria).
 - 6 September, *7Sunrise* discusses the *Southern Australia Seasonal Bushfire Outlook* with live crosses to EMV Commissioner Craig Lapsley, NSW Rural Fire Service Deputy Commissioner Rob Rogers and QFES Deputy Commissioner Mike Wassing.
 - 6 September, the Sydney Morning Herald features the *Southern Australia Seasonal Bushfire Outlook*.
 - 6 September, *Age* article on the *Southern Australia Seasonal Bushfire Outlook*.
 - 6 September, *Canberra Times* article on the *Southern Australia Seasonal Bushfire Outlook*.
 - 6 September, *The Weekly Times* coverage of the *Southern Australia Seasonal Bushfire Outlook*.
 - 6 September, ABC Country Hour Queensland covers the *Southern Australia Seasonal Bushfire Outlook*.
 - 6 September, ABC Radio NSW Country Hour covers technology in emergency services with conference keynote speaker Bart van Leeuwen.
 - 6 September, ABC Radio NSW Statewide Drive speaks with conference speaker Andrew McCullough (NSW SES) about their new initiative to recruit corporate volunteers.
 - 6 September, ABC online runs an opinion piece by researcher Dr Mel Taylor (Macquarie University) on research findings showing the top ways to prepare your pets for an emergency.
 - 5 September, live broadcast of the *Southern Australia Seasonal Bushfire Outlook* media conference on ABC 24.
 - 5 September, the CEO appears live on ABC24 to explain the *Southern Australia Seasonal Bushfire Outlook*.
 - 5 September, *Southern Australia Seasonal Bushfire Outlook* on NSW nightly news (ABC, Channel Seven, Channel Nine, Channel Ten).
 - 5 September, *The Project* mention the *Southern Australia Seasonal Bushfire Outlook*.
 - 5 September, the ABC Radio PM program cover the *Southern Australia Seasonal Bushfire Outlook*.
 - 5 September, the ABC Radio PM program cover the *Southern Australia Seasonal Bushfire Outlook*.
 - 5 September, ABC online features the *Southern Australia Seasonal Bushfire Outlook*.
 - 5 September, researcher Andrew Gissing (Risk Frontiers) discusses heatwave research on ABC 702 Sydney Mornings.
 - 5 September ABC Radio NSW Statewide Drive speaks with conference speaker Warwick Kidd (Fire and Rescue NSW) about emergency services work with counter terrorism.
 - 4 September, ABC24 features keynote conference speaker Dr Blair Trewin explaining how climate change will increase extreme weather.
 - 4 September, ABC Radio NSW Statewide Drive speaks with CRC PhD student Rachel Westcott (Western Sydney University) on her research into preparing communities for a bushfire.
 - 4 September, ABC Radio Statewide Drive Queensland speakers with keynote speaker Dr Ann Bostrom on her research into the perceptions of emergency warnings in the US.
 - 4 September, ABC online features keynote conference speaker Dr Blair Trewin explaining how climate change will increase extreme weather.
 - 1 September, CEO appears on ABC Radio's PM program discussing potential fire conditions and research showing that people do personify fire risk.
 - 1 September, researcher Andrew Gissing (Risk Frontiers) how research into how people cope with heatwaves.
 - 4 September, researcher Dr Amisha Mehta (QUT) discusses emergency warning research with ABC Radio 702 Perth Breakfast.
 - 4 September, ABC Radio NSW Country Hour covers animal emergency management research with research Dr Mel Taylor (Macquarie University).
 - 4 September ABC Radio NSW Statewide Drive speaks with CRC PhD student Rachel Westcott (Western Sydney University) on her research into preparing communities for a bushfire.
 - 4 September, ABC Radio Statewide Drive Queensland speakers with keynote speaker Dr Ann Bostrom on her research into the perceptions of emergency warnings in the US.
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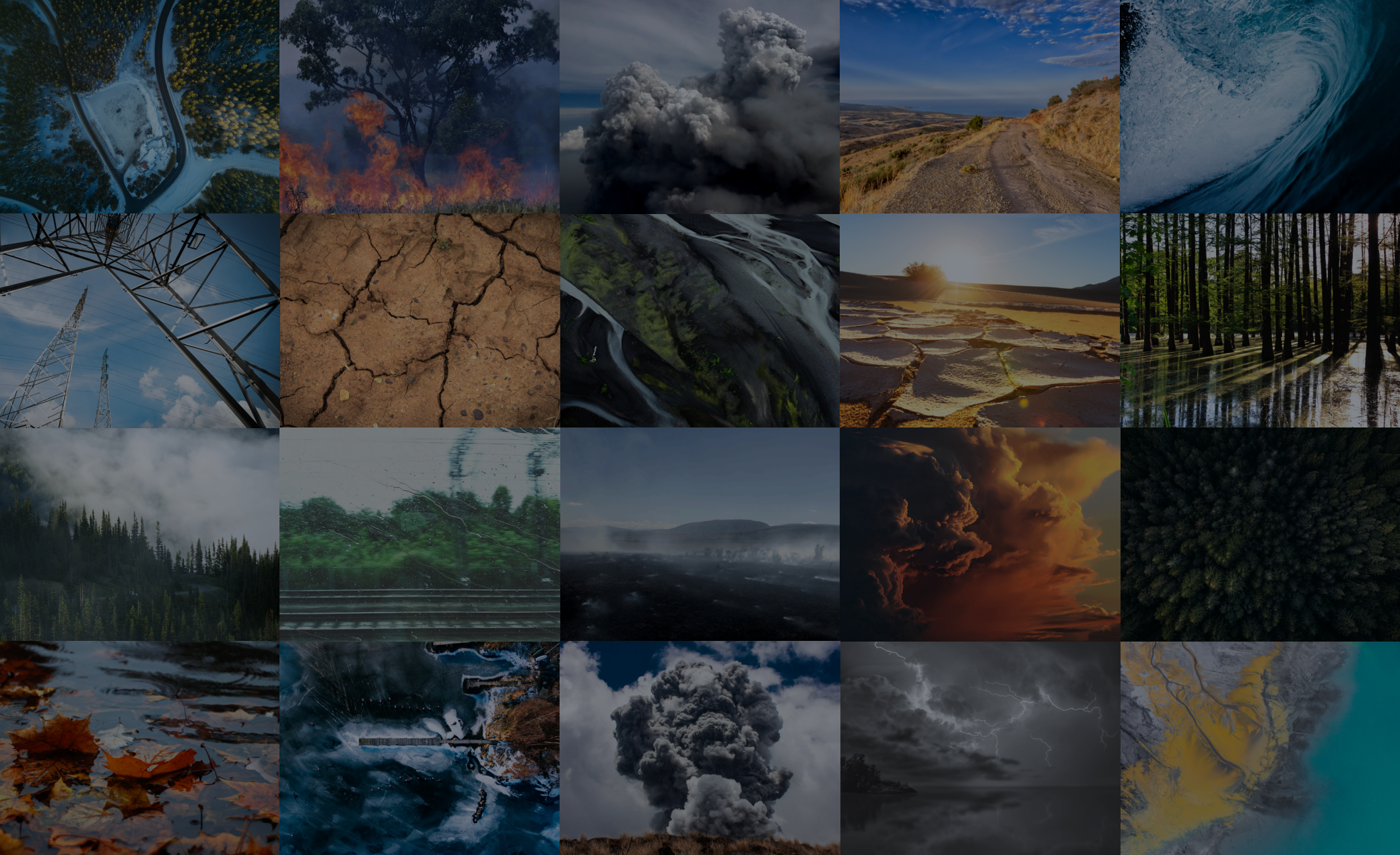
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Gissing (Risk Frontiers) discusses heatwave research on ABC 702 Sydney Drive.

- 17 August, the *Mudgee Guardian* promotes a joint CRC/NSW Rural Fire Service research survey on responses to catastrophic fire warnings the previous summer.
- 13 August, researcher Dr Marta Yebra (ANU) discusses research on monitoring vegetation in near-real time to assess fire risk in the *Sydney Morning Herald*.
- 23 July, coverage of the *Northern Australia Seasonal Bushfire Outlook* in WA's *Kimberley Echo*.
- 28 July, coverage of the *Northern Australia Seasonal Bushfire Outlook* in WA's *North West Telegraph*.
- 23 July, the CEO discusses potential fire conditions in the *Sydney Morning Herald* and *The Age*
- 11 July, CEO appears on ABC 666 Canberra Drive with CRC Association CEO Tony Peacock to discuss the national research Priorities for natural hazards emergency management
- 10 July, Insurance News covers the national research priorities for natural hazards emergency management
- 5 July, online coverage our flood fatalities research in *Stories of Australian Science 2017*



Commissioner Shane Fitzsimmons, NSW Rural Fire Service, speaks at the media conference to release the Southern Australian Seasonal Bushfire Outlook 2017. Photo: Bushfire and Natural Hazards CRC



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