



bushfire&natural
HAZARDSCRC

2019–20

Highlights and Achievements
+ a year in review 2019–20

f @bnhrc bnhrc.com.au



Australian Government
Department of Industry, Science,
Energy and Resources

Business
Cooperative Research
Centres Program

© Bushfire and Natural Hazards CRC

All material in this document, except as identified below, is licensed under the Creative Commons Attribution-Non-Commercial 4.0 International Licence.

Material not licensed under the Creative Commons licence:

- Bushfire and Natural Hazards CRC logo
- Department of Industry, Innovation and Science logo
- Cooperative Research Centres Programme logo
- All photographs
- All figures

All rights are reserved in content not licenced under the Creative Commons licence. Permission must be sought from the copyright owner to use this material.

Publisher: Bushfire and Natural Hazards CRC

October 2020
Report number 622.2020

All photographs are credited to the Bushfire and Natural Hazards CRC unless otherwise noted.



CONTENTS

EXECUTIVE SUMMARY	2
RESEARCH	14
UTILISATION AND COMMERCIALISATION	20
INTELLECTUAL PROPERTY MANAGEMENT	22
EDUCATION AND TRAINING	23
SME ENGAGEMENT	24
COMMUNICATIONS	25
GOVERNANCE	31
COLLABORATION	37
FINANCIAL MANAGEMENT	39
FUTURE PLANS AND TRANSITION ARRANGEMENTS	40
APPENDIX 1: PUBLICATIONS	41
APPENDIX 2: ADDITIONAL RESEARCH	54
APPENDIX 3: INTERNATIONAL COLLABORATION	56
APPENDIX 4: STUDENTS	58
APPENDIX 5: MEDIA	67



John Richardson from the Australian Red Cross gives a keynote presentation at the 2019 Research Forum in Melbourne.

EXECUTIVE SUMMARY

ACHIEVEMENTS

The reporting period covers the seventh year of the Bushfire and Natural Hazards CRC's eight-year funding period. The focus for the period remained on the delivery and utilisation of valued research outputs to partners. Strategically, attention was on further consolidation of impacts of the research program and assessing options for future natural hazards research.

COVID-19 restrictions from March 2020 affected the CRC's research and outreach activities, in particular, the workshops and forums that were to take place. Wherever possible, online alternatives were found to ensure that interaction continued and milestones were reached.

The primary activities 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, workshops and online engagements
- building the capacity of the sector through postgraduate research and mentoring
- developing national research priorities for natural hazards emergency management
- developing options beyond the current funding period to transition to an ongoing research centre.

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

- two books
- 12 book chapters
- 96 journal papers
- 62 refereed conference papers
- 94 reports for end-users.

Outputs from the research themes are being utilised across 10 impact areas:

- Disaster resilience.
- Education and communications.
- Economics, mitigation and value.
- Extreme weather.
- Fire predictive services.
- Future workforce.
- Indigenous initiatives.
- Infrastructure and impacts.
- Managing the landscape.
- Policy, political engagement and influence.

Research outputs were also shared and developed in collaboration with partners, such as:

- bringing all end-user and research organisations together at three Research Advisory Forums, in Hobart, Sydney and Brisbane
- hosting the Bushfire and Natural Hazards CRC-AFAC Conference in Melbourne in August 2019, which included a full day Research Forum
- hosting, with the Australian Academy of Science, the National Fire Fuels Science Forum

in May that brought together the leading scientists and practitioners in hazard reduction science for a series of online discussions

- managing commissioned research projects directly for individual partners and other clients on specific issues
- managing a Tactical Research Fund to address strategic issues for the sector
- managing a Quick Response Fund to support researchers travelling to areas affected by natural hazards to capture perishable data. Specifically, partners impacted by the 2019-20 bushfire season were supported with access to funds to meet their immediate research needs.

The value of CRC research

the Hon Prime Minister Scott Morrison invited the CRC to Parliament House after the 2019-20 bushfires to discuss current and future contributions of research to bushfire response and recovery.



CRC Chair Dr Katherine Woodthorpe, the Hon Prime Minister Scott Morrison, CRC Research Director Dr John Bates and Minister for Industry, Science and Technology the Hon Karen Andrews MP. Photo: Office of the Prime Minister.

EXECUTIVE SUMMARY

CRC Chair Dr Katherine Woodthorpe and Research Director Dr John Bates met with the Hon Prime Minister Morrison and the Minister for Industry, Science and Technology, the Hon Karen Andrews MP, in February 2020 to talk about building a bushfire-resilient Australia. The CRC was invited to discuss how it could support the Royal Commission using its research knowledge and expertise, and through the [Inquiries and Reviews database](#).

Two separate studies undertook an evaluation of the value delivered by the CRC. The results outline the many and varied benefits of the CRC's research to the Australian community (see breakout box, page 11-12).

Both reports concluded that the CRC's work is closely guided by the needs of its end-user partners, working across the before, during and after spectrum of natural hazards, including bushfire, flood, storm, cyclone, tsunami, earthquake and heatwave.

A survey of CRC end-users—including emergency services, the Australian Government, states and territories, local government, businesses, households, regional and rural communities, landowners, infrastructure providers, volunteers and academia—shows that the CRC is strengthening research capacity in natural hazards and the environment, using and building capacity in leading researchers from around the country.

With more than 100 ongoing or completed research projects, involving around 250 researchers and 150 PhD students across Australia and New Zealand, the CRC has generated benefits for its end-users and the wider Australian community.

Governance

The Governing Board met five times throughout the year, with the first four meetings held in a different capital city and the final one in a virtual format due to COVID-19 restrictions. The Board is chaired by independent director, Dr Katherine Woodthorpe AO.

At 30 June 2020, the nine-person Board consisted of five male and four female directors.

Stuart Ellis resigned from the Board of the CRC in this period. Dr Stephanie Rotarangi was both appointed and resigned from the Board during this period. Dr Greg Ayers and Sandra Whight were new appointees to the Board.

People movements

Sarah Mizzi, Partnership Development Director, began maternity leave in late-2019 and the CRC appointed Dr Paul Perry as the maternity leave replacement position. Paul was previously a Business Development Manager for RMIT's School of Science.

It is with sadness that the CRC learnt of the passing of Prof Kevin Ronan, of CQUniversity, in March. Kevin was inspirational in the establishment of a major theme of research incorporating the rights of the child into the disaster risk reduction agenda. He was a mentor to many, which included many researchers and PhD students in the CRC.

Kevin was one of the lead authors on the science of child-centred disaster risk reduction input to the 2015 Global Assessment Review, which fed into the United Nations International Strategy for Disaster Reduction Sendai Agreement. Kevin was previously the lead researcher on the *Child-centred disaster risk reduction* project and represented the CRC at many international meetings, always promoting best practice research. The CRC recognised Kevin's work and support in 2015, awarding him the CRC Outstanding Achievement Award.

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:



Prof Kevin Ronan at the UN's Global Platform for Disaster Risk Reduction conference in Cancun, Mexico.

Bushfire science roundtable

The Ministerial Bushfire Science Roundtable met in January and February in Canberra under the Minister for Industry, Science and Technology, the Hon Karen Andrews MP, with the CRC joining scientists from a wide range of organisations involved in bushfire-related research. The CRC was represented by Chair Dr Katherine Woodthorpe, Research Director Dr John Bates, and researchers Prof Vivienne Tippet (Queensland University of Technology), Dr Geoff Cary (Australian National University) and Dr Katharine Haynes (University of Wollongong). Other members of the Roundtable included CSIRO, the Australian Space Agency, Geoscience Australia, the Bureau of Meteorology, Office of the Chief Scientist, the Australian Academy of Science, ANSTO, and

EXECUTIVE SUMMARY

Science and Technology Australia. Minister Andrews highlighted that disaster response, recovery and resilience activities should be informed by multi-disciplinary research. Bushfire research, as well as broader natural hazards research, needs to draw on a wide range of disciplines, including the natural and physical sciences, engineering, humanities and social sciences. The group of experts was brought together to understand the state of the current science and where the opportunities are for future science.

Operational impact

While firefighters battled the ferocious flames around the country during the 2019-20 fire season, CRC research was on hand in operations centres. The New South Wales Rural Fire Service, Queensland Fire and Emergency Services and the South Australia Country Fire Service all benefited from the expertise of individual researchers, requesting the assistance of Dr Marta Yebra (Australian National University), Prof Jason Sharples (University of New South Wales) and Dr Mika Peace (Bureau of Meteorology) at their state operations centres.

Dr Yebra spent one of NSW's peak fire days, 12 November, at the NSW Rural Fire Service headquarters in Sydney working with fire managers analysing data on vegetation conditions and how this might affect bushfire spread. Her research was used by the Rural Fire Service to make informed decisions about where a fire may spread, and what areas should be prioritised when sending resources and equipment. Additionally, the Rural Fire Service had access to the work of the *Fire surveillance and mapping* project detecting fire hotspots from the Himawari satellite. This research is led by Prof Simon Jones and Dr Karin Reinke at RMIT University.

Prof Sharples was a part of the dialogue between fire behaviour analysts and ground operations at the Rural Fire Service. Working alongside fire managers, Prof Sharples identified risks firefighters may face with spotfires and fire coalescence. He

also provided the Rural Fire Service with expert scientific assistance on the potential for dynamic fire propagation giving real-time recommendations and support to the incident control and operation officers.

Dr Peace spent time at both the Queensland Fire and Emergency Services headquarters in Brisbane, and the Country Fire Service operation centre in Adelaide. In Queensland, Dr Peace assisted with emergency planning and weather forecasting before a series of bad fire weather days in mid-November, and worked closely with fire behaviour analysts as an embedded meteorologist. She continued as the embedded meteorologist for the Country Fire Service, mapping out likely scenarios of bushfire spread and analysing pressure points fire agencies are likely to face.

CRC and AFAC conference

Held in August, the CRC conducted its annual conference in Melbourne in conjunction with the AFAC19 conference. More than 450 people attended the Research Forum on the first day. General feedback about the forum was very positive and evidence of the CRC's influence and research use was distinct throughout the following two days. Discussion has now switched to how collaboration with agencies is assisting with the work being used, rather than just discussion of research progress.

National institute

The Australian Institute for Disaster Resilience continued a partnership between the CRC, AFAC, the Australian Red Cross and the Department of Home Affairs for most of 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. In June 2020, AFAC decided to end the participation of the CRC

as a formal partner in the Institute from 1 July 2020, which included the CRC's lead role in the Journal and co-branded industry forums and 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. The 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 CRC researchers are in prominent roles, including Prof John Handmer as Chair of the Scientific Committee. The CRC hosted a public forum at the Queensland University of Technology in Brisbane for the UN International Day for Disaster Risk Reduction in October 2019.

Cascading events report

A report detailing the outcomes of the CRC-hosted 12th Australasian Natural Hazards Management Conference of June 2019 was published this year and distributed to all partners and attendees of the conference. The report drew together expert commentary and research on how Australia could reduce the impacts of a cascading natural hazards events, such as drought followed by extreme weather and bushfires. The report, *Cascading extreme weather beyond our experience: are we ready? (2020)*, identified clear themes from the conference, particularly around future workforce; leadership, politics and politicisation; planning and land use; risk, vulnerability and mitigation; technology; mass gathering events; and keeping businesses and communities viable.

Reviews and inquiries

Following the bushfires of the 2019-20 summer, a Royal Commission and several reviews were

EXECUTIVE SUMMARY

established at both State and Federal levels. The CRC worked closely with the Royal Commission and the New South Wales and Victorian state reviews, in addition to making formal submissions.

The CEO also gave evidence to the Environment and Planning Committee of the Legislative Assembly of Victoria.

Two committees of Parliament also considered major issues from the fires. The CEO appeared at the House of Representatives Standing Committee on the Environment and Energy – Inquiry into vegetation and land management policy, and the CRC put in a submission into The Senate Finance And Public Administration References Committee inquiry into Lessons to be learned in relation to the preparation and planning for, response to and recovery efforts following the 2019-20 Australian bushfire season.

Additionally, heatwave and fire research from the CRC was central to the Queensland Government's review of the devastating 2018 bushfires. Released by the Government in July 2019, the CRC was asked to highlight key points of research, knowledge and other evidence to inform the review, with the studies forming a suite of reports launched by the Queensland Premier Annastacia Palaszczuk. The heatwaves and bushfires were analysed by Dr Graham Mills, while Dr Neil Burrows identified lessons from significant bushfires in Australia and overseas to provide learning opportunities for Queensland fire agencies. Both CRC reports were cited extensively in the Inspector-General Emergency Management's overall 2018 Queensland Bushfires Review, which is being used to assess the future of the state's disaster management system.

International engagement

The CRC was invited to contribute to the preparation of the Asian Pacific Ministerial Conference on Disaster Risk Reduction (APMCDRR) that was scheduled for July 2020 in Brisbane but postponed due to COVID-19.

Specifically, the CRC was involved in the Pillar 3 working group for the APMCDRR which is focused on science and technology, and led by Geoscience Australia, and the working group for Pillar 2 which focused on resilient infrastructure, led by Emergency Management Australia. This activity has been tentatively rescheduled to early 2021.

Global links

The CEO presented at the Canadian Wildfire Conference in Ottawa in November on the impact of 15 years of coordinated research in Australia. During this time the CEO also discussed the Canadian Blueprint for Wildfire Research, of which he is a contributing author, and opportunities for research linkages between the two countries. The Canadian Department

of Natural Resources has considered the CRC model to be best practice in managing coordinated research.

The CEO was invited by the Organisation for Economic Cooperation and Development (OECD) to an international meeting in Paris in January 2020 to discuss the economic impact of future wildfire risk. This was an opportunity to get the CRC's work into international policy frameworks. The CEO also met with the Australian delegation to the OECD at the Australian Embassy in Paris. This included the Ambassador and Deputy Head of mission.

The Communications Director conducted a workshop on the communication of research and complex information to the agencies and communities at the National Cohesive Wildland Fire Management Strategy conference in the United States in October.



Communications Director David Bruce speaks at the National Cohesive Wildland Fire Management Strategy conference in the US, October 2019. Photo: Ron Steffens.



CEO Dr Richard Thornton launches the Australian Seasonal Bushfire Outlook: 2019 at a national media conference, August 2019.

EXECUTIVE SUMMARY

He also addressed a meeting of the Tall Timbers Research Centre's workshop on future wildfire research. The discussion was about research priorities and effective structures for research delivery. The CRC was approached as they believed that the CRC model was a best practice approach to the issue.

Public outreach

With extensive media coverage of the bushfires in the Australian summer of 2019-20, the CRC was recognised as an authoritative source of information, both within Australia, as well as overseas. The CRC was a source of expert, informed opinion for local, state, national and international media, fielding many requests for evidence-based comment. Both the CEO and Research Director were prominent in the media commentary, as well as many researchers.

Earlier, in the lead-up to the bushfire season, the joint annual CRC and AFAC conference in Melbourne in August was a busy time for media engagement with the conference combined with the release of the *Australia Seasonal Bushfire Outlook*, which forecast the potential for an historically bad fire season.

The ABC covered the conference with three journalists dedicated on site over the three days for radio and online coverage. Many speakers from the conference program were called upon for interviews. The advantage of having this type of coverage from the ABC meant that interviews conducted could be broadcast nationally across the ABC network.

The *Sunrise* breakfast show on Channel Seven attended the conference on 29 August, broadcasting the weather live from the exhibition floor and conducting four live crosses to showcase various elements of the trade show.

A media conference was held on the morning of 28 August to launch the *Australia Seasonal Bushfire Outlook: August 2019*. The CEO hosted the media conference with speakers from the

Bureau of Meteorology and the fire agencies that assisted with the development of the Outlook.

The media conference was broadcast live nationally on TV by the ABC News Channel, while it was attended by ABC News, Channel Nine, Network Ten, ABC online, AAP and *The Guardian* and Warrandyte TV. The media conference was livestreamed on the CRC Facebook page, while the Country Fire Authority and ACT Emergency Services Authority recorded footage to release a video to their audiences post the media conference.

An attendance record was achieved for the annual conference with 4,061 registered delegates.

More than 120 presentations and panel discussions shared the latest science and lessons learned on topics including community preparedness, health and wellbeing, diversity and inclusion, cultural fire management, bushfire and smoke modelling, predictive services, and climate change. This included the second Australian Disaster Resilience Conference, as well as the Institution of Fire Engineers conference, both held alongside the main program.

The conference featured sessions, panel discussions, networking functions, award ceremonies and a trade exhibition with 196 exhibitors showcasing the latest technology and equipment in the sector. The CRC showcased the research and PhD program through a contribution of more than 50 posters.

In opening the conference week, the CRC Research Forum looked back on the change in communities since the 2009 Black Saturday bushfires, and looked forward at what may still be to come, with a near record 453 emergency managers, volunteers, researchers and policy makers in attendance for the first day.

Oration

The AFAC19 Research Forum featured the inaugural Dr Laurie Hammond Oration, delivered by Prof Mary O'Kane AC in honour of late Dr Laurie Hammond,

first Chair of the CRC. Prof O'Kane is the chair of the NSW Planning Assessment Commission and has previously been the NSW Chief Engineer and Scientist. As Chair of the 2018 independent review of the CRC, as well as the 2008 review of the entire Cooperative Research Centres program, Prof O'Kane spoke to the value and breadth of avenues for public benefit research.

Resilience partnerships

The CRC has joined forces with the Minderoo Foundation for its long-term resilience plan that convenes leading experts from government, non-government and industry partners in the fields of natural hazards resilience. The Fire and Flood Resilience Fund is focusing on four



Prof Mary O'Kane gives the inaugural Dr Laurie Hammond Oration, August 2019.

EXECUTIVE SUMMARY

key themes: resilient communities, resilient landscapes and wildlife, enhanced disaster prediction and enhanced disaster response. Other organisations involved include Federal and State government agencies; non-government organisations; financial, insurance and utilities; and peak bodies and industry associations.

AWARDS

Top talent

CRC research leader Prof John Handmer of RMIT University was named the top researcher in emergency management for 2019 by *The Australian*. Showcasing leading researchers from a variety of fields, the annual *Research* magazine acknowledged Prof Handmer's leadership and



Prof John Handmer

achievements in emergency management research. Prof Handmer has a long history with both the Bushfire and Natural Hazards CRC and the Bushfire CRC as a leader in research into community safety. His initial work provided a pivotal evaluation of the 'stay or go' policy, before broadening to research on shared responsibility, non-traditional volunteering and the economics of bushfire. After the Black Saturday bushfires in 2009, Prof Handmer led the research that investigated the human behaviour and community safety elements of the fires. His more recent studies centred around volunteers and spontaneous volunteering, as lead researcher for the *Out of uniform* project.

Queensland fire contribution

CRC researcher Dr Mika Peace from the Bureau of Meteorology was acknowledged with an award



Dr Mika Peace accepts the Bureau of Meteorology's CEO's Choice Excellence award in 2019. Photo: Bureau of Meteorology

in September 2019 for her work during the 2018 Queensland bushfires. Dr Peace received the Bureau of Meteorology's CEO's Choice Excellence award for the delivery of exceptional impact and value to emergency management customers and to the people of Queensland. During the bushfires, Dr Peace was deployed to Queensland to provide expertise on fire weather. Based at the Queensland Fire and Emergency Services control centre in Brisbane, Dr Peace worked closely with fire behaviour analysts to provide expert insight and specialised knowledge on fire weather. Dr Peace's specialised knowledge on fire weather gave QFES expert insight, particularly around the potential for pyrocumulonimbus (bushfire thunderstorms) to form, which can profoundly change the way bushfires behave. After the bushfires, the Queensland Premier, Annastacia Palaszczuk, invited Dr Peace to attend the Christmas Cabinet Reception as a thank you, alongside the many others who assisted during the bushfires.

Wind research leads all-comers

CRC research was behind a Queensland Government program that was recognised as a leading resilience project in that state. The Household Resilience Program by the Queensland Department of Housing and Public Works took out the Government category at the 2019 Get Ready Queensland Resilient Australia Awards. CRC findings inform the program, which was created in 2018 to help homeowners in cyclone prone areas upgrade their house to improve its chances of surviving a cyclone or storm. Led by Prof John Ginger and Dr David Henderson at James Cook University, the study showed that homes built before the 1980s were the most vulnerable to cyclones and storm damage. The program provides Queensland homeowners with a grant of up to 75 per cent of the cost of improvements, allowing for the upgrade of the roof structure, protection of windows and strengthening of doors—key areas at risk of damage during strong cyclonic winds.

EXECUTIVE SUMMARY

Vice Chancellor award

Dr Paula Dootson was recognised for her research excellence by the Queensland University of Technology, receiving a Vice Chancellor award for leadership in December 2019. Dr Dootson received the award for an initiative that aligns QUT academics who are researching the topic of trust, ensuring that synergies are identified and that the research is conducted in a coordinated and collaborative fashion.

Champions of change

Research by a CRC team to map community engagement across Australia received an award from the Queensland Inspector-General Emergency Management. A/Prof Kim Johnston (Queensland



Dr Barbara Ryan, Queensland Inspector-General Emergency Management Alistair Dawson, A/Prof Kim Johnston and Prof Maureen Taylor with their highly commended award at the 2020 Public Safety and Associated Agencies International Women's Day event, March 2020.

University of Technology), Prof Maureen Taylor (University of Technology Sydney) and Dr Barbara Ryan (University of Southern Queensland) were presented with the highly commended Champion of Change Award at the 2020 Public Safety and Associated Agencies International Women's Day event in Brisbane by Queensland's Inspector-General Emergency Management, Alistair Dawson. Their research, through the CRC Tactical Research Fund, is helping emergency management agencies better prepare communities for emergencies, with long-term benefits such as a continuous model of community engagement for preparedness.

Emergency awards

The Emergency Media and Public Affairs conference presented two awards to the CRC in June 2020. Their Excellence in Research award was won by CRC research on how emergency services agencies can minimise the effect of conflicting cues on the instigation of protective action. Led by Dr Paula Dootson and her team at Queensland University of Technology comprising of A/Prof Dominique Greer, Prof Vivienne Tippet and Dr Sophie Miller, the research provides clear evidence of conflicting cues in practice, collates first-hand interview responses from Australian emergency services representatives, and explores the types of strategies that might help mitigate the negative effects of conflicting cues. The research provides evidence that public information and warnings is as much a frontline job as the operational responders, and offers strategies for emergency services agencies to help minimise the negative social, physical and economic consequences of conflicting cues that impact community decision making during a natural hazard.

Highly commended was research on the motivations, experiences and emotions of State Emergency Services volunteers. Led by Dr Darja Kragt from the University of Western Australia, this research provides insights and data nationally

to help develop new recruitment and retention strategies for SES volunteers. Based on the findings of this research, strategies to improve volunteer recruitment and retention rates are recommended to include a focus on managing the expectations of volunteers. The research team, comprising of Dr Aleksandra Luksyte, Hawa Muhammad Farid (University of Western Australia), A/Prof Patrick Dunlop, Dr Djurre Holtrop and Prof Marylène Gagné (Curtin University) have collaborated closely with the Department of Fire and Emergency Services in Western Australia, who have already used the findings of the study to inform their volunteer recruitment.

Immediate impact with economics

CRC research produced one of 2019's most popular papers published in an economic journal. The paper, by Prof Mehmet Ulubasoglu (Deakin University), Dr Muhammad Rahman (Monash University), Dr Yasin Kursat Onder, Dr Yiqun Chen (University of Melbourne) and Prof Abbas Rajabifard (University of Melbourne), analysed the direct effects of floods and bushfires on gross value of different economic sectors. *The Economic Record*—the flagship journal of the Economic Society of Australia—was one of the most popular papers of 2019, being among the top 10 per cent of papers downloaded from the journal that year.

Fellowship success

CRC researcher A/Prof Dominique Greer was awarded Associate Fellow (Indigenous) of the Higher Education Academy by the Queensland University of Technology in May 2020. The award follows a pilot program underpinned by a new module on Indigenous Perspectives in Learning and Teaching, run by QUT. The program has created a pathway for all educators to transform their practice and make Indigenous perspectives a key feature of the course learning experience.

EXECUTIVE SUMMARY



Sam Hillman.

International scholarship

A panel of international fire science experts have awarded CRC associate student Sam Hillman from RMIT University with their prestigious scholarship in September 2019. The International Association of Wildland Fire awarded Hillman \$3,000 USD toward his PhD with the Remote Sensing Centre at RMIT University. In conjunction with his studies, Hillman has a graduate position at Forest Fire Management Victoria and is a seasonal firefighter during the warmer months. His PhD investigates the use of image-based and LiDAR point clouds to improve below canopy forest structure for fuel hazard assessments.

CRC recognition

Two CRC researchers and two end-users were recognised for their outstanding achievements in research utilisation at the CRC's annual conference in Melbourne in August 2019. Dr Blythe McLennan (RMIT University) and industry user Amanda Lamont (Australian Institute for Disaster Resilience) were awarded for drawing on the practical experiences of CRC partner agencies in several states to develop a framework on best practices for engagement with spontaneous volunteers. The research also contributed to the national handbook collection of the Australian Institute for Disaster Resilience with the publication *Communities Responding to Disasters: Planning for Spontaneous Volunteers*.

Researcher Dr Marta Yebra (Australian National University) and lead end-user Dr Adam Leavesley (ACT Parks and Conservation) were also recipients of this award. Cutting-edge technology producing spatial information on vegetation conditions, fire hazard and impacts, supports a wide range of fire risk management and response activities such as hazard reduction burning and pre-positioning firefighting resources. This next generation of fire risk monitoring tools is available to land managers and fire services across Australia through the Australian Flammability Monitoring System and

ACT Parks and Conservation has been a leader in promoting this uptake among CRC partners.

Event success

The CRC's annual conference with AFAC and Deutsche Messe won a key award at the annual ceremony honouring event success across Australasia. The Exhibition and Event Association of Australasia awarded AFAC19 powered by INTERSCHUTZ the Best Association Event for 2019. The EEAA's annual Awards for Excellence celebrate outstanding achievement within the exhibition and event industry. In addition to winning the Best Association Event, AFAC19 was also nominated as a finalist for the Best Trade Show over 10,000m².

RISKS AND IMPEDIMENTS

As the year placed the CRC near the end of the current funding period, it was important to ensure that all research milestones were on track and that the CRC was laying foundations for future research.

At this point, partner support and engagement were crucial to achieve ongoing utilisation and transition to a longer-term research centre. Without such support and recognition of the value of the research outputs, transition to future research opportunities would be at risk.

To meet this challenge, the focus for the period was on the delivery and utilisation of valued research outputs to partners. This was supported by activities focused on promoting the value and impacts of the research program for partners and for the wider community.

This was accompanied by the development of a Transition Plan and an engagement strategy to harness partner support for research beyond the current funding period.

The following tenets were adopted by the Board to guide the planning for the future.

Dr Blythe McLennan and Amanda Lamont accept their Outstanding Achievement in Research Utilisation award from CEO Dr Richard Thornton.

EXECUTIVE SUMMARY

The CRC will transition into an Entity that has a similar vision and mission to the current CRC, hence:

1. The Entity's program of activities, will not close at the end of the current Commonwealth funding.
2. There will be more research needed by the industry sector and the Entity should continue in some form.
3. Funding from its current core partners, including the Commonwealth, will be required, to make the Entity sustainable in the longer-term.
4. The future scope of research will be established by its funding partners.

A key assumption has been that the CRC is not eligible under the guidelines for refunding in its current form from the CRC Programme.

It is also taken as a given that there cannot be a transition if the CRC cannot demonstrate value to its core partners by delivering on its commitments over the remainder of the current funding period. This is a fundamental point, but it is consistent with all current activities and therefore considered as business as usual for the CRC.

The CRC has also identified and has been managing a set of key risks through its Audit, Risk and Compliance Committee, and Research and Utilisation Committee of the Board. These risks have been managed through close monitoring by management working with both end-users and researchers.

The high-level strategic risks associated with running the CRC are reported to the Board at each meeting, and the controls are tested on a regular basis. Reputational and

partnership risks are managed through regular visits by the Chair and the CEO to the end-user and research partner organisations at a Commissioner/Chief Officer level or similar.

Finally, COVID-19 restrictions from March 2020 affected the CRC's research and outreach activities, in particular, the workshops and forums that were to take place. As is evidenced in this report, wherever possible, online alternatives were found to ensure that interaction continued and milestones were reached.

IMPACTS

In the reporting period there were no changes to the expected outputs, usages or impacts and their associated probabilities. There were no changes to the expected non-monetary impacts. There were no changes to the expected monetary impacts.



Chair Dr Katherine Woodthorpe speaks at the International Day for Disaster Risk Reduction forum in Brisbane, October 2019.

EXECUTIVE SUMMARY

THE VALUE OF CRC RESEARCH

Australian communities are greatly benefiting from eight years of research into the response, recovery and mitigation of natural hazards, according to an independent report.

SGS Economics & Planning was commissioned to undertake an evaluation of the value delivered by the Bushfire and Natural Hazards CRC since its inception in 2013. The results outline the many and varied benefits of the CRC's research to the Australian community.

The CRC's work is closely guided by the needs of its end-user partners, working across the before, during and after spectrum of natural hazards, including bushfire, flood, storm, cyclone, tsunami, earthquake and heatwave.

A survey of CRC end-users—including emergency services, the Australian Government, states and territories, local government, businesses, households, regional and rural communities, landowners, infrastructure providers, volunteers and academia—shows that the CRC is strengthening research capacity in natural hazards and the environment, using and building capacity in leading researchers from around the country.

“The CRC’s reliability as a source of respected truth and knowledge enables it to be a pillar upon which decisions are made by agencies.”
(CRC partner survey response)

With more than 100 ongoing or completed research projects, involving around 250 researchers and 150 PhD students across Australia and New

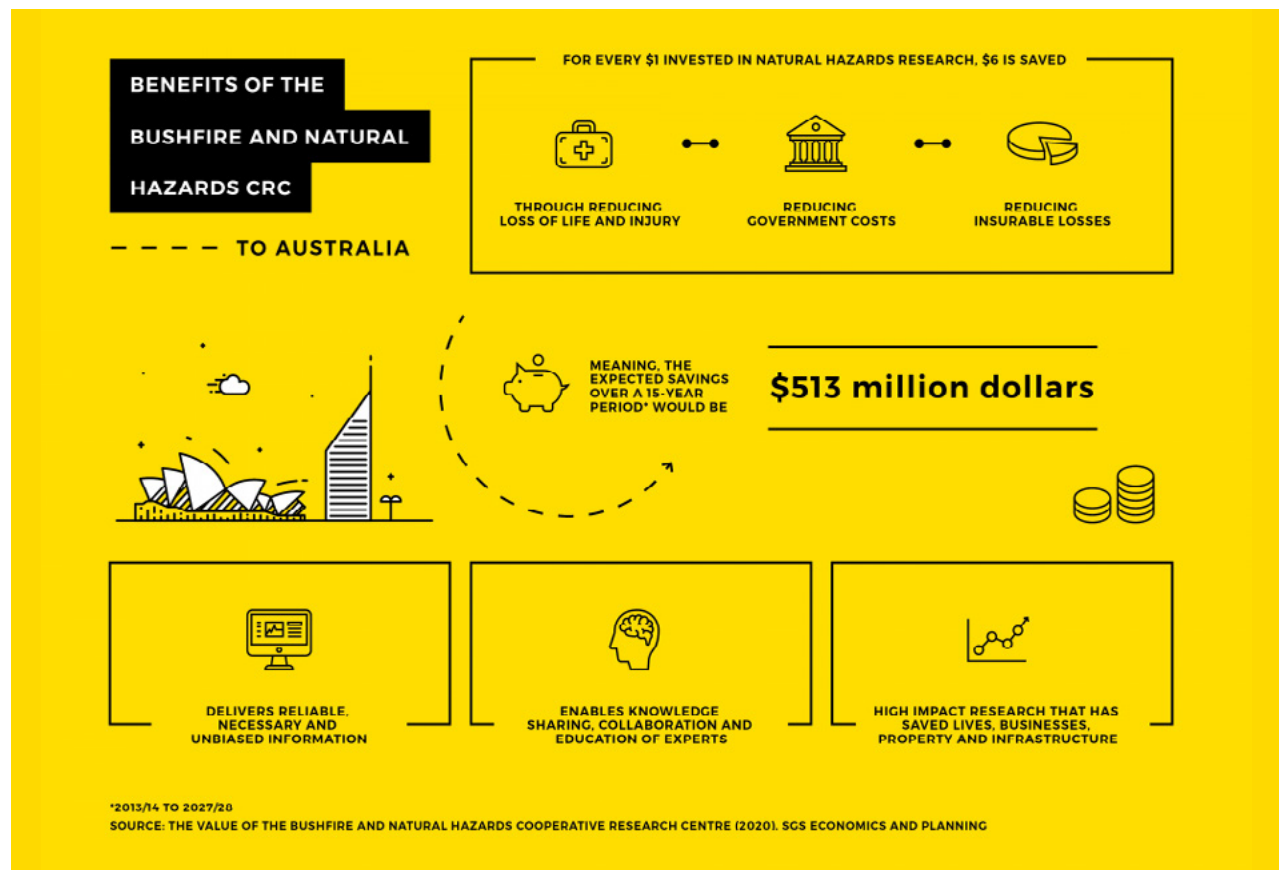
Zealand, the CRC has generated benefits for its end-users and the wider Australian community that SGS groups under three key benefit areas:

- **As a large, independent and trusted institution**, the CRC provides trusted advice for the community and efficient planning and decision making for government and emergency services.
- **As a network of knowledge holders for natural hazards**, the CRC enables knowledge sharing, collaboration and education of experts from a range of fields at both a national and international level, producing new research, innovation and products for end-users.
- **As a creator of higher impact and new research**, the CRC delivers information, products, services and tools that drive better decision making, behavioural changes in the community, and improved disaster recovery.



The Hon Senator Kim Carr MP speaks about CRC research at a Senate Estimates Committee hearing in March 2020.

EXECUTIVE SUMMARY



SGS found that, for every dollar invested in the CRC, six dollars of benefit is received by end-user partners—reducing loss of life and injury, reducing government costs, and reducing insurable losses. This 6:1 economic return of six dollars is expected to deliver a total benefit of \$513 million over the 15-year period of 2013-14 to 2027-28.

Benefits into the future

A separate report found that the CRC's research value to Australia was up to \$850.1 million over 15 years.

The Risk Laboratory, the International Institute for Applied Systems Research and Strahan Research

were commissioned to undertake an assessment of the value of the research delivered by the CRC, which would be used alongside the independent evaluation of SGS Economics & Planning.

The evaluation finds that for every dollar spent on the CRC, there is a seven dollar return and concludes that this represents outstanding value for Australia.

The assessment estimates the total value of four distinct pathways to value, expanding the potential value of research, highlighting the range of strategic areas that publicly funded research enhances, and indicating the main ways the CRC has value.

The four pathways to, and sources of, value are:

- **project level impacts**, including improved agency policy or practice, cost savings and effectiveness, and impacts resulting from the combined value to the fire and emergency management sector of all projects and other work
- **training and capacity building**, including impacts on the development of the skills, expertise and capacity of people in the emergency management sector, and the proactive creation of active networks and communities of practice
- **knowledge generation**, including the production of both formal codified knowledge (published papers, reports, PhDs, etc.) and informal knowledge through seminars, conferences and networks of practice
- **broader social and economic impacts**, including the value of avoided loss and damage that can be attributed to CRC research.

Summing the value of each of the pathways, the total value of CRC research is estimated at \$850.1 million, which is based on the benefits that have begun to accrue since 2018 and continue over 15 years to the year 2032.

EXECUTIVE SUMMARY

FIRE FUELS SCIENCE FORUM

A National Fire Fuels Science Forum was moved from Canberra in March to an online webinar format in May due to COVID-19, in partnership with the Australian Academy of Science. The webinars were a scaled down version of the original forum due to the format, but the aims were the same:

1. To assist the Royal Commission and the state inquiries in understanding the issues and solutions in managing the landscape for fire.
2. To bring together leading scientists to determine the state of science of prescribed burning – what is known, what is unknown, what is in agreement, what is in dispute.

The first webinar covered why hazard reduction is so difficult to undertake, and so divisive. Four expert panellists presented their views: Dr Sarah Harris (Country Fire Authority), Sascha Rundle (ABC Emergency Broadcasting), Oliver Costello (Firesticks Alliance) and Justin Leonard (CSIRO). Attendance was extremely strong, with 522 people attending from 12 countries. All states and territories of Australia were represented.

FEEDBACK RECEIVED:

"It was such a great forum! Thanks for hosting online so we could all attend."

"As our local RFS Fire Brigade Senior Deputy Captain I got a lot out of the first webinar."

"Very fascinating information and lots of questions were answered."

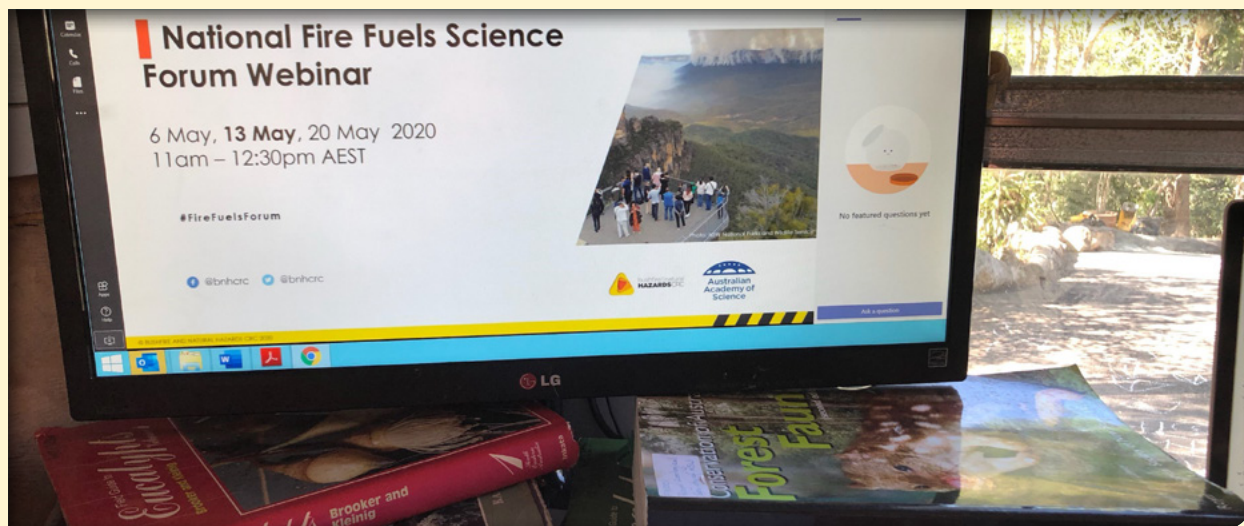


Photo: Craig Weldon.

The second webinar (13 May) covered the science of hazard reduction: what do we know and what are the knowledge gaps? Panellists were: Dr Neil Burrows, Prof Mike Clarke (La Trobe University), A/Prof Tina Bell (University of Sydney), Dr Philip Zylstra (Curtin University) and Prof Mark Adams (Swinburne University of Technology). Attendance remained high with 497 people watching.

The third and final webinar, on 20 May, rounded out the series with a discussion of the potentials and limitations when applying hazard reduction burning. Dr Adam Leavesley (ACT Parks and Conservation Service) gave a practical perspective, referencing the ACT's Orroral fire in 2020 as an example of the effects of planned burning on bushfire suppression and landscape. Dr Valerie Densmore (WA Department of Biodiversity,

Conservation and Attractions) outlined one of the pitfalls and complications of prescribed burning in practice—the effects and changes of fuel moisture differentiation. Ruth Ryan (HVP Plantations) provided a plantation industry perspective, including the need for risk modelling that considers social and cultural implications. Lastly, Dr Simon Heemstra (NSW Rural Fire Service) explained the ways that fire services use science to improve the practice, application and communication of hazard reduction burning.

The series enabled an informative and accessible discussion of the issues, science, constraints, beliefs, culture, truths and myths around hazard reduction burning in Australia. Videos of each webinar, all the presentations, plus background papers are on the CRC website.

RESEARCH

The reporting period covers the seventh year of the CRC's eight-year funding period, where priorities for the research program were to consolidate the CRC's research investment, to promote value and impacts of the research, and to refine pathways for the uptake and utilisation of the research outcomes and knowledge.

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

- two books
- 12 book chapters
- 96 journal papers
- 62 refereed conference papers
- 94 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.

Outputs from the research themes are being utilised across 10 impact areas:

- Disaster resilience.
- Economics, mitigation and value.
- Education and communications.
- Extreme weather.
- Fire predictive services.
- Future workforce.
- Indigenous initiatives.
- Infrastructure and disaster impacts.
- Managing the landscape.
- Policy, political engagement and influence.

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,

as well as journal papers (either in full where permitted, or as links to independent publishers).

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

Of the 28 Commonwealth output milestones for 2019-20, a total of 24 have been completed and four are in progress. All four of the delayed milestones have been extended due to COVID-19 related disruptions and are expected to be completed in the 2020-21 financial year.

RESEARCH MANAGEMENT

The 2019-20 focus was on:

- the ongoing reinforcement of collaborative work between researchers and end-user representatives in integrated project teams. These teams include a minimum of two, and in some cases as many as 15, end-user representatives to provide advice on context, direction and how to maximise the benefits to the end-user partner organisations
- completing the late-term research milestones for projects, including workshops, analysis, software development and utilisation. There have been no significant technical or scientific issues arising during this phase of the research program
- confirmation of governance and review processes at the program and project level, including advice from the independent International Science Advisory Panel
- identification and delivery of utilisation opportunities in collaboration with partners.

The main activities were:

- bringing all end-user and research organisations together at three Research Advisory Forums, held in Hobart, Sydney and Perth, to ensure ongoing, personal interaction at the project level between researchers and end-user representatives that comprise the integrated project teams

- hosting the Bushfire and Natural Hazards CRC – AFAC Conference in Melbourne in August 2019, which included a full day Research Forum
- hosting, with the Australian Academy of Science, the National Fire Fuels Science Forum in May that brought together the leading scientists and practitioners in hazard reduction science for a series of online discussions.

There were additional developments:

- The Tactical Research Fund provided a source of funding for short-term, end-user focused projects, addressing strategic issues for the sector.
- Quick response funding supported researchers travelling to areas affected by natural hazards to gain first-hand knowledge of the event and its impacts, and to capture perishable data.
- Commissioned research projects, outside of the main program, were conducted directly for partners and other clients on specific issues.

Post-fires research

The CRC reached out to the NSW and Victorian fire agencies with an offer to help conduct post-fire research, including providing funding from the Tactical Research Fund. Work with the NSW Rural Fire Service is now underway, with community research investigating bushfire safety and preparation. COVID restrictions have limited the scope of this research to online interviews and surveys. This research has been supported by a donation the global investment bank, Jefferies Financial Group, with staff and clients donating \$100,000 to the CRC to support the research.

END-USER INVOLVEMENT

The CRC has 39 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

RESEARCH

organisations. Ongoing and active engagement between researchers and end-users is considered crucial to the success of each project. In addition to regular formal and informal interaction at the project level, researchers and end-users meet under the AFAC Collaboration Model, the joint CRC-AFAC annual conference, and at Research Advisory Forums:

The AFAC Collaboration Model spans 34 Groups, Technical Groups and Networks. These end-user led groups meet to share knowledge and shape practices for the fire and emergency services sector, with the CRC providing opportunities to engage with the development of the evidence base needed to underpin the development of the sector.

The annual conference in August 2019, was a joint effort between the Bushfire and Natural Hazards

CRC and AFAC in Melbourne. The Research Forum of the conference, organised by the CRC, attracted 453 registrants from academia and emergency services agencies across Australia, New Zealand and internationally, including many project end-user representatives.

Research Advisory Forums were refreshed in early 2019 in a new format and rolled out across the year to better reflect the advanced stage of most of the core research program. Forums were held in Hobart, Sydney and Perth, but those planned for 2020 were cancelled due to COVID-19 restrictions.

The format for the forums has evolved many times since the CRC began in 2013 to reflect the current needs of the research. The change allowed a greater focus on the utilisation of research

according to themes, rather than a focus on individual projects. The new smaller and more targeted format has been reduced from two days to one day, with several forums each year timed to align with other major sector meetings.

This approach recognises the strong links and understanding that have been developed within projects and extends the engagement to promote broader links between projects. The forums promote discussions involving a focused but more diverse but group of stakeholders. One outcome has been greater clarity on the way research can be used by CRC partners and what needs to be done to achieve that outcome.

To support this initiative, the CRC Board increased funding for utilisation projects on the understanding that the transition from research outcomes to changed practices and policies required not only insight, but a commitment of time and effort. The new-look forums provide the CRC and its partners with much greater clarity on the priority areas for investment in utilisation.



Dr Noreen Krusel presents at a Research Advisory Forum in Sydney, October 2019.

ACHIEVEMENTS

There are many highlights from the 2019-20 research and utilisation program:

- The Australian Disaster Resilience Index has been launched. The Index was developed with the University of New England, governments and emergency service organisations across Australia and New Zealand. The Index provides a tool for policymakers to understand at a national level how resilience varies in different regions of Australia, providing a means to track change over time and to allocate resources that are relevant and targeted.
- Emergency warning messages have been analysed for community comprehension, leading to improved phrasing and information content of messaging that have ultimately protected

RESEARCH

threatened communities and saved lives. Research from the Communications and Warnings cluster of projects (Queensland University of Technology, Macquarie University, University of Wollongong, University of Melbourne, RMIT University) forms part of the *National Handbook on Communications and Warnings*, and the companion document, *Choosing Your Words*, published by the Australian Institute for Disaster Resilience. These insights have been adopted at the national level and rolled out to all states and territories, continuing the evolution of our understanding of the importance of communication in times of emergency, to ensure everyone that receives information can understand what is being communicated and will know what actions they need to take.

- The *Managing animals in disasters* project has identified best practice approaches for the management of pets and livestock during emergencies, and is now focusing on community events to promote research outcomes. Dr Mel Taylor from Macquarie University regularly visits animal shows to talk about research on emergency preparedness and animals. Additionally, Mackay Regional Council used insights from the research in local media advertising to encourage bushfire preparedness.
- A new National Fire Danger Rating System currently under development will draw from a range of CRC projects in fire behaviour, fire ecology, weather and climate, predictive services, and communications and warnings. Based on this research, which includes the University of New South Wales, University of Melbourne, Victoria University, RMIT University, Australian National University, University of Sydney, University of Wollongong, Western Sydney University, Queensland University of Technology, the Bureau of Meteorology and CSIRO, the new system will improve community awareness of risk exposure, provide greater scientific accuracy behind decisions, advice

and warnings and give communities greater confidence in the information being provided.

- A national research project into the mental health and wellbeing of police and emergency service personnel in a collaboration between the CRC and Beyond Blue with the University of Western Australia provides insights into workplace culture and well-being. Data from this research, the most comprehensive study of its type in Australia, is being used by the sector to review current mental health support strategies and to identify opportunities to modify existing or introduce new support programs.
- The national Inquiries and Reviews database contains a catalogue of 312 inquiries and reviews

relating to emergency management/natural hazards across all jurisdictions in Australia between 1886 and 2020. The data can be sorted via disaster and inquiry type, date and jurisdiction. For more in-depth analysis, CSV files can be downloaded allowing local queries and reports. The database enables a filter-search of 3,949 recommendations, allowing a search and comparison of keywords and themes. This database was used as a resource by the Royal Commission into National Natural Disaster Arrangements to gather recommendations from previous inquiries and Royal Commissions. It was developed in partnership with Aither, the Australian National University and AFAC.



Dr Mel Taylor (fifth from right) with members of the Hawkesbury-Nepean Floodplain strategy team and NSW SES at the Horse Owner Emergency Preparedness Open Day, July 2019. Photo: NSW SES

RESEARCH

- The Savanna Monitoring and Evaluation Reporting Framework is an online tool that evaluates the effects of fire where burnt area mapping is available across the Northern Territory, large parts of Western Australia, and northern Queensland. The research by the Charles Darwin University team assesses nearly 20 years of data to show where bushfires have burnt, at what time of year (early or late dry season) and when an area was last burnt. This enables land managers access the latest metrics to better measure the effect of different fire regimes on ecology and carbon emissions.
- Development of a decision support system to assist stakeholders evaluate disaster mitigation investment decisions that consider future scenarios. Utilisation of this project has been advanced through a national training program and case studies in Victoria, South Australia, Tasmania and Western Australia involving bushfire, flooding, coastal inundation, earthquake and heatwave, with both the Western Australian and Tasmanian governments further investing into the development of a model to show natural hazard risk exposure for their states. The system has been developed by the researchers at the University of Adelaide, the Research Institute for Knowledge Systems (the Netherlands) and the Karlsruhe Institute of Technology (Germany).
- The Australian Exposure Information Platform allows users to generate exposure reports needed for decision making before, during and after hazard events. The customised reports provide a detailed statistical summary of the number of people, dwellings, structures, businesses, and agricultural and environmental assets in any specified area across Australia. The Platform was a key source of information during the 2019-20 bushfire season and is used regularly by more than 50 organisations across government, industry and emergency sectors to produce thousands of reports each month. It was developed in partnership with Geoscience Australia, the University of Melbourne and the University of Canberra.
- The Prescribed Burning Atlas (University of Wollongong, Western Sydney University, University of Melbourne) is a website that assists land and fire managers in tailoring their burning strategies to outcomes that will best reduce the risk in a target area within available budgets. The Atlas incorporates thousands of fire simulations to compare the level of risk reduction achieved from different combinations of prescribed burning techniques. It also compares the costs of different mitigation options and their effect on reducing the likelihood of life loss, property loss and landscape damage, as well as the effects of climate change on prescribed burning effectiveness. It covers 13 different landscape types across New South Wales, the ACT, Victoria, Tasmania, South Australia and Queensland, comprising different types of landscapes such as temperate forests, grasslands, savannas, deserts, woodlands and scrub.
- Fuels3D is an online tool designed by researchers at RMIT University for fire and land managers in the field to quickly, accurately and consistently capture important information on fuel hazard and burn severity. This benefits whole organisations by reducing both staff hours in the field and individual biases in estimating bushfire risk.
- The Australian Flammability Monitoring System is supporting fire risk management and response activities such as hazard reduction burning and pre-positioning firefighting resources and, in the long-term, the new National Fire Danger Rating System. The web-based tool, developed by the research team at the Australian National University, is useful for fire and land managers and other industries such as the insurance and agricultural sectors and electricity and water suppliers. Communities across land management and agriculture can assess how dry vegetation on their properties is for a range of potential activities, including preparation for fire season.



Prof Holger Maier.

RESEARCH



Dr Steve Curnin (left) and A/Prof Ben Brooks (second from right) and WA local government staff at a decision-making workshop, October 2019. Photo: WA Local Government Association.

- Development of a prototype, high-resolution soil-moisture analysis system called JASMIN in partnership with the Bureau of Meteorology is providing more accurate estimates of land dryness that contribute to the fire danger rating and warning systems, fire behaviour and flood prediction models, and the development of heatwaves. This will flow on to improvements to emergency warnings issued to the public.
- Issues of recruitment, retention, diversity, and wellbeing among State Emergency Service volunteers have been identified as part of a larger study on volunteering conducted by researchers at Curtin University and the University of Western Australia. Strategies to improve volunteer recruitment and retention rates are being considered by SES agencies around Australia.
- Development of practical team monitoring tools such as an Emergency Management Breakdown Aide Memoire and the Team Process Checklist helped emergency managers and responders strengthen teamwork before, during and after emergencies. Emergency services were engaged throughout development by the research team at CQUniversity and the University of Tasmania, with information sought from 18 agencies ranging from state emergency services, to urban fire, rural fire and local councils. Following its launch at the National Lessons Management Forum in 2018, the tools have been adopted for training purposes in several states, with the Team Process Checklist also translated to Spanish by the Pau Costa Foundation for use in Spain.
- Development and delivery of options-based creative decision-making resources and workshops by the team at the University of Tasmania assisted with the professional development of staff and volunteers in emergency services and other organisations with critical decision-making roles in emergencies. Workshops have been held in with the Western Australian Local Government Association and the Western Australia State Emergency Management Committee, and two tools developed—the Psychological Safety Checklist and the Cognitive Bias Aide Memoire.
- The identification of four key largescale forces reshaping the nature of volunteering in the 21st century by the research team at RMIT University led to the subsequent incorporation of the research findings in the *Communities Responding to Disasters: Planning for Spontaneous Volunteers – Handbook 12*, published by the Australian Institute for Disaster Resilience. This handbook is used as a guide for emergency organisations across Australia on best practices for engagement with spontaneous volunteers.
- CRC PhD student Avianto Amri's research has produced a board game to empower children at home. Developed as part of Avianto's CRC PhD at Macquarie University, PREDIKT provides the teachers and parents to play and learn about disaster preparedness with children in a fun and interactive way. Initial results have shown that the education intervention is successful in motivating parents to discuss householder preparedness with their children. The resource, which is cheap and scalable, is currently being used by agencies and practitioners across Australia, Indonesia, Malaysia and Thailand. The game forms part of a broader toolkit, which includes worksheets, templates, tips and preparedness items for multiple hazard types, to further strengthen disaster preparedness through interactive learning.

» **PUBLICATIONS - SEE APPENDIX 1 FOR A FULL LIST OF PUBLICATIONS.**

RESEARCH

INTERNATIONAL RESEARCH LINKS

The CRC maintains the following international links:

- A Memoranda of Understanding with the US Forest Service, Department of Interior and Bureau of Land Management.
- A Memoranda of Understanding with the Association for the Development of the Industrial Aerodynamics (ADAI, Portugal).
- A Memorandum of Understanding with the Natural Hazards Research Platform (New Zealand), established in 2015.
- A Memorandum of Understanding with the Coastal Resilience Centre of Excellence, University of North Carolina, established in 2018.
- A Memorandum of Understanding for the European Commission funded project GEOSAFE with Australian partners RMIT University and the University of Melbourne.

The CRC is the designated 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 hazards, mitigating their impacts, and improving related policy-making mechanisms.

The CRC has an International Science Advisory Panel comprised of independent experts to oversee the research program, providing strategic advice on the quality and overall development of the CRC's research and education programs to ensure the research is of a high quality:

- (Chair) Prof Carmen Lawrence, School of Psychology, University of Western Australia. Prof Lawrence has previously conducted research for a Bushfire CRC project examining community preparedness.

- Dr Gavin Smith, North Carolina State University, global expert in natural hazards and climate change adaptation.
- Dr Mark Finney, Research Forester with the Fire, Fuel and Smoke Science Program, US Forest Service, with 25 years' experience in fire research.
- Dr Anthony Bergin, Deputy Director of the Australian Strategic Policy Institute, whose role has included looking at national security from an all hazards perspective and disaster management planning.

In March 2020 the CRC hosted a delegation of visiting Members of Parliament from the European Union for a briefing on the latest findings from natural hazards science. The group from the

Delegation for Relations with Australia and New Zealand met with CEO Dr Richard Thornton, who gave an overview of Australia's exceptional fire season and discussed the latest findings on fire spread modelling, warnings, economics, recovery and understanding risk. The group, which included European Ambassador to Australia Michael Pulch and Assistant Director at the International and Parliamentary Relations Office Erin Lloyd, also discussed potential CRC research partnerships in Europe. The visit occurred prior to the COVID-19 outbreak.

Many of the CRC's core projects have strong and ongoing links with international partners. (See Appendix 2)



CEO Dr Richard Thornton (second from left) with the European Union delegation, March 2020.

UTILISATION AND COMMERCIALISATION

The CRC is on target to achieve its utilisation outcomes. There were 20 utilisation milestones for the reporting period, of which 16 have been completed, and four are expected to be completed by end of June 2020.

RESEARCH TO CAPABILITY

End-user engagement is central to the CRC's utilisation strategy. A model of a Research to Capability process is depicted (right), together with examples of how the strategy is being enacted within the 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 for every core research project.



SETTING RESEARCH DIRECTIONS

- Stakeholders identify needs
- Proposals are requested from the research community
- Projects are reviewed, selected, revised and approved



MAINTAINING AND REFINING RESEARCH FOCUS

- End-users are actively engaged on research projects
- Ongoing advice and access to partner organisations is provided



IDENTIFYING MECHANISMS FOR KNOWLEDGE APPLICATION

- End-users identify potential application of research outputs
- Briefings are held via AFAC, ANZEMC sub-committees and direct access to end-user organisations to support appropriate planning timeframes in end-user organisations



TRANSLATING RESEARCH OUTPUT INTO PRODUCT

- Detail is identified of how the knowledge developed should be translated into products such as training, methodologies, practices, systems
- CRC supports technology uptake activities

CORE BUSINESS



ORGANISATIONAL ACCEPTANCE OF RESEARCH PRODUCT

- It is ensured that the receiving organisation has the skills to integrate the knowledge being delivered



ENHANCED ORGANISATIONAL CAPABILITY

- Organisations are able to consistently achieve something new or significantly better

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 also in the final stages of implementing a monitoring and evaluation framework for the utilisation program. This framework uses a 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.

The CRC Board has endorsed the understanding that the CRC operates as a knowledge network and market, reflecting the close engagement between researchers and end-users, and the lack of barriers between the CRC's members for contributing to, and using, outcomes of the CRC research. Importantly, one of the mechanisms for utilisation in a knowledge network comes through diffusion into member organisations, and where outcomes are most commonly measured through case studies, testimonials and participation.

There have been no spin-off companies or licensing of technology to SMEs.



Dr Mika Peace and Andrew Sturgess share their experiences of researcher/operations partnerships at the annual conference after Dr Peace assisted the Queensland Fire and Emergency Services during their bushfires.

INTELLECTUAL PROPERTY MANAGEMENT

Bushfire and Natural Hazards CRC's principles for the treatment of Intellectual Property (IP) are consistent with the National Principles of IP Management for Publicly Funded Research.

All IP created by personnel attached to the CRC on projects funded by the CRC is Centre IP (that is, it is owned by the CRC or the CRC has a worldwide, irrevocable, royalty-free licence to use). This IP is made freely available to all members of the CRC in line with the conditions of the Participant's Agreement.

There were no key items of IP held by the CRC during the reporting period that are considered appropriate for protection through patents or other forms of formal IP protection.

The primary market for any IP developed is our partner organisations.

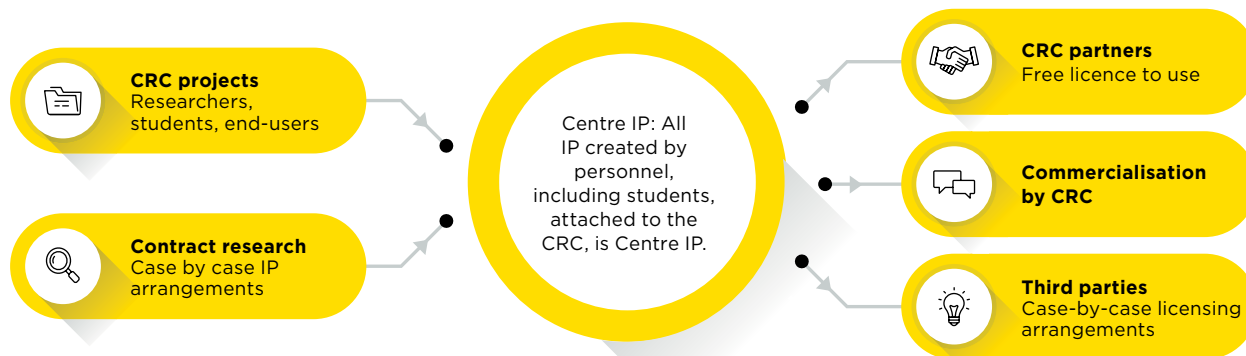
The secondary markets for Centre IP is suppliers to Australian and international fire and emergency services agencies, such as those that support the delivery of emergency services, those that provide services to the community, and those that provide advice and products to the community.

The general principles for treatment of Centre IP are shown diagrammatically to the right.

PRINCIPLES OF IP MANAGEMENT

The primary mechanisms for ensuring adherence to the National Principles of IP Management for publicly funded research are:

- a Background IP register for capturing information on all pre-existing IP contributed by partners to CRC research projects
- a publications policy that ensures that all research generated by the projects is reviewed prior to public release, including for review for potential commercial exploitation



Commercialisation and licensing income

retained by CRC for further research and is not distributed to partners, inventors or other parties.

- an IP register for capturing information on all Foreground IP generated by the research projects (Centre IP)
- communication of all research results to all partners to maximise potential of IP exploitation by those partners.

The IP arrangements, in combination with the strategy for communicating research results to partners, ensure that:

- all partners are aware of outcomes generated by the CRC
- all partners have free access to the research outcomes for their own internal business operations

Prior to wind-up, a strategy and plan will be submitted to the Commonwealth specifying how Centre IP and commercialisation assets will be handled.

the nature of the research outputs to date supports an approach whereby all are made publicly available on the CRC website. Notification of these publications is done through a monthly public newsletter and extensive social media networks. This is an effective and efficient way to maximise the use and value of the research.

In addition, the CRC supports technology transfer/research utilisation activities to maximise the likelihood of a successful uptake of the research. This ensures that maximum benefits will accrue to end-users and to Australia.

EDUCATION AND TRAINING

The high number of student completions continued this year, demonstrating that the CRC is building a capacity and capability of highly skilled researchers for the sector. The CRC is building this capacity with postgraduate students working 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 151 students (70.5 FTE)—57 scholarship, 94 associates. The CRC has exceeded its original target of 34 PhD completions by June 2021 with 63 students (31 scholarships and 32 associates) already completing their PhD studies.

Completion timeframes

- 2014-15 – two
- 2015-16 – five
- 2016-17 – 12
- 2017-18 – 16
- 2018-19 – 18
- 2019-20 – 10

Additionally, the CRC had 15 Masters students, with nine completed, as well as one scholarship student completing a Graduate Certificate in Research.

To support the students, the CRC runs a variety of events centred on learning and networks, however, much of this was curtailed in second half of the financial year (early 2020) due to COVID-19. The annual conference in August and the three Research Advisory Forums, plus industry working groups (run by partner organisation AFAC), were key gatherings where students had the opportunity to present their findings. A number of students have also received CRC support to present their research at other national and international conferences.

A new online environment was launched in early 2020 to support students in the absence of regular face-to-face interaction. This included a quarterly e-newsletter and revamped pages on the CRC website that highlight student achievements and impacts, publications and other activities.

<https://www.bnhcrc.com.au/education>

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



Mitchell Humphreys, Dr Maryam Nasim and Li Zhao at the AFAC19 conference, August 2019.

SME ENGAGEMENT

The Bushfire and Natural Hazards CRC has extensive engagement activities with small-to-medium enterprises, as well as large corporations.

The overall strategic plan for the CRC, as well as the specific strategies for Research Utilisation and for Communications, includes SME engagement as a prime objective.

WORKING WITH INDUSTRY

SME engagement highlights include:

- The CRC participated in the annual conference with AFAC and Deutsche Messe Australia in Melbourne in August 2019. A feature of the

conference was the trade exhibition with 196 exhibitors from the broader industry, the majority of which were small-to-medium enterprises active in both Australia and New Zealand. The conference also attracted significant corporate sponsorship, including long-term sponsor relationships with global vehicle manufacturers Scania, Hino and Isuzu, and fire equipment suppliers Dräger, Motorola and Gaam.

- The CRC participates and supports a calendar of engagement events that includes several emergency management and operations conferences (including the Emergency Management Conference, and the Disaster and Emergency Management Conference), regional volunteer events and industry specific conference

and activities. All these events involve significant participation from local and regional SMEs.

- The Fire Protection Association Australia (FPAA), which represents more than 6,000 SMEs, is a contributing member of the CRC and actively promotes CRC research to its members through *Fire Australia*, its quarterly journal which is published jointly by the CRC, AFAC, and FPAA and is distributed to 6,000 members of the broad fire and emergency services sector.
- *Hazard Notes*, the CRC's research briefing papers, are publicly available online and are distributed through an extensive email database that includes SMEs, small rural fire brigades and State Emergency Service units, and to regional councils. They are also shared widely on social media.



The trade exhibition at the annual conference features the latest technology for emergency services



Nearly 200 exhibitors attended the annual conference, a majority of whom were small-to-medium enterprises

COMMUNICATIONS

With the CRC into its seventh year, the communications priorities continued to highlight the positive impacts of the research program with a focus on:

- building public and industry knowledge of how to use the research, through targeted events, conferences, workshops, online content and in the general media
- creating and distributing branded publications and products to demonstrate the value of the CRC.

The COVID-19 pandemic severely impacted on CRC events and activities in the second half of the reporting period. This necessitated significant changes in the way the CRC communicated research to partners and the community.

RESEARCH EVENTS

The first half of this reporting period saw much activity around raising the profile of the research outputs, at conferences and other forums, and in various media, across a range of audiences including local government, communications, community safety and risk managers.

With COVID-19 requiring all planned events to be cancelled or postponed from mid-March 2020, much of the year was impacted as the planning and organisation of many events planned in the second half of 2020 are underway months in advance. Given the uncertainty it was difficult to set new dates for the postponed events.

This included a Northern Territory research forum (originally scheduled for April), the Northern Australia Fire Managers forum (July), the CRC's annual conference and Research Forum, AFAC20 powered by INTERSCHUTZ (August), and a 12-month schedule of Research Advisory Forums.

Annual conference

An attendance record was achieved for the annual conference with 4,061 delegates attending AFAC19 powered by INTERSCHUTZ in Melbourne in August 2019 at the Melbourne Convention and Exhibition Centre.

The CRC's annual Research Forum again opened the program, which connected 453 delegates from a range of fire, land management and emergency services with volunteers, researchers and policymakers.

A feature of the Research Forum was the inaugural Dr Laurie Hammond Oration, given by Prof Mary O'Kane AC.

In the full conference, dedicated streams explored the theme 'A shift to the new norm: riding the wave of change'. More than 120 presentations and panel discussions shared the latest science and lessons learned on topics including community preparedness, health and wellbeing, diversity and inclusion, cultural fire management, bushfire and smoke modelling, predictive services, and climate change. This included the second Australian Disaster Resilience Conference, as well as the Institution of Fire Engineers conference, both held alongside the main program.

The conference featured sessions, panel discussions, networking functions, award ceremonies and a trade exhibition with 196 exhibitors showcasing the latest technology and equipment in the sector.

The CRC showcased the research and PhD program through a contribution of more than 50 posters.

Research Advisory Forums

Research Advisory Forums provided critical links between partners and research teams as most projects moved into advanced stages of report writing and the formative stages of utilisation.

The extreme weather Research Advisory Forum was held in Perth in July 2019. More

than 60 delegates came together at the Department of Fire and Emergency Services Western Australia to discuss CRC research that is improving scientific understanding and predication capability around severe weather.

The Research Advisory Forum on communications, community engagement and education saw more than 60 emergency management agency representatives and researchers come together in Hobart in September 2019. Research presentations covered the latest research in communications, community engagement and recovery around disaster management.

The predictive services Research Advisory Forum was held at the NSW Rural Fire Service in Sydney in October 2019. This forum explored how research is improving the ability to understand, predict, forecast and monitor natural hazards. More than 40 researchers, end-users and emergency management personnel came together for presentations and discussions on the capabilities of bushfire prediction and forecasting, and how these capabilities are fundamental to improving resilience through better planning, preparedness, risk management and response.

Disaster Risk Reduction Day

The International Day for Disaster Risk Reduction was acknowledged in Australia by the CRC on 11 October 2019. The CRC hosted an event at the Queensland University of Technology, with support from the Department of Home Affairs, the Australian Institute for Disaster Resilience, Queensland Fire and Emergency Services, the Queensland Reconstruction Authority and the Queensland Inspector-General Emergency Management. More than 50 people came together to hear expert practitioners and researchers discuss how their work is helping to build disaster resilient communities across Australia. The Hon Craig Crawford MP, Queensland Minister for Fire and Emergency Services, opened the proceedings.

COMMUNICATIONS



Queensland Minister for Fire and Emergency Services, the Hon Craig Crawford MP, opens the International Day for Disaster Risk Reduction forum in Brisbane, October 2019.

Panellists for the forum were:

- Celeste Young, Victoria University and Bushfire and Natural Hazards CRC
- John Rolfe, Queensland Fire and Emergency Services
- Kieran Dibb, Queensland Reconstruction Authority
- Peter Hillcoat, Lockyer Valley Regional Council
- Craig Carpenter, Queensland Department of Public Works and Housing.

Similar events were held worldwide through the United Nations Office for Disaster Risk Reduction.

Fuels Forum

A National Fire Fuels Science Forum was moved from Canberra to an online webinar format over three Wednesdays in May, in partnership with the Australian Academy of Science. The webinars were a scaled down version of the original forum due to the format.

The first webinar covered why hazard reduction is so difficult to undertake, and so divisive.

Four expert panellists presented their views to 522 people attending from 12 countries.

The second webinar covered the science of hazard reduction: what do we know and what are the knowledge gaps? The final webinar rounded out the series with a discussion of the potentials and limitations when applying hazard reduction burning.

The series enabled an informative and accessible discussion of the issues, science, constraints, beliefs, culture, truths and myths around hazard reduction burning in Australia. Videos of each webinar, all the presentations, plus background papers are on the CRC website.

EM media

The CRC is a partner in the Emergency Media and Public Affairs conferences in Australia and New Zealand. Conferences were held in Sydney and Wellington before more than 100 communications and community engagement practitioners at each venue, with the CRC prominent through its sponsorship of the conference.

WEBSITE

The website is the central repository of all the CRC's public documents, statements, research reports, news, videos and much more, 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 links to the legacy website of the preceding Bushfire CRC.

While minor improvements are always being made, the overall look and feel of the site have remained stable since August 2019, with a few key additions. The Inquiries and Reviews Database was launched in October 2019, which captures outcomes from inquiries and reviews into emergency management and natural hazards, and has been one of our most popular pages throughout 2019-20 with more than 5,000 page views. Other websites developed through the research are also linked off the main site, such as the Australian Flammability Monitoring System, the Savanna Monitoring and Evaluation Reporting Framework, the Australian Exposure Information Platform, the Australian Disaster Resilience Index and the Prescribed Burning Atlas. Further websites based on research are under development and will be launched throughout 2020-21.

One of the major upcoming improvements to the site will be a refreshed Driving Change page that will tell the story of how CRC research has changed the operations of our partners over the past eight years. This Driving Change section will eventually become the legacy website of the current CRC and will group our research into navigable themes, with links to all online tools developed through various research projects (research outputs), case studies showing research impact, key publications and resources, explainer videos, as well as links to all the project pages.

This year, the CRC's website saw a significant boost in the number of users and site visits—

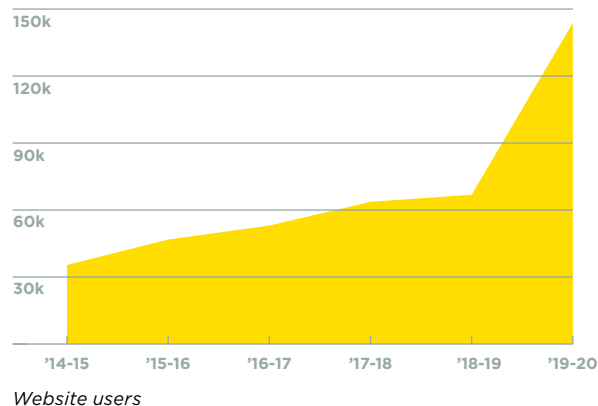
COMMUNICATIONS

the number of users increased by 115 per cent to 143,825 users, while the number of page views increased by 68 per cent to 409,365 (see graphs below). The peak traffic period was around the 2019–20 bushfire season, which attracted a significant surge in new users and unique page views. January 2020 saw the website experience its highest ever amount of page views.

Other peak traffic periods were around the release of both the *Northern Australia Seasonal Bushfire Outlook 2019* (27 June 2019) and the *Australian Seasonal Bushfire Outlook August 2019* (28 August 2019).

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 *Australian Seasonal Bushfire Outlook August 2019*, *Australian Seasonal Bushfire Outlook December 2019*, *Northern Australia Seasonal Bushfire Outlook 2019*, our About Us page, the research landing page, publications page and the Inquiries and Reviews Database (launched in October 2019).

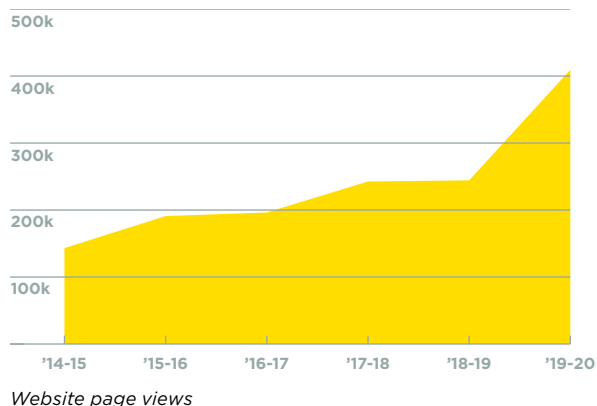


Hazard News and Hazard Notes

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 2,275 to 2,590, representing an increase of 14 per cent. The open rate during this period was 33 per cent, with 8 per cent clicking on a link within the email. The average open rate in Mailchimp for not-for-profit organisations is 22 per cent, while the click rate is just 2 per cent—the CRC is far exceeding these averages.

Mailchimp also enables us to track our outreach in specific areas around the world. Local Australian readers make up the majority of our opens, with 88 per cent. The United States is next with 7 per cent, with readership also in New Zealand, the United Kingdom, Canada, Japan, Germany, the Czech Republic, Austria, India and Fiji.

Within Australia, our *Hazard News* audience is comprised of a wide variety of people. Fire and emergency services staff and volunteers across all states and territories comprise 30 per cent of the audience, federal and state government department representatives make up 16 per cent,



and academics 17 per cent. Councils are well represented, with 50 local councils across the six states subscribed through 87 individuals. Local and national media are also subscribed, with 23 journalists receiving the latest CRC news.

MEDIA

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

Australia's severe bushfire season in 2019–20 generated headlines across the world, with the CRC often called on to provide expert comment to local, national and international media. The coverage highlights the high media profile of the CRC in providing evidence-based comment, with the CEO, Research Director and individual researchers appearing regularly from September 2019 through to January 2020 on TV and radio, and in print and online articles, to discuss science and research and its role in natural hazards management. Major Australian media outlets to feature the CRC included multiple live crosses on ABC TV, appearances on the nightly news on the ABC and commercial channels, ABC AM, ABC PM, RN News Radio, ABC Melbourne, ABC Brisbane, ABC Adelaide, ABC New South Wales, 3AW Mornings with Neil Mitchell; *The Sydney Morning Herald*, *The Age*, *The Australian*, *The Guardian Australia* and *Good Weekend*. International coverage included *The New York Times*, *The Washington Post*, *The Atlantic*, the BBC, Aljazeera, *The Washington Times*, CNN International, the International Business Times, *Japan Today*, *Liberation* (France), *Die Zeit* (Germany), the Sri Lankan *Guardian* and Channel Asia News.

Peak periods coincided with the release of the *Australian Seasonal Bushfire Outlooks* in August and December 2019, and much of January 2020 in response to the bushfires that were, and had been, burning in New South Wales and Victoria

COMMUNICATIONS

over the Christmas and New Year period. In addition to discussion of the bushfire season, key topics that the CRC provided expert comment on included prescribed burning and the role of climate change in Australia's fire seasons. An opinion piece from the CEO was published in *The Australian* on 4 January 2020, outlining that for Australia to move forward on bushfire management, the country must build on the knowledge that it already has to find new ways of managing fire. *The Conversation* website published numerous pieces by CRC researchers on their science.

After the fire season, the expertise of the CRC continued to be sought out by the media to examine the impacts of the fire season, with regular coverage of issues such as understanding risk, fire modelling and the economic impact of the fires topics of interest. Media coverage of the two national inquiries after fire season—the *Royal Commission into National Natural Disaster Arrangements* and the *Senate Inquiry Lessons to be learned in relation to the preparation and planning for, response to, and recovery efforts following the 2019-20 Australian bushfire season*—saw the positive impact of the research on the operations of emergency services agencies highlighted.

» **ALL MEDIA MENTIONS ARE LISTED ON THE CRC WEBSITE AND AVAILABLE IN APPENDIX 5.**

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*, the *Australian Emergency Services Magazine*, *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



Emergency Management Victoria Commissioner Andrew Crisp addresses the media at the release of the *Australian Seasonal Bushfire Outlook: 2019*.

by the Climate Council, the Australian Academy of Science 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 print and digital readership estimates combined are upward of 40,000.

The CRC's 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 annual conference, AFAC19 powered by INTERSCHUTZ, was a peak time for media engagement, combined with the release of the *Australian Seasonal Bushfire Outlook*. The ABC covered the conference with three journalists dedicated on site over the three days for radio and online coverage across their national network, while the *Sunrise* breakfast show on the Seven Network attended the conference on the final morning, broadcasting the weather live from the

COMMUNICATIONS

exhibition floor and conducting four live crosses to showcase various elements of the trade show. The CEO, Dr Richard Thornton, was also interviewed about the *Australian Seasonal Bushfire Outlook: August 2019*. Two media conferences were held at the conference by the CRC, the first to launch the *Australian Seasonal Bushfire Outlook: August 2019*, and the second to release new research on preventable residential fire fatalities in partnership with the Metropolitan Fire Brigade and AFAC.

The *Australian Seasonal Bushfire Outlook: August 2019* media conference was hosted by Dr Thornton with speakers from all the agencies that assisted with the development of the *Outlook*. These were Dr David Jones from the Bureau of Meteorology; Commissioner Andrew Crisp, Emergency Management Victoria; Deputy Commissioner Mark Roche, Queensland Fire and Emergency Services; Senior Assistant Commissioner Bruce McDonald, New South Wales Rural Fire Service; Chief Fire Officer Joe Murphy, Australian Capital Territory Rural Fire Service; Acting Chief Officer Bruce Byatt, Tasmania Fire Service; Acting Chief Officer Andrew Stark, South Australia Country Fire Service; and Deputy Commissioner Craig Waters, Western Australia Department of Fire and Emergency Services.

The media conference was broadcast live on television by the ABC News Channel, and was also attended by Channel Nine, Network Ten, ABC online, AAP, The Guardian and Warrandyte TV. The media conference was livestreamed on the CRC Facebook page, while the Country Fire Authority and ACT Emergency Services Authority recorded footage to release a video to their audiences after the media conference. The CRC utilised this footage to create a highlights clip for YouTube.

The preventable residential fire fatalities media conference was hosted by Research Director Dr John Bates, with speakers comprising Acting Chief Officer Greg Leach, Metropolitan Fire Brigade; Andrew Gissing, Risk Frontiers; and Director Community Safety Amanda Leck, AFAC. Coverage was strong, with more

than 200 mentions of the research in media outlets across the country. This included WIN regional news across Victoria, *The Herald Sun*, *The Daily Telegraph*, *The Courier Mail*, *Adelaide Now*, *The Mercury*, *NT News*, 87 local papers throughout Australia, 774 ABC Melbourne's breakfast radio show and 3AW.

SOCIAL MEDIA

The CRC is active on Facebook, Twitter, YouTube and LinkedIn, using the social media tool Sprout Social to provide analytics and schedule social media posts.

The communications team regularly engages on social media and sees these channels as key communication tools. An active engagement strategy throughout the year, including daily posts, has seen great improvements in both engagement with existing subscribers, and growth in new subscribers. Collaborating closely with our partners (both research organisations and emergency services) has seen the reach of CRC posts on social media extend considerably during the last 12 months.

Combined data across Facebook and Twitter shows that the CRC achieved 70,021 engagements in the 2019–20 financial year, an increase of 43 per cent on the previous year. This includes Facebook shares, reactions and comments, and Twitter likes and retweets.

Total impressions across our Facebook and Twitter channels was more than 1.8 million, an increase of 16 per cent. This is a welcome sign of growing engagement, after seeing a dip in engagement in the 2018–19 financial year compared to the prior year. Combined subscribers across both channels have increased by 25 per cent, to a total of 10,495. The demographics show that Facebook and Twitter users are more often male (55 and 63 per cent respectively) and of a younger cohort, with the highest portion of users aged between 25 and 44 on both Facebook and Twitter (51 per cent and 59 per cent respectively).

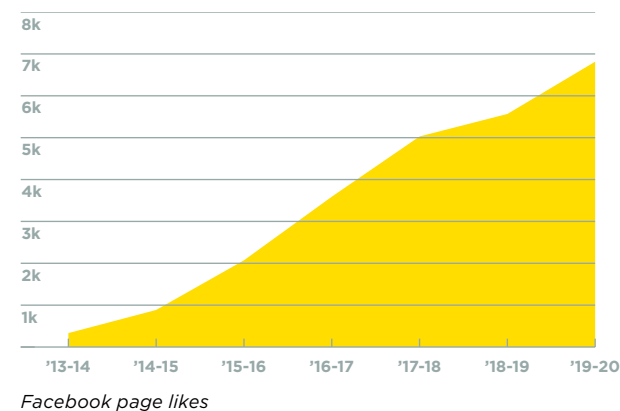
The *Australian Seasonal Bushfire Outlooks* continue to draw significant engagement across all platforms, with three of the top four performing posts (across Twitter and Facebook) last financial year related to a CRC *Bushfire Outlook*. See below for more detail.

Facebook

Beginning the 12-month reporting period with 5,566 likes, by 30 June 2020 Facebook likes had grown to 6,815, an increase of 22 per cent. This represents an increasing rate of growth compared to the previous year, which saw a 10 per cent boost in followers.

CRC Facebook posts received more than a million impressions (1,067,294, all organic, none paid), an increase of 14 per cent. This reflects the promising growth rates seen in the number of followers and is a significant improvement on the decline (of 37 per cent) reflected in the previous financial year.

These figures, across impressions and engagement, show that the content posted through Facebook continues to be popular with the CRC audience. The CRC continues to refine its strategy, ensuring that posts are made with the right content at the right time of day (usually 10am or 5:30pm). Videos and photography are consistently



COMMUNICATIONS

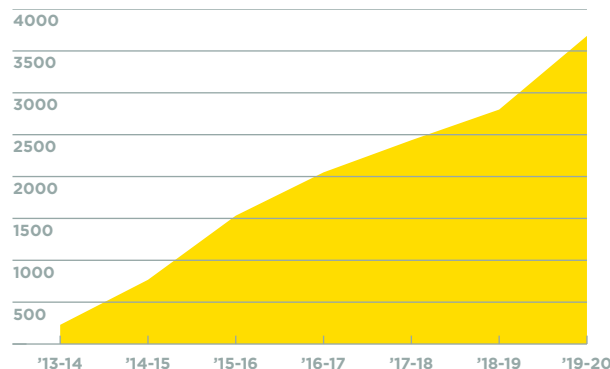
important to our audience and a way to generate engagement—videos in particular, with 11,664 views via Facebook during the last financial year.

The CRC has an engaged audience, with an increase in engagement of 49 per cent in the 2019–20 financial year, to a total of 53,645 engagements (reactions, comments, shares and post clicks). In addition to being engaged, the Facebook audience for the 2019–20 financial year were mostly Australian (spread across all states and territories), mostly between the ages of 25 and 54 (74.4 per cent), and were 55 per cent male, 44 per cent female and 1 per cent nonbinary/unspecified.

Twitter

During 2019–20, the CRC grew its followers on Twitter from 2,826 to 3,680, an increase of 30 per cent (predominantly during the 2019–20 bushfire season). In total, 495 tweets were posted, with 768,991 impressions across the 12-month period (18 per cent increase).

People clicking on links in CRC tweets was up 77 per cent, contributing to 16,376 engagements in total (an increase of 27 per cent). This shows that overall engagement and reach continues to improve,



Twitter followers

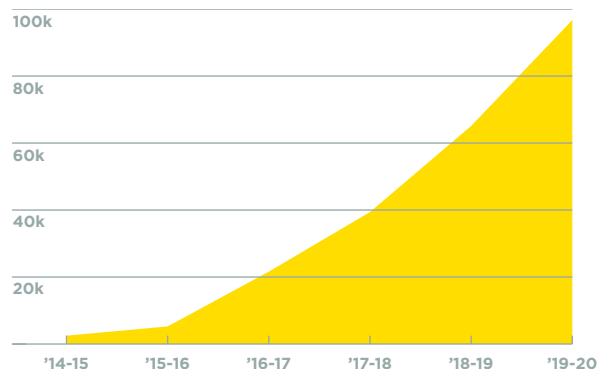
along with growth and impressions. Regular and strategic posting of informative content, such as the *Australian Seasonal Bushfire Outlooks*, photos, videos and links to new research, was key to achieving strong engagement. However, the number of people liking and replying to CRC tweets was down (3 per cent and 16 per cent respectively). This provides an opportunity to improve the number and quality of our conversation-starting tweets in future.

The audience of the Twitter page is 63 per cent male and 37 per cent female, and the largest age group represented is people between 25 and 34 (35 per cent). In addition, many CRC staff, including the CEO, Research Director and Communications Director, are active on Twitter and reinforce the CRC official postings through their personal accounts.

YouTube

The CRC's YouTube channel continues to grow, with new videos added from important CRC events, such as the 2019 annual conference, replays of webinars and highlights from the 2019 International Day for Disaster Risk Reduction.

The communications team continues to work closely with researchers to find opportunities to convey their



YouTube minutes watched

work using video, including several recorded online events during the COVID-19 lockdown. These are available after the live event and are popular on the CRC YouTube page (the Hazard Channel on the CRC website). Often, where time constraints mean that not all questions could be answered during an event, presenters answer additional questions on a dedicated Q&A video, with this approach proving popular. More so this financial year than last financial year, people are coming to the CRC YouTube channel via the website/Hazard Channel, rather than via a Google search.

The total number of videos available on the channel is now 182, with 40 videos added during the 2019–20 financial year. People watched these videos 13,981 times during that period, for a collective 1,600 hours (96,720 minutes), and the average view time was 6.5 minutes (an increase of 25 per cent). Impressions were up by 48 per cent, to 109,951.

The webinars playlist was by far the most popular, attracting 67 per cent of all traffic, followed by the 2020 National Fire Fuels Science event playlist (25 per cent).

The top three most popular videos overall were:

- Black Tuesday 1967 Tasmania bushfires (5,150 views)
- The Day the Flames Came: Dwellingup 1961 (1,002 views)
- National Fire Fuels Science Webinar: The thing about hazard reduction (674 views).

LinkedIn

The CRC continues to grow its large LinkedIn presence, now with 4,355 followers, an increase of 27 per cent on the previous year. LinkedIn posts usually mirror the Facebook posts, with tagging key partners as the main priority. LinkedIn attracts an engaged audience who frequently comment and share CRC's posts.

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 the first four meetings held in a different capital city and the final one in a virtual format due to COVID-19 restrictions. The in-person meetings were held in conjunction with either a research event 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 independent director, Dr Katherine Woodthorpe AO. At 30 June 2020, the nine-person Board consisted of five male and four female directors (including Chair).



Dr Katherine Woodthorpe, Chair of the CRC.

GOVERNING BOARD MEMBERS

NAME	ROLE	KEY SKILLS	INDEPENDENT/ ORGANISATION	MOVEMENTS	ATTENDANCE
Dr Katherine Woodthorpe AO	Chair	Governance and strategy	Independent	Appointed March 2019	5 out of 5
Stuart Ellis	Director	Industry based skills	AFAC	Appointed June 2013 Resigned December 2019	2 out of 3
Kathy Gramp	Director	Finance and governance	Independent	Appointed December 2013	3 out of 5
Lee Johnson	Director	Industry based skills	Independent	Appointed December 2013	5 out of 5
Dr Greg Ayers	Director	Industry based skills	Independent	Appointed July 2019	5 out of 5
Mark Croswell	Director	Industry based skills	Dept of Home Affairs	Appointed May 2018	4 out of 5
Naomi Stephens	Director	Industry based skills	NSW National Parks and Wildlife Service	Appointed December 2013	4 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 Police Service	Appointed November 2016	5 out of 5
Sandra Whight	Director	Industry based skills	Bureau of Meteorology	Appointed March 2020	1 out of 2
Dr Stephanie Rotarangi	Director	Industry based skills	Country Fire Authority	Appointed, July 2019 Resigned December 2019	0 out of 3

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 2019	Canberra
September 2019	Sydney
November 2019	Hobart
March 2020	Brisbane
May 2020	Online

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
Dr Greg Ayers	Chair	Industry based skills	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	Department of Human Services, 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 NSW	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
Dr Timothy Neale	Deakin University
A/Prof Michael Eburn	Australian National University
Dr Katharine Haynes	University of Wollongong
Dr Thomas Loridan	Macquarie University
Dr Briony Towers	RMIT University
Dr Mel Taylor	Macquarie University
Dr Ilona McNeill	University of Melbourne
Prof Vivienne Tippet	Queensland University of Technology
Prof David Johnston	Massey University
A/Prof Chris Bearman	CQUniversity
Dr Tariq Maqsood	RMIT University

NAME	ORGANISATION
Prof Michael Griffith	University of Adelaide
A/Prof Trent Penman	University of Melbourne
Dr Thomas Duff	University of Melbourne
Dr Melissa Parsons	University of New England
A/Prof Ross Bradstock	University of Wollongong
Dr Karin Reinke	RMIT University
Dr Matthew Mason	University of Queensland
Krishna Nadimpalli	Geoscience Australia
Prof John Ginger	James Cook University
Prof Sujeeva Setunge	RMIT University
Prof John Handmer	RMIT University
Dr Michael Jones	University of Wollongong
Steve Sutton	Charles Darwin University
Prof Jeremy Russell-Smith	Charles Darwin University
Dr Scott Nichol	Geoscience Australia
Prof Charitha Pattiaratchi	University of Western Australia

NAME	ORGANISATION
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 Moinuddin	Victoria University
A/Prof Tina Bell	University of Sydney
Prof Jason Sharples	University of New South Wales
Prof Alan March	University of Melbourne
Harald Richter	Bureau of Meteorology
Celeste Young	Victoria University
Prof Bruce Rasmussen	Victoria University
Andrew Gissing	Risk Frontiers
Prof Lisa Gibbs	University of Melbourne
Dr Blythe McLennan	RMIT University
A/Prof Patrick Dunlop	Curtin University
Prof David Lawrence	University of Western Australia

GOVERNANCE

KEY STAFF

NAME	POSITION/ROLE	TIME
Dr Richard Thornton	Chief Executive Officer	1.0
Dr John Bates	Research Director	1.0
David Bruce	Communications Director	1.0
Trevor Essex	Company Secretary/ Business Manager	0.3
Leanne Beattie	Executive Assistant	1.0

NAME	POSITION/ROLE	TIME
Sarah Mizzi	Partnership Development Manager (on maternity leave)	0.3
Dr Paul Perry	Partnership Development Manager (maternity leave replacement)	0.7
Dr Desiree Beekharry	Core Research Program Manager	1.0

NAME	POSITION/ROLE	TIME
Loriana Bethune	Utilisation and DELWP Program Manager	0.8
Dr Matthew Hayne	Research Utilisation Manager	0.5
Nathan Maddock	Communications Manager	1.0
Amy Mulder	Communications Officer	0.5
Bethany Patch	Communications Officer	0.3
Vaia Smirneos	Communications Officer (Events)	0.6
David Boxshall	Research Services Team Leader	1.0
Kelsey Tarabini	Research Services Project Officer	1.0
Nicklaus Mahony	Research Services Project Officer	1.0
Kate Eagles	Financial Controller	0.3
Anna Nikitina	Finance Officer	0.3
Catrin Harris	Graphic Designer	0.4
Gabriel Zito	Communications Assistant - Intern to January 2020	0.5
Radhiya Fanham	Communications Assistant - Intern from January 2020	0.5



CRC staff 2020.

GOVERNANCE

PARTICIPANTS

PARTICIPANT NAME	PARTICIPANT TYPE	ABN	ORGANISATION TYPE
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
NSW National Parks and Wildlife Service	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
Metropolitan Fire and Emergency Services Board	Essential	28 598 558 561	State Government

PARTICIPANT NAME	PARTICIPANT TYPE	ABN	ORGANISATION TYPE
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
Victoria 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 and 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
RMIT University	Essential	49 781 030 034	University
University of Adelaide	Essential	61 249 878 937	University

GOVERNANCE

PARTICIPANT NAME	PARTICIPANT TYPE	ABN	ORGANISATION TYPE
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
Victoria University	Essential	83 776 954 731	University
Western Sydney University	Essential	53 014 069 881	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 Queensland	Other	74 851 544 037	Industry
University of Canberra	Other	81 633 873 422	University
Volunteering Queensland	Other	46 621 632 398	Industry
Flinders University	Other	65 542 596 200	University



Dr Kamaljit Sangha at AFAC19, August 2019.

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, on-going 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.



End-user Janine Taylor from the Queensland Fire and Emergency Services discussing research partnerships.

The number of end-user participants varies across the projects, with up to 40 in some.

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 recent collaboration between end-users and researchers include:

National Research Priorities

The National Research Priorities for natural hazards emergency management are 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. They were mostly conducted in collaboration with organisations that are major representative stakeholders, including AFAC and the Bureau of Meteorology, but external organisations are also involved.

The final workshop was with electricity networks, organized by the CRC through S&C Electric Company and Energy Networks Australia. Priorities for that sector were released in early 2019.

Research Advisory Forums were held three times in late 2019 before being disrupted by COVID-19 restrictions in early 2020. In a demonstration of collaboration with a broad range of partners, these forums continued the pattern of being held in partner university venues or fire and emergency service agency offices. These full 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 80-100 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.

Operational impact

The New South Wales Rural Fire Service, Queensland Fire and Emergency Services and the South Australia Country Fire Service all benefited from the expertise of individual researchers during the 2019-20 fire season, requesting the assistance of Dr Marta Yebra (Australian National University), Prof Jason Sharples (University of New South Wales) and Dr Mika Peace (Bureau of Meteorology) at their state operations centres. The researchers assisted operational personnel by providing expert advice and knowledge on landscape conditions, extreme fire behaviour and fire weather.

Fire outlook forums

These meeting for fire managers around Australia were convened through the AFAC Predictive

COLLABORATION

Services Group as a teleconference. They include participation from the Bureau of Meteorology, many universities and all fire and land management agencies across the regions. The quarterly 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 Office for Disaster Risk 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 John Handmer, is Chair of the IRDR Scientific Committee.

Each year on 13 October, the CRC leads a national collaborative effort to mark the International Day for Disaster Risk Reduction with a public forum. In October 2019, this event was held in Brisbane in partnership with Queensland CRC partners, including the Queensland Fire and Emergency Services and Queensland University of Technology as well as other key state-based stakeholders, the Queensland Reconstruction Authority and the Inspector-General Emergency Management. The event was also supported by the Department of Home Affairs and the Australian Institute for Disaster Resilience. The Hon Craig Crawford MP, Queensland Minister for Fire and Emergency Services, opened the proceedings.

Science advice

The CRC International Science Advisory Panel, which provides strategic advice and review of the CRC 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 North Carolina State University, and 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*.

National fire danger

The CRC has continued 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 expected to contribute to different aspects of an enhanced Fire Danger Rating System. The CRC, through its Research Director Dr John Bates is a formal member of the National Fire Danger Ratings Board, which formally reports to the Australia New Zealand Emergency Management Committee.

Staff connections

The CEO Dr Richard Thornton is a member of the National Flood Risk Advisory Group, a sub-group of the Council of Australian Government's Australian and New Zealand Emergency Management Committee. 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 Victoria University Industry Advisory Board for the Centre for Environmental Safety and Risk Engineering; a member of the CRC Association Board; on the science advisory panel for the New Zealand Resilience to Nature's Challenges National Science Challenge; 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 Dr John Bates is Editor-in-chief of the *Australian Journal of Emergency Management* and is on the Program Committee for the Disaster and Emergency Management Conference.

The Communications Director David Bruce is a Board member on the International Association of Wildland Fire and is Chair of the Wildfire Communications Committee. The Communications Manager Nathan Maddock is on the Program Committee of the Emergency Media and Public Affairs annual conference.

The Utilisation and DELWP Program Manager Lorian Bethune and Research Services Project Officer Kelsey Tarabini are both involved with Women and Firefighting Australasia. The Research Utilisation Manager is a Board member and Secretary, while the Research Services Project Officer is the Youth Ambassador in an ex officio role.



Queensland Fire and Emergency Services Deputy Commissioner Mark Roche at the 2019 Australian Seasonal Bushfire Outlook media launch.

FINANCIAL MANAGEMENT

The CRC is in a sound financial position and has met all its key financial goals during the year. It is well placed to meet the continuing needs of members and stakeholders for the remaining year of its program.

The CRC recorded Total Comprehensive Income of \$1.771 million for the financial year. Additional revenues from non-budgeted sources as well as less than budgeted expenditure on the research program has resulted in a significant surplus compared to budget. Several research program milestones have been delayed until 2020-21 due to the impact of COVID-19. All milestones are being monitored closely with plans in place to ensure project delivery.

On a comparative basis, total revenue turnover for the year increased by approximately 20 per cent from \$12.512 million to \$14.914 million, while research expenditure increased by 10 per cent from \$10.430 million to \$11.490 million. Other centre expenses have increased by approximately two per cent during the period from \$2.101 million to \$2.148 million.

The company audit was conducted by Deloitte in July 2020 and no adverse issues were identified. The auditors have provided an unqualified audit report.

The Audit, Risk and Compliance Committee met regularly during the year and actively managed the CRC's audit and compliance program.

On 23 July 2020, the Australian Government announced funding of \$88.1 million over 10 years to extend and scale-up critical research into bushfires and natural hazards.

The funding will support the transition of the current Bushfire and Natural Hazards CRC to a new research centre for natural hazard resilience and disaster risk reduction.

The CRC is currently working with the Commonwealth to identify issues relevant to the establishment of the new centre and its effect on the CRC.



Research posters are always popular at the annual conference.

FUTURE PLANS AND TRANSITION ARRANGEMENTS

The Bushfire and Natural Hazards CRC welcomed the 23 July 2020 announcement from the Australian Government to continue funding natural hazards research in Australia by investing \$88.1 million over the next 10 years.

This announcement will continue the coordinated national research effort of two CRCs over the last 18 years and will address the major challenges arising from the 2019-20 bushfire season. As part of the announcement the CRC has received \$2 million to immediately investigate key issues from the 2019-20 bushfire season.

The CRC is now working closely with the Australian Government to develop a new strategic research agenda for Australia along with its partners at CSIRO, AFAC, state-based emergency service agencies, universities and industry partners.

The current budgetary decisions taken by the Board assumes that the 2020-21 year is a wind-down year of the CRC as it transitions to the new centre in July 2021. However, the injection of the additional \$2 million, for research relating to the last fire season, will see a ramp up of a series of research projects during the 2020-21 financial year.

The current discussions with the Australian Government may see the transition of the CRC legal entity into new centre, which may mean that wind-up is not necessary.

A joint statement was released by the Minister for Industry, Science and Technology, Hon Karen Andrews MP, and the Minister for Emergency Management, the Hon David Littleproud MP:

The Australian Government has today announced it is providing \$88.1 million to extend and scale-up funding for critical research into bushfires and natural hazards.

The funding will support the transition of the current Bushfire and Natural Hazards Cooperative Research Centre (BNHCRC) to a new, world-class research centre for natural hazard resilience and disaster risk reduction.

This includes an additional \$2 million to boost funding for the current BNHCRC in the 2020-21 financial year to continue their important work following the Black Summer Bushfires. The Government will be continuing to work closely with the BNHCRC to support their transition to this new research centre following this period.

Minister for Emergency Management David Littleproud said the funding would build on the work of the BNHCRC, while strengthening ties with Australia's emergency management sector.

"The scale of the disaster season Australia experienced last summer was unprecedented, and the horrific Black Summer bushfire lingers in the national psyche," Minister Littleproud said.

"The new centre will deliver world-leading, evidence-based research to support the needs of our emergency services and communities across Australia to reduce climate and disaster risks, and prepare for, respond to and recover from future natural disasters.

"Although floods, cyclones and bushfires are a natural part of the Australian landscape, we must continue to improve our resilience and response efforts to ensure their impact on lives, communities and the environment is minimised.

"This is where sustained, long-term funding for natural hazards research plays a pivotal role and

why the Australian Government is committed to a new 10-year national research centre."

Minister for Industry, Science and Technology Karen Andrews said the new centre would take advantage of the strong research foundation already established in Australia around bushfires and natural hazards.

"Over the past 18 years the Bushfire and Natural Hazards CRC and its predecessor, the Bushfire CRC, have built a global reputation for delivering research outcomes that have helped better predict bushfire events, which in turn help protect frontline responders and save lives," Minister Andrews said.

"The Government is committed to backing applied natural hazards research which will deliver tangible outcomes as well as innovative knowledge and solutions."

The Department of Home Affairs, through Emergency Management Australia, and the Department of Industry, Science, Energy and Resources will work closely with key stakeholders, including CSIRO, the current BNHCRC and the Australasian Fire and Emergency Services Authorities Council, to help establish the new centre over the coming 12 months.

The centre will be co-funded by partners from across Australia, including state and territory governments and emergency service agencies, universities and industry partners, and represent a true collaborative effort on a national scale.



APPENDIX 1: PUBLICATIONS

JOURNAL ARTICLES 2019–20

1. Adams, M, Buckley, T & Turnbull, T (2020) Diminishing CO2-driven gains in water-use efficiency of global forests, *Nature Climate Change*, vol. 10, pp. 466-471.
2. Adams, M, Shadmanroodposhti, M & Neumann, M (2020) Causes and consequences of eastern Australia's 2019-20 season of mega-fires: a broader perspective, *Global Change Biology*, vol. 26, no. 7, pp. 3756-3758.
3. Ahmed, M, Haynes, K & Taylor, M (2020) Vehicle-related flood fatalities in Australia, 2001-2017, *Journal of Flood Risk Management*, vol. 13, no. 3.
4. Ahmed, M, Haynes, K, Tofa, M, Hope, G & Taylor, M (2020) Duty or Safety? Exploring Emergency Service Personnel's Perceptions of Risk and Decision-Making When Driving through Floodwater, *Progress in Disaster Science*, vol. 5.
5. Amirsardari, A, Lumantarna, E, Rajeev, P & Goldsworthy, HM (2020) Seismic Fragility Assessment of Non-ductile Reinforced Concrete Buildings in Australia, *Journal of Earthquake Engineering*, pp. 1-35.
6. Brooks, B, Curnin, S, Owen, C & Boldeman, J (2019) New human capabilities in emergency and crisis management: from non-technical skills to creativity, *Australian Journal of Emergency Management*, vol. 34, no. 4, pp. 23-30.
7. Cawson, J, Hemming, V, Ackland, A, Anderson, W, Bowman, D, Bradstock, R, Brown, T, Burton, J, Cary, G, Duff, T, Filkov, A, Furlaud, J, Gazzard, T, Kilinc, M, Nyman, P, Peacock, R, Ryan, M, Sharples, J, Sheridan, G, Tolhurst, K, Wells, T, Zylstra, P & Penman, T (2020) Exploring the key drivers of forest flammability in wet eucalypt forests using expert-derived conceptual models, *Landscape Ecology*, vol. 35, pp. 1775-1798.
8. Chuvieco, E, Aguado, I, Salas, J, Garcia, M, Yebra, M & Oliva, P (2020) Satellite Remote Sensing Contributions to Wildland Fire Science and Management, *Current Forestry Reports*, vol. 6, pp. 81-96.
9. Cubrinovskia, M, Bradley, B, Elwood, K, Johnston, D, Orchiston, C, Sullivan, T & Wotherspoon, L (2020) Wellington's Earthquake Resilience: Lessons from the 2016 Kaikōura Earthquake, *Earthquake Spectra*, vol. 36, no. 3.
10. Curnin, S & O'Hara, D (2019) Nonprofit and public sector interorganizational collaboration in disaster recovery: Lessons from the field, *Nonprofit Management and Leadership*, vol. 30, no. 2, pp. 277-297.
11. Curnin, S, Brooks, B & Owen, C (2020) A case study of disaster decision-making in the presence of anomalies and absence of recognition, *Journal of Contingencies and Crisis Management*, vol. 28, no. 2 pp. 1-12.
12. Derakhshan, H, Nakamura, Y, Griffith, M & Dhanasekar, M (2020) Simplified calculation of roof accelerations in existing low-rise symmetric unreinforced masonry buildings with flexible diaphragms, *Bulletin of Earthquake Engineering*, vol. 18, pp. 3383-3400.
13. Derakhshan, H, Nakamura, Y, Griffith, M & Inghan, J (2020) Suitability of height amplification factors for seismic assessment of existing unreinforced masonry components, *Journal of Earthquake Engineering*.
14. Derakhshan, H, Walsh, K, Ingham, J, Griffith, M & Thambiratnam, D (2019) Seismic fragility assessment of non-structural components in unreinforced clay brick masonry buildings, *Earthquake Engineering and Structural Dynamics*, vol. 49, no. 3, pp. 285-300.
15. Di Virgilio, G, Evans, J, Blake, S, Armstrong, M, Dowdy, A, Sharples, J & McRae, R (2019) Climate change increases the potential for extreme wildfires, *Geophysical Research Letters*, vol. 46, no. 14, pp. 8517-8526.
16. Di Virgilio, G, Evans, J, Clarke, H, Sharples, J, Hirsch, A & Hart, M (2020) Climate change significantly alters future wildfire mitigation opportunities in southeastern Australia, *Geophysical Research Letters*, vol. 47, no. 15.
17. Dwyer, G, Hardy, C & Maguire, S (2020) Post-Inquiry Sensemaking: The Case of the 'Black Saturday' Bushfires, *Organization Studies*.
18. Elliott, M, Lewis, T, Venn, T, Srivastava & Kumar, S (2019) Planned and unplanned fire regimes on public land in south-east Queensland, *International Journal of Wildland Fire*, vol. 29, no. 5, pp. 326-338.
19. Filkov, A & Penman, T (2020) Frequency of dynamic fire behaviours in Australian forest environments, *Fire*, vol. 3, no. 1, pp. 1-17.
20. Filkov, A, Ngo, T, Matthews, S, Telfer, S & Penman, T (2020) Impact of Australia's catastrophic 2019/20 bushfire season on communities and environment: retrospective analysis and current trends, *Journal of Safety Science and Resilience*, vol. 1, pp. 44-56.
21. Fisher, R, Heckbert, S, Maria, J & Sutton, S (2019) Augmenting physical 3D models with projected information to support environmental knowledge exchange, *Applied Geography*, vol. 112.
22. Fountain, L, Tofa, M, Haynes, K, Taylor, M & Ferguson, S (2019) Older adults in disaster and emergency management: what are the priority research areas in Australia?, *International Journal Of Disaster Risk Reduction*, vol. 39.
23. Gajanayake, A, Khan, T & Zhang, G (2020) Post-Disaster

APPENDIX 1: PUBLICATIONS

- Reconstruction of Road Infrastructure, *European Journal of Transport and Infrastructure Research*, vol. 20, no. 1, pp. 1-16.
24. Gajanayake, A, Zhang, G, Khan, T & Mohseni, H (2020) Postdisaster Impact Assessment of Road Infrastructure: State-of-the-Art Review, *Natural Hazards Review*, vol. 21, no. 1, pp. 1-14.
 25. García-Haro, F, Campos-Taberner, M, Moreno, Á, Tagesson, H, Camacho, F, Martínez, B, Sánchez, S, Piles, M, Camps-Valls, G, Yebra, M & Gilabert, M (2020) A global canopy water content product from AVHRR/Metop, *ISPRS Journal of Photogrammetry and Remote Sensing*, vol. 162, pp. 77-93.
 26. García, M, Riaño, D, Yebra, M, Salas, J, Cardil, A, Monedero, S, Ramirez, J, Martin, M, Vilar, L, Gajardo, J & Ustin, S (2020) A Live Fuel Moisture Content Product from Landsat TM Satellite Time Series for Implementation in Fire Behavior Models, *Remote Sensing*, vol. 12, no. 11.
 27. Gilbert, A, Sutherland, D, Frangieh, N, Moinuddin, K, Shamseddine, I, Meradji, S & Morvan, D (2020) Physics-Based Simulations of Flow and Fire Development Downstream of a Canopy, *Atmosphere*, vol. 11, no. 7, pp. 683.
 28. Gonzalez-Mathiesen, C, March, A & Stanley, J (2019) Challenges for wildfire-prone urban-rural interfaces: the case of Melbourne, *Revista Urbano*, vol. 22 no. 39, pp. 88-105.
 29. Gonzalez-Mathiesen, C, March, A, Leonard, J & Holland, M (2019) Urban Planning: historical changes integrating bushfire risk management in Victoria, *Australian Journal of Emergency Management*, vol. 31, no. 4, pp. 60-66.
 30. Gormley, A, Bell, T & Possell, M (2020) Non-additive effects of forest litter on flammability, *Fire*, vol. 3, no. 2.
 31. Greene, I, Lokuge, W & Karunasena, W (2020) Structural Design of Floodways Under Extreme Flood Loading, *International Journal of Disaster Resilience in the Built Environment*, vol. 11, no. 4.
 32. Grimaldi, S, Xu, J, Li, Y, Pauwels, V & Walker, J (2020) Flood mapping under vegetation using single SAR acquisitions, *Remote Sensing of Environment*, vol. 237.
 33. Hayes, P, Bearman, C, Thomason, M & Bremner, P (2020) Staying on task: a tool to help regional and state coordination centres, *Australian Journal of Emergency Management*, vol. 35, pp. 38-44.
 34. Haynes, K, Bird, D & Whittaker, J (2020) Working outside 'the rules': Opportunities and challenges of community participation in risk reduction, *International Journal of Disaster Risk Reduction*, vol. 44.
 35. Harris, S & Lucas, C (2019) Understanding the variability of Australian fire weather between 1973 and 2017 *PloS one*, vol. 14, no. 9.
 36. Hillman, S, Wallace, L, Reinke, K, Hally, B, Jones, S & Saldias, D (2019) A method for validating the structural completeness of understory vegetation models captured with 3D remote sensing, *Remote Sensing*, vol. 11, no. 18, pp. 2118.
 37. Hilton, J, Grimaldi, S, Cohen, R, Garg, N, Li, Y, Marvanek, S, Pauwels, V & Walker, J (2019) River Reconstruction Using a Conformal Mapping Method, *Environmental Modelling & Software*, vol. 119, pp. 197-213.
 38. Howlader, M, Masia, M & Griffith, M (2020) In-plane response of perforated unreinforced masonry walls under cyclic loading - experimental study, *ASCE, Journal of Structural Engineering*, vol. 146, no. 6.
 39. Howlader, M, Masia, M & Griffith, M (2020) In-plane shear testing of unreinforced masonry walls and comparison with FEA and NZSEE predictions, *International Journal of Masonry Research and Innovation*, vol. 5, no. 1, pp. 47-66.
 40. Howlader, M, Masia, M & Griffith, M (2020) Numerical Analysis and Parametric Study of Unreinforced Masonry Walls with Arch Openings under Lateral In-Plane Loading, *Engineering Structures*, vol. 208.
 41. Johnston, K, Taylor, M & Ryan, B (2020) Emergency management communication: The paradox of the positive in public communication for preparedness, *Public Relations Review*, vol. 46, no. 2.
 42. Kruse, J, Turnbull, T, Rennenberg, H & Adams, M (2020) Plasticity of leaf respiratory and photosynthetic traits in *Eucalyptus grandis* and *E. regnans* grown under variable light and nitrogen availability, *Frontiers in Forests and Global Change*, vol. 3, no. 5.
 43. Lewis, S, Blake, S, Trewin, B, Black, M, Dowdy, A, Perkins-Kirkpatrick, S, King, A & Sharples, J (2020) Deconstructing factors contributing to the 2018 fire weather in Queensland, Australia, *Bulletin of the American Meteorological Society*, vol. 101, no. 1, pp. 115-122.
 44. Liu, L, Lim, S, Shen, X & Yebra, M (2019) A hybrid method for segmenting individual trees from airborne lidar data, *Computers and Electronics in Agriculture*, vol. 163.
 45. Liu, L, Lim, S, Shen, X & Yebra, M (2019) A multiscale morphological algorithm for improvements to canopy height models, *Computers & Geosciences*, vol. 130, pp. 20-31.
 46. Lokuge, W, Greene, I, Etemadi, E & Karunasena, W (2019) Role of structural analysis in floodway design process, *Australian Journal of Civil Engineering*, vol. 17, no. 2, pp. 110-119.

APPENDIX 1: PUBLICATIONS

47. March, A, Riddell, G, Nogueira de Moraes, L, van Delden, H, Stanley, J, Dovers, S, Beilin, R & Maier, H (2020) Urban Planning Capabilities for Bushfire: Treatment Categories and Scenario Testing, *Australian Journal of Emergency Management*, vol. 35, no. 3.
48. McLennan, B (2020) Conditions for effective coproduction in community-led disaster risk management, *Voluntas: International Journal of Voluntary and Nonprofit Organizations*, vol. 31, pp. 316–332.
49. McLennan, B, Whittaker, J, Kruger, T & Handmer, J (2020) Navigating authority and legitimacy when 'outsider'volunteers co-produce emergency management services, *Environmental Hazards*, pp. 1-16.
50. Molyneaux, R, Gibbs, L, Bryant, R, Humphreys, C, Hegarty, K, Kellett, C, Gallagher, H, Block, K, Harms, L, Richardson, J, Alkemade, N & Forbes, D (2020) Interpersonal violence and mental health outcomes following disaster, *BJPsych Open*, vol. 6, no. 1.
51. Moreira, F, Ascoli, D, Safford, H, Adams, M, Moreno, J, Pereira, J, Catry, F, Armesto, J, Bond, W, González, M, Curt, T, Koutsias, N, McCaw, L, Price, O, Pausas, J, Rigolot, E, Stephens, S, Tavsanoglu, C, Vallejo, V, van Wilgen, B, Xanthopoulos, G & Fernandes P (2020) Wildfire management in Mediterranean-type regions: paradigm change needed, *Environmental Research Letters*, vol. 15, no. 1.
52. Ndalila, M, Williamson, G, Fox-Hughes, P, Sharples, J & Bowman, D (2020) Evolution of a pyrocumulonimbus event associated with an extreme wildfire in Tasmania, Australia, *Natural Hazards and Earth System Sciences*, vol. 20, no. 5, pp.1497-1511.
53. Neumann, M, Eastaugh, C & Adams, M (2020) Managing mixed Callitris-Eucalyptus forests for carbon and energy in central-eastern Australia, *Biomass and Bioenergy*, vol. 140.
54. Parackal, K, Ginger, J & Henderson, D (2020) Progressive failures of batten to rafter connections under fluctuating wind loads, *Engineering Structures*, vol. 215.
55. Pathiranage, T & Lokuge, W (2020) Vulnerability assessment of bridges subjected to extreme cyclonic events, *Natural Hazards*, vol. 102, pp. 401-417.
56. Penman, T, Cirulis, B & Marcot, B (2020) Bayesian decision network modeling for environmental risk management: A wildfire case study, *Journal of Environmental Management*, vol. 270.
57. Penman, T, Clarke, H, Cirulis, B, Boer, M, Price, O & Bradstock, R (2020) Cost-effective prescribed burning solutions vary between landscapes in eastern Australia, *Frontiers in Forests and Global Change*, vol. 3.
58. Penney, G, Habibi, D & Cattani, M (2020) RUIIM-A fire safety engineering model for rural urban interface firefighter taskforce deployment, *Fire safety journal*, vol 113.
59. Petal, M, Ronan, K, Ovington, G & Tofa, M (2020) Child-centred risk reduction and school safety: An evidence-based practice framework and roadmap, *International Journal of Disaster Risk Reduction*, vol. 49, pp. 1-12.
60. Pooley, K (2020) The effect of firefighter-delivered fire safety education on young people who misuse fire, *Fire safety journal*, vol. 115.
61. Quill, R, Sharples, J & Sidhu, L (2020) A Statistical Approach to Understanding Canopy Winds over Complex Terrain, *Environmental Modelling & Assessment*, vol. 25, no. 2, pp. 231-250.
62. Raja, B, Miramini, S, Duffield, C, Sofi, M, Mendis, P & Zhang, L (2020) The influence of ambient environmental conditions in detecting bridge concrete deck delamination using infrared thermography (IRT), *Structural Control and Health Monitoring*, vol. 27, no. 4.
63. Raza, S, Menegon, S, Tsang, H & Wilson, J (2020) Axial Load Variation of Columns in Symmetrical RC Buildings Subject to Bidirectional Lateral Actions in Regions of Low to Moderate Seismicity, *Journal of Earthquake Engineering*, pp. 1-29.
64. Raza, S, Menegon, S, Tsang, H-H & Wilson, J (2020) Force-displacement behaviour of limited ductile high-strength RC columns under bidirectional earthquake actions, *Engineering Structures*, vol. 208.
65. Riddell, G, van Delden, H, Maier, H & Zecchin, A (2019) Exploratory scenario analysis for disaster risk reduction: Considering alternative pathways in disaster risk assessment, *International Journal of Disaster Risk Reduction*, vol. 39.
66. Riddell, G, van Delden, H, Maier, H & Zecchin, A (2020) Tomorrow's disasters – embedding foresight principles into disaster risk assessment and treatment, *International Journal of Disaster Risk Reduction*, vol. 45.
67. Ripley, S, Kaiser, L, Campbell, E, Shadwell, J, Johnston, D & Neely, D (2020) Engaging stakeholders in pre-event recovery planning: utilising a recovery capitals framework, *Australian Journal of Emergency Management*.
68. Rogers, A, Dempster, F, Hawkins, J, Johnston, R, Boxall, P, Rolfe, J, Kragt, M, Burton, M & Pannell, D (2019). Valuing non-market economic impacts from natural hazards: A review, *Natural Hazards*, vol. 99, pp. 1131-1161.

APPENDIX 1: PUBLICATIONS

69. Ruane, S (2020) Applying the principles of adaptive governance to bushfire management: a case study from the South West of Australia, *Journal of Environmental Planning and Management*, vol. 63, no. 7, pp. 1215-1240.
70. Rushton, A, Gray, L, Canty, J & Blanchard, K (2019) Beyond binary:(re) defining “gender” for 21st century disaster risk reduction research, policy, and practice, *International journal of environmental research and public health*, vol. 16, no. 20, pp. 3984.
71. Russell-Smith, J, McCaw, L & Leavesley, A (2020) Adaptive prescribed burning in Australia for the early 21st Century—context, status, challenges *International Journal Of Wildland Fire*, vol. 29, no. 5, pp. 305-313.
72. Sharples, J & Hilton, J (2020) Modelling Vorticity-Driven Wildfire Behaviour Using Near-Field Techniques, *Frontiers in Mechanical Engineering*, vol. 5, pp. 69.
73. Simpson, H, Bradstock, R & Price, O (2019) A temporal framework of large wildfire suppression in practice, a qualitative descriptive study, *Forests*, vol. 10, no. 10, pp. 884.
74. Storey, M, Price, O, Bradstock, R & Sharples, J (2020) Analysis of Variation in Distance, Number, and Distribution of Spotting in Southeast Australian Wildfires, *Fire*, vol. 3, no. 2, pp. 10.
75. Storey, M, Price, O, Sharples, J & Bradstock, R (2020) Drivers of long-distance spotting during wildfires in south-eastern Australia, *International Journal of Wildland Fire*, vol. 29, pp. 459-472.
76. Strahan, K, Keating, A & Handmer, J (2020) Models and frameworks for assessing the value of disaster research, *Progress in Disaster Science*, vol. 6.
77. Sullivan, A, Swedosh, W, Hurley, R, Sharples, J & Hilton, J (2019) Investigation of the effects of interactions of intersecting oblique fire lines with and without wind in a combustion wind tunnel, *International Journal of Wildland Fire*, vol. 28, no. 9, pp. 704-719.
78. Sutherland, D, Sharples, J & Moinuddin, K (2020) The effect of ignition protocol on grassfire development, *International Journal of Wildland Fire*, vol. 29, no. 1, pp. 70-80.
79. Tang, Y, Lam, N, Tsang, H-H & Lumantarna, E (2019) Use of Macroseismic Intensity Data to Validate a Regionally Adjustable Ground Motion Prediction Model, *Geosciences*, vol. 9, no. 10, pp. 422.
80. Taylor, M, Tofa, M, Haynes, K, McLaren, J, Readman, P, Ferguson, D, Rundle, S & Rose, D (2019) Behaviour around Floodwater: challenges for floodwater safety and risk communication, *Australian Journal of Emergency Management*, vol. 34, no. 4, pp. 40-47.
81. Taylor, M, Ryan, B & Johnston, K (2020) The missing link in emergency management: evaluating community engagement, *Australian Journal of Emergency Management*, vol. 35, no. 1, pp. 45-52.
82. Thomas, C, Sharples, J & Evans, J (2020) The terminal-velocity assumption in simulations of long-range ember transport, *Mathematics and Computers in Simulation*, vol. 175, pp. 96-107.
83. Tory, K & Kepert, J (2020, *in revision*) Pyrocumulonimbus Firepower Threshold: A pyroCb prediction method, *Weather and Forecasting*.
84. Towers, B (2020) Children, bushfire and climate change, *Advocate: Journal of the National Tertiary Education Union*, vol. 27, no. 1, pp. 26.
85. Tsang, H, Daniell, J, Wenzel, F & Wilson, J (2020) A universal approach for evaluating earthquake safety level based on societal fatality risk, *Bulletin of earthquake engineering*, vol. 18, no. 1, pp. 273-296.
86. Vaculik, J, Visintin, P, Lucas, W & Griffith, M (2020) Durability of near-surface-mounted FRP-to-clay brick masonry retrofits under environmental exposure, *ASCE, Journal of Composites for Construction*, vol. 24, no. 1.
87. Vahanvati, M (2020) Unpacking the meaning of resilience: The Tarnagulla community definition comparing to the literature, *Australian Journal of Emergency Management*, vol. 35, no. 1, pp. 29-37.
88. Van Dijk, A, Renzullo, L, Yebra, M & Rapley, S (2020) A major scorecard gives the health of Australia's environment less than 1 out of 10, *Chain Reaction*, vol. 42.
89. Wang, H, van Eyk, P, Medwell, P, Birzer, C, Tian, Z, Possell, M & Huang, X (2019) Air permeability of the litter layer in broadleaf forests, *Frontiers in Mechanical Engineering*, vol. 5.
90. Wang, L, Quan, X, He, B, Yebra, M, Xing, M & Liu, X (2019) Assessment of the dual polarimetric sentinel-1A data for forest fuel moisture content estimation, *Remote Sensing*, vol. 11, no. 13.
91. Ward, P, Blauhut, V, Bloemendaal, N, Daniell, J, de Ruiter, M, Duncan, M, Emberson, R, Jenkins, S, Kirschbaum, D, Kunz, M, Mohr, S, Muis, S, Riddell, G, Schäfer, A, Stanley, T, Veldkamp, T & Winsemius, H (2020) Natural hazard risk assessments at the global scale, *Natural Hazard Earth System Science*, vol. 20, pp. 1069-1096.
92. Waring, B, Neumann, M, Prentice, I, Adams, M, Smith, P, Siegert, M (2020) Forests and decarbonization – roles of natural and planted forests, *Frontiers in Forests and Global Change*, vol. 3.
93. Watson, K, Singleton, J, Tippet, V & Nissen, L (2019) Do disasters

APPENDIX 1: PUBLICATIONS

- predict international pharmacy legislation?, *Australian Health Review*, vol. 44, no. 3, pp. 392-398.
94. Watson, K, Singleton, J, Tippet, V & Nissen, L (2019) Defining pharmacists' roles in disasters: A Delphi study, *PLoS one*, vol. 14, no. 12.
 95. Yebra, M, Scortechini, G, Badi, A, Beget, M, Boer, M, Bradstock, R, Chuvieco, E, Danson, F, Dennison, P, Resco de Dios, V, Di Bella, C, Forsyth, G, Frost, P, Garcia, M, Hamdi, A, He, B, Jolly, M, Kraaij, T, Martín, M, Mouillot, F, Newnham, G, Nolan, R, Pellizzaro, G, Qi, Y, Quan, X, Riaño, D, Roberts, D, Sow, M & Ustin, S (2019) Globe-LFMC, a global plant water status database for vegetation ecophysiology and wildfire applications, *Scientific data*, vol. 6.
 96. Zabihi, A, Tsang, H-H, Gad, E & Wilson, J (2019) Design procedure for seismic retrofit of RC beam-column joint using single diagonal haunch, *Structural Engineering and Mechanics*.
- RESEARCH FORUM
CONFERENCE PROCEEDINGS
(AJEM MONOGRAPH NO. 4)**
1. Chappel, H (2019) WHS 2.0 World Health and Safety: Integrating disaster risk reduction and sustainable development into every workplace using the Sendai Framework, Paris Agreement and the Sustainable Development Goals, *Australian Journal of Emergency Management*, Monograph no. 4, pp 84-92.
 2. Chen, T, Yuen, A, Chan, Q & Yeoh, G (2019) Safety awareness of firefighters and their perception of fire risk in cladding fires, *Australian Journal of Emergency Management*, Monograph no. 4, pp. 93-102.
 3. Clarke, H, Cirulis, B, Bradstock, R, Boer, M, Penman, T & Price, O (2019) A new decision support tool for prescribed burning risk assessment, *Australian Journal of Emergency Management*, Monograph no. 4, pp. 5-8.
 4. Fox-Hughes, P, Matthews, S, Collins, C, Grootemaat, S, Hollis, J, Holmes, A, Kenny, B, Runcie, J & Sauvage, S (2019) Fire weather and prototype fire danger ratings associated with the Gell River fire, Tasmania, *Australian Journal of Emergency Management*, Monograph no. 4, pp. 19-25.
 5. Hayes, P, Karanasios, S, Cooper, V & Porblet-Balcell, M (2019) Joining the dots: using social media to connect with more vulnerable Victorians during emergencies, *Australian Journal of Emergency Management*, Monograph no. 4, pp. 154-163.
 6. Maqsood, T, Dale, K, Edwards, M & Nadimpalli, K (2019) Flood vulnerability functions: detailed vs generalised approach, *Australian Journal of Emergency Management*, Monograph no. 4, pp. 45-51.
 7. McLennan, B (2019) What's wrong and what needs fixing? Stakeholder perspectives on making the future of emergency volunteering, *Australian Journal of Emergency Management*, Monograph no. 4, pp. 103-110.
 8. McRae, R (2019) Experiences with the global impacts of climate change, *Australian Journal of Emergency Management*, Monograph no. 4, pp.77-83.
 9. Moinuddin, K & Sutherland D, (2019) Simulations of radiation heat flux on a structure from a fire in an idealised shrubland, *Australian Journal of Emergency Management*, Monograph no. 4, pp. 26-31.
 10. Parackal, K, Wehner, M, Ryu, H, Ginger, J, Smith, D, Henderson, D & Edwards, M (2019) Modelling the vulnerability of a high-set house roof structure to windstorms using VAWS, *Australian Journal of Emergency Management*, Monograph no. 4, pp. 52-63.
 11. Peace, M, Keppert, J & Ye, H (2019) ACCESS-Fire: coupled fire-atmosphere modelling, *Australian Journal of Emergency Management*, Monograph no. 4, pp. 32-36.
 12. Richter, H, Arthur, C, Wehner, M, Wilke, D, Dunford, M & Ebert, B (2019) The physical impact of strong winds and heavy rain on residential housing: a pilot study, *Australian Journal of Emergency Management*, Monograph no. 4, pp. 64-76.
 13. Sturgess, A & Peace, M (2019) Science in operations: QFES response to 2018 Queensland fires, *Australian Journal of Emergency Management*, Monograph no. 4, pp. 15-18.
 14. Sutton, S, Paton, D, Buerget, P, Meilanda, E & Sagala, S (2019) Are we future ready? It depends on who you ask, *Australian Journal of Emergency Management*, Monograph no. 4, pp. 121-128.
 15. Thacker, G, Luke, R & Cort, E (2019) Fit for Duty pilot: ensuring the safety of CFA members and increasing access to health services, *Australian Journal of Emergency Management*, Monograph no. 4, pp. 141-145.
 16. Ulubasoglu, M & Beaini, F (2019) Disasters and economic resilience in small regional communities: the case of Toodyay, *Australian Journal of Emergency Management*, Monograph no. 4, pp. 129-140.
 17. Van Dijk, A, Yebra, M, Cary, G & Shah, S (2019) Towards a comprehensive characterisation of flammability and fire danger, *Australian Journal of Emergency Management*, Monograph no. 4, pp. 9-14.
 18. van Leeuwen, J & Gissing, A (2019) Business involvement in natural disasters in Australia and New Zealand, *Australian Journal of Emergency Management*, Monograph no. 4, pp. 111-120.

APPENDIX 1: PUBLICATIONS

19. Windisch, M (2019) Denaturalising heatwaves: gendered vulnerability in urban heatwaves, a review, *Australian Journal of Emergency Management*, Monograph no. 4, pp. 146-153.
 20. Wright, A, Grimaldi, S, Li, Y, Walker, J & Pauwels, V (2019) Improving flood forecast skill using remote sensing, *Australian Journal of Emergency Management*, Monograph no. 4, pp. 37-44.
 21. Young, J, Couper, K & Beccari, B (2019) It's raining news: exploring the impact of mass-SMS on preparedness for a severe weather event, *Australian Journal of Emergency Management*, Monograph no. 4, pp. 164-170.
- RESEARCH FORUM EXTENDED ABSTRACTS (AJEM MONOGRAPH NO. 5)**
1. Banks, N & Austin, D (2019) Climate Ready Communities: empowering communities to spread climate preparedness messaging and take local action, *Australian Journal of Emergency Management*, Monograph no. 5, pp. 61-65.
 2. Cuthbertson, J (2019) Climate change as an emerging disaster risk in Australian and Oceania, *Australian Journal of Emergency Management*, Monograph no. 5, pp. 96-98.
 3. Dranger, K & Robertson, T (2019) Research activities within European Union research program for improving preparedness and resilience, *Australian Journal of Emergency Management*, Monograph no. 5, pp. 53-60.
 4. Engel, C, Matthews, S, Jones, S & Reinke, K (2019) Detecting active fires from space using Himawari-8: a report from the regional New South Wales trail, *Australian Journal of Emergency Management*, Monograph no. 5, pp. 4-6.
 5. Gagne, M, Luksyte, A, Dunlop, P, Holtrop, D, Kragt, D & Farid, H (2019) Emergency volunteer retention: can a culture of inclusiveness help?, *Australian Journal of Emergency Management*, Monograph no. 5, pp. 45-52.
 6. Nyman, P, Yeats, P, Langhans, C, Noske, P, Haydon, S & Sheridan, G (2019) Probability and consequence of post-fire contamination events in a water supply, *Australian Journal of Emergency Management*, Monograph no. 5, pp. 11-14.
 7. Parker, J & Allen, A (2019) Utilisation of fire spread simulators to assess power networks fire risk, *Australian Journal of Emergency Management*, Monograph no. 5, pp. 28-35.
 8. Pikusa, E (2019) The mitigation exercise: a long-term mitigation planning process, with a coastal flooding case study Adelaide, *Australian Journal of Emergency Management*, Monograph no. 5, pp. 76-79.
 9. Reinke, K, Wallace, L, Hillman, S, Hally, B & Jones, S (2019) Fuels3D: barking up the wrong tree and beyond, *Australian Journal of Emergency Management*, Monograph no. 5, pp. 7-10.
 10. Riddell, G, van Delden, H, Maier, H, Zecchin, A, Vanhout, R, Daniell, J, Araya, S, Dandy, G & Newman, J (2019) Future risk framework: understanding tomorrow's risk and what we can do to reduce it, *Australian Journal of Emergency Management*, Monograph no. 5, pp. 80-88.
 11. Riley, J (2019) Intelligent warnings: a twenty-first century approach to encouraging protective action in emergencies, *Australian Journal of Emergency Management*, Monograph no. 5, pp. 66-70.
 12. Tory, K (2019) Pyrocumulonimbus firepower threshold: A pyrocumulonimbus prediction tool, *Australian Journal of Emergency Management*, Monograph no. 5, pp. 21-27.
 13. Towers, B (2019) School-based bushfire education: advancing teaching and learning for risk reduction and resilience, *Australian Journal of Emergency Management*, Monograph no. 5, pp. 71-75.
 14. Vinodkumar, Dharssi, I & Fox-Hughes, P (2019) JASMIN: a high-resolution soil moisture analysis system for fire prediction, *Australian Journal of Emergency Management*, Monograph no. 5, pp. 15-20.
 15. Young, C, Jones, R, Maharaj, N & Rasmussen, B (2019) Transforming through diversity and inclusion capability: the pathway to achieving diversity benefits, *Australian Journal of Emergency Management*, Monograph no. 5, pp. 35-44.
 16. Zovko-Rajak, D, Tory, K & Kepert, J (2019) A case study of South Australia's severe thunderstorm and tornado outbreak (28 September 2016), *Australian Journal of Emergency Management*, Monograph no. 5, pp. 89-95.
- CONFERENCE PROCEEDINGS/ PAPERS 2019-20**
1. Alazem, R, Lumantarna, E, Lam, N & Menegon, S (2019) Development of Cost-effective Mitigation Strategy for Limited Ductile Reinforced Concrete Buildings, Proceedings, Australian Earthquake Engineering Society Conference, Newcastle.
 2. Allen, J, Allen, E & Richter, H (2020) Australian Tornadoes: Unpredictable or an evident hazard?, Proceedings, Australian Meteorological and Oceanographic Society Conference, Fremantle.
 3. Bradley, L, Mehta, A & Miller, S (2019) Towards trust and protective actions: the role of risk communication and context during natural hazards, Proceedings, Australian and

APPENDIX 1: PUBLICATIONS

- New Zealand Academy of Management conference, Cairns, 3-6 December 2019.
4. Bradstock, R, Boer, M, Clarke, H, Cirulis, B, Penman, T & Price, O (2019) How much does it cost to save a life or a house: the comparative cost-effectiveness of using alternative prescribed burning strategies for risk mitigation, Proceedings, 8th International Fire Ecology and Management Congress, Arizona.
5. Burton, C, Vaculik, J, Visintin, P, Griffith, M & Sheikh, A (2019) Pull out capacity of chemical and mechanical anchors in clay masonry under quasi-static, cyclic and impact loading, Paper no. 63, Proceedings, Australian Earthquake Engineering Society Conference, Newcastle.
6. Clarke H, Cirulis B, Bradstock R, Boer M, Penman T & Price, O (2019) From hectares to tailor-made solutions for risk mitigation: An integrated prescribed burning research project, Proceedings, Bushfire and Natural Hazards CRC & AFAC conference, Melbourne, 27-30 August 2019.
7. Edwards, M, Wehner, M, Ryu, H, Griffith, M & Vaculik, J (2019) Modelling the vulnerability of old URM buildings and the benefit of retrofit, Paper no. 2, Proceedings, Australian Earthquake Engineering Society Conference, Newcastle.
8. Filkov, A, Cirulis, B & Penman, T (2020) Quantifying merging fire behaviour phenomena using Unmanned Aerial Vehicle technology, Proceedings, 23rd International Congress on Modelling and Simulation, Canberra, December 2019.
9. Florec, V & Rogers, A (2019) Tools that help decision making in natural hazard mitigation, Proceedings, Bushfire and Natural Hazards CRC & AFAC conference, Melbourne, 27-30 August 2019.
10. Gissing, A, Eburn, M & McAneney, J (2019) Planning and Capability Requirements for Catastrophic and Cascading Events, Proceedings, Palgrave Series ARPU.
11. Harald, R (2020) Operational calibrated thunder probabilities: Are we getting better?, Proceedings, Australian Meteorological and Oceanographic Society Conference, Fremantle.
12. Henderson, D, Buckley, B, Dyer, A, Stone, G & Leplastrier, M (2020) Wind and Rain – systemic failures resulting in loss of functionality of residences and commercial properties during severe weather, Proceedings, Australian Meteorological and Oceanographic Society, Perth.
13. Henderson, D, Smith, D, Boughton, G & Ginger, J (2019) Damage and Loss from Wind-driven Rain Ingress to Australian Buildings, Proceedings, 15th International Conference on Wind Engineering, Beijing.
14. Hilton, J, Garg, N & Sharples, J (2019) Incorporating firebrands and spot fires into vorticity-driven wildfire behaviour models, Proceedings, 23rd International Congress on Modelling and Simulation, Canberra.
15. Hilton, J, Sharples, J, Garg, N, Rudman, M, Swedosh, W & Commins, D (2019) Wind-terrain effects on firebrand dynamics, Proceedings, 23rd International Congress on modelling and Simulation, Canberra.
16. Hoult, R, Appelle, A, Almeida, P & Beyer, K (2019) Experimental Tests of Thin RC U-shaped Walls with a Single Layer of Reinforcement, Proceedings, Australian Earthquake Engineering Society Conference, Newcastle.
17. Hu, Y, Lam, N & Menegon, S (2019) Ground Motion Accelerograms for Nonlinear Time History Analysis in Low-to-Moderate Seismicity Regions, Proceedings, Australian Earthquake Engineering Society Conference, Newcastle.
18. Humphreys, M, Ginger, J & Henderson, D (2019) Effect of Opening Area on Full-scale Internal Pressure Measurements, Proceedings, 15th International Conference on Wind Engineering, Beijing.
19. Kepert, J (2020) Boundary layer dynamics of tropical cyclone rainbands, Proceedings, Conference of the Australian Meteorological and Oceanographic Society, Perth, 10-13 February 2020.
20. Kepert, J, Schroeter, S, Tory, K & Thurston, W (2019) A fast, physically based scheme for predicting long-range spotting potential, Proceedings, Bushfire and Natural Hazards CRC & AFAC conference, Melbourne, 27-30 August 2019.
21. Kepert, J, Schroeter, S, Tory, K & Thurston, W (2019) A fast, physically based scheme for predicting long-range ember transport in bushfire plumes, Proceedings, 2020 Conference of the Australian Meteorological and Oceanographic Society, Perth, WA, February 10-13.
22. Long, S, Martin, F & Owen, C (2019) The shadow side of learning, leadership and culture in emergency services organisations, Proceedings, Bushfire and Natural Hazards CRC & AFAC conference, Melbourne, 27-30 August 2019.
23. Lumentarna, E, Lam, N & Wilson, J (2019) Predicting Maximum Displacement Demand of Asymmetric Reinforced Concrete Buildings, Proceedings, Australian Earthquake Engineering Society Conference, Newcastle.
24. Maqsood, T, Wehner, M, Dale, K & Edwards, M (2019) Reduction of flood vulnerability through the implementation of mitigation strategies, Proceedings, 2nd International Conference on Natural Hazards and Infrastructure, Greece.

APPENDIX 1: PUBLICATIONS

25. Maqsood, T, Wehner, M, Dale, K, Edwards, M, Mohanty, I, Corby, N, Gibson, F & Rogers, A (2019) Assessing tangible and intangible flood impacts in Newstead, Launceston, Proceedings, Floodplain Management Association National Conference, Canberra.
26. McLennan, B & Kruger, T (2019) Where should we be going, and are we on our way yet? Stakeholder perspectives on making the future of emergency volunteering, Proceedings, Bushfire and Natural Hazards CRC & AFAC conference, Melbourne, 27-30 August 2019.
27. Menegon, S, Wilson, J, Lam, N & Gad, E (2019) Review of confinement requirements for the seismic design of rectangular RC walls in Australia, Proceedings, Australian Earthquake Engineering Society Conference, Newcastle.
28. Nguyen, K, Filkov, A, Mendis, P, Estacio, A, Zhang, K & Penman, T (2019) Vertical heat transfer of aluminium composite claddings, Proceedings, 22nd International Conference on Composite Materials, Melbourne.
29. Nie, Y, Sheikh, A, Griffith, M, Visintin, P & Vaculik, J (2019) The application of mixed-mode de-cohesion criteria in masonry finite element analysis, Paper no. 60, Proceedings, Australian Earthquake Engineering Society Conference, Newcastle.
30. Parackal, K, Ginger, J & Henderson, D (2019) Progressive Failures of Light Framed Timber Roof, Proceedings, 15th International Conference on Wind Engineering, Beijing.
31. Prohanov, S, Kasymov, D, Zakharov, O, Agafontsev, M, Perminov, V, Martynov, P, Reyno, V & Filkov, A (2019) Improvement of Firebrand Tracking and Detection Software, Proceedings, AP Ershov Informatics Conference, Novosibirsk.
32. Raza, S, Tsang, H-H, Menegon, S & Wilson, J (2019) Influence of loading history on the drift capacity of limited ductile reinforced concrete columns, Proceedings, Australian Earthquake Engineering Society Conference, Newcastle.
33. Raza, S, Tsang, H-H, Menegon, S & Wilson, J (2020) Experimental testing of limited ductile RC columns under varying triaxial loading protocols, Proceedings, 8th International Conference on Advances in Experimental Structural Engineering, Christchurch.
34. Richter, H, Arthur, C, Wilke, D, Martin, S, Wehner, M, Ebert, E & Dunford, M (2020) Validation of a prototype wind hazard impact model –the april 2015 dungog case, Proceedings, Australian Meteorological and Oceanographic Society Conference, Fremantle.
35. Ryu, H, Edwards, M, Wehner, M, Gray, S, Griffith, M, Vaculik, J, Corby, N & Allen, T (2019) Earthquake Management Logistics for York, WA, Pre and Post Mitigation, Proceedings, Australian Earthquake Engineering Society Conference, Newcastle.
36. Sithole, B (2019) Hazard smart remote communities in Northern Australia – Community led preparedness, Proceedings, APRU Conference, October 2019.
37. Smith, D & Morrison, M (2019), Full-scale Wind Tunnel Testing of North American and Australian Roofing Tile System, Proceedings, 15th International Conference on Wind Engineering, Beijing.
38. Tory, K, Kepert, J, Wilke, D & Porter, Z (2019) The PyroCb Firepower Threshold: A pyrocumulonimbus prediction tool, Proceedings, Bureau of Meteorology Research and Development Workshop, Melbourne, 25-28 November 2019.
39. Tsang, H-H, Daniell, J, Wenzel, F & Wilson, J (2019) How Safe is Safe Enough? Melbourne Case Study, Proceedings, Australian Earthquake Engineering Society Conference, Newcastle.
40. Vaculik, J & Griffith, M (2019) Out-of-plane fragility of URM parts and components based on time-history analysis – comparison to simplified force-based approaches, Paper no. 62, Proceedings, Australian Earthquake Engineering Society Conference, Newcastle.
41. Xing, B, Lumantarna, E, Lam, N & Menegon, S (2019) Prioritisation strategy for seismic retrofitting of reinforced concrete buildings in Australia, Proceedings, Australian Earthquake Engineering Society Conference, Newcastle.

TECHNICAL REPORTS 2019-20

1. Bates, J (2020) Cascading extreme weather beyond our experience: Are we ready? A report on the 12th Australasian Natural Hazards Management Conference, *Bushfire and Natural Hazards CRC*.
2. Bates, J (2020) East Coast Low extreme weather scenario: 12th Australasian Natural Hazards Management Conference, *Bushfire and Natural Hazards CRC*.
3. Beaini, F & Ulubasoglu, M (2019) Demographic profiling: Queensland floods 2010-11 case study brisbane river catchment area: Technical Report, *Bushfire and Natural Hazards CRC*.
4. Beaini, F & Ulubasoglu, M (2019) Demographic profiling: Western Australia Toodyay bushfires 2009 case study: Technical Report, *Bushfire and Natural Hazards CRC*.
5. Bell, T (2020) Optimisation of fuel reduction burning regimes for fuel reduction, carbon, water and vegetation outcomes: Annual Report 2019-20, *Bushfire and Natural Hazards CRC*.
6. Bell, T, Parnell, D & Possell, M (2019) Sampling and data analysis of 40

APPENDIX 1: PUBLICATIONS

- prescribed burns: Technical Report, *Bushfire and Natural Hazards CRC*.
7. Burrows, N (2019) Lessons and insights from significant bushfires in Australia and Overseas, *Office of the Inspector-General Emergency Management Queensland*.
8. Brooks, B & Curnin, S (2019) Evaluation of pre-intervention data: divergent thinking and brain plasticity: Technical Report, *Bushfire and Natural Hazards CRC*.
9. Clarke, H, Cirulis, B, Penman, T, Price, O, Boer, M & Bradstock, R (2020) From hectares to tailor-made solutions for risk mitigation: Final Project Report, *Bushfire and Natural Hazards CRC*.
10. Coates, L, Kaandorp, G, Harris, J, van Leeuwen, J, Avci, A, Evans, J, George, S, Gissing, A, van den Honert, R & Haynes, K (2019) Preventable residential fire fatalities in Australia: July 2003 to June 2017: Technical Report, *Bushfire and Natural Hazards CRC*.
11. Dale, K, Maqsood, T & Wehner, M (2020) Cost-effective mitigation strategy development for flood prone buildings: Annual Report 2019-20, *Bushfire and Natural Hazards CRC*.
12. Dale, K, Maqsood, T, Wehner, M & Nadimpalli, K (2019) Benefit versus cost analysis and optimal cost-effective mitigation strategies – flood: Technical Report, *Bushfire and Natural Hazard CRC*.
13. Eburn, M, Moore, C & Gissing, A (2019) The Potential Role of the Commonwealth in Responding to Catastrophic Disasters: Technical Report, *Bushfire and Natural Hazards CRC*.
14. Edwards, A (2019) Multi-scaled calibration of high-resolution burnt area and fire severity mapping: Technical Report, *Bushfire and Natural Hazards CRC*.
15. Filkov, A, Duff, T & Penman, T (2020) Determining threshold conditions for extreme fire behaviour: Annual Report 2019-20, *Bushfire and Natural Hazards CRC*.
16. Florec, V, Rogers, A, Hailu, A & Pannell, D (2020) Economics of natural hazards: Annual Report 2019-20, *Bushfire and Natural Hazards CRC*.
17. Furlaud, J & Bowman, D (2020) Understanding post-fire fuel dynamics using burnt permanent forest plots: Technical Report, *Bushfire and Natural Hazards CRC*.
18. George, S, O'Brien, J, Hussein, S & van Leeuwen, J (2020) January 2020 NSW bushfires study: Technical Report, *Bushfire and Natural Hazards CRC*.
19. Gibbs, L, Quinn, P, Johnston, D, Blake, D, Campbell, E & Richardson, J (2020) Recovery capitals (ReCap): Applying a community capitals framework to disaster recovery: Annual Report: 2019-20, *Bushfire and Natural Hazards CRC*.
20. Gissing, A, Eburn, M & George, S (2020) Planning and capability requirements for catastrophic and cascading disasters: Technical Report, *Bushfire and Natural Hazards CRC*.
21. Gissing, A, Eburn, M, McAneney, J (2020) Shaping future catastrophic disasters: Technical Report, *Bushfire and Natural Hazards CRC*.
22. Gissing, A & George, S (2020) Business Involvement in Disaster Management: Technical Report, *Bushfire and Natural Hazards CRC*.
23. Gissing, A & George, S (2020) Community Organisation Involvement in Disaster Management: Technical Report, *Bushfire and Natural Hazards CRC*.
24. Gissing, A, Timms, M, Browning, S, Coates, L, Crompton, R & McAneney, J (2020) Compound Natural Disasters in Australia: A Historical Analysis: Technical Report, *Bushfire and Natural Hazards CRC*.
25. Greer, D, Dootson, P, Miller, S & Tippet, V (2019) Research Program 2 Managing conflicting information during a natural disaster: An emergency services agencies perspective: Technical Report, *Bushfire and Natural Hazards CRC*.
26. Griffith, M (2020) Cost-effective mitigation strategy development for building related earthquake risk: Annual Report 2019-20, *Bushfire and Natural Hazards CRC*.
27. Jones, S, Reinke, K & Engel, C (2020) Active fire detection using the Himawari-8 satellite: Annual Report 2019-20, *Bushfire and Natural Hazards CRC*.
28. Karunaratne, S, Possell, M, Pepper, D & Bell, T (2019) Modelling emissions from prescribed burning using FullCAM: Technical Report, *Bushfire and Natural Hazards CRC*.
29. Kepert, J, Tory, K & Wilke, D (2020) Improved predictions of severe weather to reduce community impact: Annual Report 2019-20, *Bushfire and Natural Hazards CRC*.
30. Khan, N, Sutherland, D & Moinuddin, K (2020) Recirculation regions downstream of a canopy on a hill: Technical Report, *Bushfire and Natural Hazards CRC*.
31. Khan, N, Sutherland, D & Moinuddin, K (2020) Simulation of flows through canopies with varying atmospheric stability: Technical Report, *Bushfire and Natural Hazards CRC*.
32. Kruger, T, & McLennan, B (2019) Emergency volunteering 2030: Views from the community sector: Environmental scan report no. 3: Technical Report, *Bushfire and Natural Hazard CRC*.
33. Lumantarna, E, Lam, N, Tsang, H, Gad, E & Wilson, J (2019) Progress report on costing of limited ductile reinforced concrete buildings: Technical Report, *Bushfire and Natural Hazards CRC*.

APPENDIX 1: PUBLICATIONS

34. Lumantarna, E, Lam, N, Tsang, H, Gad, E & Wilson, J (2020) Final report on vulnerability of as-built and retrofitted LDRC buildings: Technical Report, *Bushfire and Natural Hazards CRC*.
35. Mackie, B (2020) Weather forecasts and agency warnings: Who trusts who?, *Bureau of Meteorology*.
36. MacDonald, F (2020) Building resilience: understanding the capabilities of diverse communities: Technical Report, *Bushfire and Natural Hazards CRC*.
37. McLennan, B, Dunlop, P, Kragt, D, Holtrop, D, Gagne, M, Luksyte, A & Farid, HM (2020) Enabling sustainable emergency volunteering: Annual Report 2019-20, *Bushfire and Natural Hazards CRC*.
38. Maier, H, Riddell, G, van Delden, H, Araya, S, Zecchin, A, Vanhout, R, Dandy, G & Hamers, E (2020) Improved decision support for natural hazard risk reduction: Annual Report 2019-20, *Bushfire and Natural Hazards CRC*.
39. March, A & Nogueira de Moraes, L (2020) Integrated urban planning for natural hazard mitigation: Annual Report 2019-20, *Bushfire and Natural Hazards CRC*.
40. March, A, Nogueira de Moraes, L, Riddell, G, Dovers, S, Stanley, J, Van Delden, H, Beilin, R & Maier, H (2020) Integrating Bushfire Risk Reduction and Statutory Mechanisms in South Australia: Assessment of the Draft Planning and Design Code 2019: Technical Report, *Bushfire and Natural Hazard CRC*.
41. March, A, Nogueira de Moraes, L, Riddell, G, Dovers, S, Stanley, J, Van Delden, H, Beilin, R & Maier, H (2020) Integrated Urban Planning for Natural Hazard Mitigation: Including Risk Scenario Assessments for Bushfire Risk in Urban Edge Expansion Processes in Victoria: Technical Report, *Bushfire and Natural Hazard CRC*.
42. March, A, Nogueira de Moraes, L, Riddell, G, Dovers, S, Stanley, J, Van Delden, H, Beilin, R & Maier, H (2020) Managing Risk at the Urban Edge: Improving Subdivision and Urban Change Processes: Technical Report, *Bushfire and Natural Hazard CRC*.
43. March, A, Nogueira de Moraes, L, Riddell, G, Dovers, S, Stanley, J, van Delden, H, Beilin, R & Maier, H (2020) Australian inquiries into natural hazard events: Recommendations relating to urban planning for natural hazard mitigation (2009-2017): Technical Report, *Bushfire and Natural Hazards CRC*.
44. Massetti, A, Yebra, M, Hilton, J & Rüdiger, C (2020) Case Study: Use of remote sensing data to derive spatial and temporal explicit fuel accumulation curves across defence lands: Technical Report, *Bushfire and Natural Hazards CRC*.
45. McLennan, B (2020) Emergency volunteering 2030: A sector-wide snapshot. Environmental scan synthesis report: Technical Report, *Bushfire and Natural Hazards CRC*.
46. McLennan, B (2020) Emergency volunteering 2030: Views from emergency response volunteer representatives: Environmental scan report no. 4: Technical Report, *Bushfire and Natural Hazards CRC*.
47. Mehta, A, Murray, S, Bradley, L & Weeks, C (2020) Research Program 1 An evidence based for emergency alerts: Leveraging signal words to support community action: Technical Report, *Bushfire and Natural Hazards CRC*.
48. Mills, G (2019) The science behind the Queensland bushfire and heatwave event, *Office of the Inspector-General Emergency Management Queensland*.
49. Mehta, A, Bradley, L, Miller, S & Murray, S (2019) Towards trust and protective actions in risk communication: Technical Report, *Bushfire and Natural Hazards CRC*.
50. Mohanty, I, Edwards, M, Ryu, H & Wehner, M (2020) Project A9: Cost-effective mitigation strategy development for building related earthquake risk: Technical Report, *Bushfire and Natural Hazards CRC*.
51. Moinuddin, K, Khan, N & Sutherland, D (2020) Effect of relative humidity on grassfire propagation: Technical Report, *Bushfire and Natural Hazards CRC*.
52. Muhammad, H, Kragt, D, Dunlop, P, Gagné, M, Luksyte, A & Holtrop, D (2019) State Emergency Service: Volunteer views on expectations, experiences, and motivations: Annual Report 2019-20, *Bushfire and Natural Hazards CRC*.
53. Nogueira de Moraes, L & March, A (2019) Submission to the Beyond Tourism 2020 Strategy Steering Committee Report to Government Consultation, Beyond Tourism 2020 Strategy Steering Committee Report to Government: Response to the Invitation to Comment, pp. 1-8.
54. Bearman, C, Brooks, B, Owen, C, & Curnin, S (2020) Using the human centred design method to develop tools for non-technical skills in emergency management: Technical Report, *Bushfire and Natural Hazards CRC*.
55. Parnell, D, Bell, T & Possell, M (2020) Near infrared spectroscopy as a new fire severity metric: Technical Report, *Bushfire and Natural Hazards CRC*.
56. Parnell, D, Bell, T & Possell, M (2020) Quantifying the conversion of vegetation to ash for soil carbon fingerprinting: Technical Report, *Bushfire and Natural Hazards CRC*.
57. Parnell, D, Possell, M & Bell, T (2020) Estimating carbon stocks and biomass in surface fuel layers: Technical Report, *Bushfire and Natural Hazards CRC*.

APPENDIX 1: PUBLICATIONS

58. Parsons, D & Riddell, G (2020) Mitigation Exercise Trial – The application of UNHaRMED to mitigation planning: Technical Report, *Bushfire and Natural Hazard CRC*.
59. Parsons, M & Foster, H (2020) Reimagining program monitoring and evaluation for disaster resilience outcomes: Technical Report, *Bushfire and Natural Hazard CRC*.
60. Parsons, M, Reeve, I, McGregor, J, Marshall, G, Stayner, R, McNeill, J, Hastings, P, Glavac, S & Morley, P (2019) The Australian Natural Disaster Resilience Index. Volume I – State of Disaster Resilience Report: Technical Report, *Bushfire and Natural Hazards CRC*.
61. Parsons, M, Reeve, I, McGregor, J, Morley, P, Marshall, G, Stayner, R, McNeill, J, Glavac, S & Hastings, P (2019) The Australian Natural Disaster Resilience Index. Volume II – Index Design and Computation: Technical Report, *Bushfire and Natural Hazards CRC*.
62. Parsons, M, Reeve, I, McGregor, J, Marshall, G, Stayner, R, McNeill, J, Hastings, P, Glavac, S & Morley, P (2020) The Australian Disaster Resilience Index: a summary: Technical Report, *Bushfire and Natural Hazards CRC*.
63. Parackal, K, Ginger, J, Henderson, D & Wehner, M (2019) Community benefits of roof upgrades: Technical Report, *Bushfire and Natural Hazards CRC*.
64. Parackal, K, Ginger, J, Henderson, D & Wehner, M (2019) Model for assessing the vulnerability of Australian housing to windstorms: Technical Report, *Bushfire and Natural Hazards CRC*.
65. Parackal, K, Ginger, J, Wehner, M & Henderson, D, (2019) Retrofitting of a high-set Queensland house for wind loading: Technical Report, *Bushfire and Natural Hazards CRC*.
66. Parackal, K, Wehner, M, Ginger, J, Ryu, H, Henderson, D & Edwards, M (2020) Improving the resilience of existing housing to severe wind events: Annual Report 2019-20, *Bushfire and Natural Hazards CRC*.
67. Peace, M, Kepert, J, Ye, H & Greenslade, J (2020) Coupled fire-atmosphere modelling: Annual Report 2019-20, *Bushfire and Natural Hazards CRC*.
68. Pepper D, Bell T, Possell M & Parnell D (2020) Model predictions for fuel reduction burning of eucalypt open forest in the Greater Blue Mountains region: Technical Report, *Bushfire and Natural Hazards CRC*.
69. Rashid, M, Hilton, J, Khan, N, Sutherland, D & Moinuddin, K (2020) A report on WRF software development (preliminary): Technical Report, *Bushfire and Natural Hazards CRC*.
70. Rasmussen, B & Maharaj, N (2019) The economic benefits of the Indigenous Fire and Rescue Employment Strategy (IFARES) program: Fire and Rescue New South Wales: Technical Report, *Bushfire and Natural Hazards CRC*.
71. Richter, H, Arthur, C, Wilke, D, Dunford, M, Ebert, B & Wehner, M (2020) Impact-based forecasting for the coastal zone: east coast lows: Annual Report 2019-20, *Bushfire and Natural Hazards CRC*.
72. Riddell, G, van Delden, H & Koks, E (2020) Integrated assessment of flood mitigation options – GRUMP Gawler River UNHaRMED Mitigation Project: Technical Report, *Bushfire and Natural Hazard CRC*.
73. Ronan, K & Towers, B (2019) Building best practice in child-centred disaster risk reduction project report 2014-16: Technical Report, *Bushfire and Natural Hazard CRC*.
74. Russell-Smith, J (2020) Developing effective emergency management partnerships in remote north Australian communities: Annual Report 2019-20, *Bushfire and Natural Hazards CRC*.
75. Ryan, B, Johnston, K & Taylor, M (2019) Community engagement techniques toolkit: Technical Report, *Bushfire and Natural Hazards CRC*.
76. Ryan, B, Johnston, K, Taylor, M & McAndrew, R (2020) A systematic literature review of effectiveness of community engagement for preparedness techniques: Technical Report, *Bushfire and Natural Hazards CRC*.
77. Ryu, H, Wehner, M, Edwards, M & Mohanty, I (2020) Progress report on case study CBD precinct: Technical Report, *Bushfire and Natural Hazards CRC*.
78. Setunge, S, Zhang, K, Shi, L, Atapattu, K, Mendis, P, Ngo, T, Zhang, L, Hearth, N, Karunasena, K, Lokuge, W & Amaratunga, D (2020) Enhancing resilience of critical road infrastructure: bridges, culverts and floodways under natural hazards: Annual Report 2019-20, *Bushfire and Natural Hazards CRC*.
79. Sharples, J, Hilton, J, Sullivan, A & Badlan, R (2020) Fire coalescence and mass spot fire dynamics: experimentation, modelling and simulation: Annual Report 2019-20, *Bushfire and Natural Hazards CRC*.
80. Taylor, M, Johnston, K & Ryan, B (2019) Monitoring, evaluation and learning toolkit: Technical Report, *Bushfire and Natural Hazards CRC*.
81. Ulubasoglu, M (2020) Disasters and economic resilience: the income effects of the Cyclone Oswald 2013 on small business owners: Technical Report, *Bushfire and Natural Hazards CRC*.
82. Ulubasoglu, M & Beaini, F (2020) Disasters and economic resilience: the effects of the Queensland Floods 2010-11 on individual income: a case study on the Brisbane River catchment area: Technical Report, *Bushfire and Natural Hazards CRC*.

APPENDIX 1: PUBLICATIONS

83. Ulubasoglu, M & Onder, Y (2020) Disasters and economic resilience: the effects of the Black Saturday bushfires on individual income: Technical Report, *Bushfire and Natural Hazard CRC*.
 84. Van Delden, H, Riddell, G, Vanhout, R, Newman, J, Maier, H, Zecchin, A & Dandy, G (2019) UNHaRMED framework report: a co-creation approach for the development and use of decision support systems for disaster risk reduction: Technical Report, *Bushfire and Natural Hazard CRC*.
 85. Vinodkumar & Dharssi, I (2019) Use of remote sensing measurements and data assimilation techniques to improve estimates of landscape dryness: Technical Report, *Bushfire and Natural Hazards CRC*.
 86. Vinodkumar, Dharssi, I & Fox-Hughes, P (2019) Disaggregation of JASMIN soil moisture product to 1KM resolution: Technical Report, *Bushfire and Natural Hazards CRC*.
 87. Vinodkumar, Dharssi, I, Yebra, M & Fox-Hughes, P (2020) Exploring the soil moisture-live fuel moisture relationship: Technical Report, *Bushfire and Natural Hazards CRC*.
 88. Wehner, M, Ryu, H, Griffith, M, Edwards, M, Corby, N, Mohanty, I, Vaculik, J & Allen, T (2020) Earthquake mitigation of WA regional towns – York Case Study: Technical Report, *Bushfire and Natural Hazard CRC*.
 89. Wickramashinghe, A, Khan, N & Moinuddin, K (2020) Physics-based simulation of firebrand and heat flux on structures in the context of AS3959: Technical Report, *Bushfire and Natural Hazards CRC*.
 90. Weir, J, Neale, T & Clarke, L (2019) Scientific diversity, scientific uncertainty and risk mitigation policy and planning: Final Project Report, *Bushfire and Natural Hazards CRC*.
 91. Yebra, M, van Dijk, A & Cary, G (2020) Mapping bushfire hazards and impacts: Final Project Report, *Bushfire and Natural Hazards CRC*.
 92. Young, C (2020) Diversity and inclusion: building strength and capability: Annual Report 2019–20, *Bushfire and Natural Hazards CRC*.
 93. Young, C & Jones, R (2019) Risky business: why diversity and inclusion matter. Into the future: building skills and capabilities for a diverse and inclusive workforce, workshop synthesis and key findings: Technical Report, *Bushfire and Natural Hazards CRC*.
 94. Yu, M, Pepper D, Bell T & Possell M (2020) Detecting the effects of prescribed burning using generalised additive modelling: Technical Report, *Bushfire and Natural Hazards CRC*.
 - Science, Practice and Politics of Burning the Bush, Australasian Fire & Emergency Service Authorities, Melbourne.
 2. Stanley, J, March, A, Ogloff, J & Thompson, J (2020) Feeling the heat: International perspectives on the prevention of wildfire ignition, Vernon Press, Wilmington.
- ### BOOK CHAPTERS 2019–20
1. Bell, T, Gharun, M, Possell, M & Adams, M (2020) Impacts of prescribed burning on forest carbon and water, in Leavesley A, Wouters M & Thornton R (eds) Prescribed Burning in Australasia: The Science, Practice and Politics of Burning the Bush, AFAC, Melbourne, pp. 117-123.
 2. Dovers, S (2020) Public Policy and Disaster Justice, in Lukasiewicz A & Baldwin C (eds) Natural Hazards and Disaster Justice, Palgrave Macmillan, Singapore, pp. 51-71.
 3. Eburn, M (2020) Looking to Courts of Law for Disaster Justice, in Lukasiewicz A & Baldwin, C (eds) Natural Hazards and Disaster Justice, Palgrave Macmillan, Singapore, pp. 133-150.
 4. Filkov, A, Cawson, J & Penman, T (2020) Wildland fires – Environmental Impact of Fire Handbook, Elsevier, pp. 65.
 5. Herrington, V, Blackman, D, Carroll, J & Owen, C (2019) Connected policing: The importance of social capital and boundary spanning in Australian police leadership, in Ramshaw P, Silvestri M & Simpson M (eds) Police Leadership, Palgrave Macmillan, Cham, pp. 255-275.
 6. Johnston, D, Vinnell, L, Wallis, A, Coomer, M, McClure, J, Becker, J & Gunnell, S (2020) A bibliography of social research on the earthquake risk in Wellington, Aotearoa New Zealand: 1848 to 2019, in Disaster Research Science Report, Wellington, Massey University, pp. 49.
 7. Maizuar, M, Zhang, L, Miramini, S, Mendis, P & Duffield, C (2020) Structural Health Monitoring of Bridges Using Advanced Non-destructive Testing Technique, in Wang C, Ho J & Kitipornchai S (eds) Lecture Notes in Civil Engineering, vol 37, Springer, Singapore, pp. 963-972.
 8. March, A, Nogueira de Moraes, L & Stanley, J (2020) Dimensions of risk justice and resilience: mapping urban planning's role between individual versus collective rights, in Lukasiewicz, A & Baldwin, C (eds) Natural Hazards and Disaster Justice, Palgrave Macmillan, Singapore, pp. 93-116.
 9. Sofi, M, Lumantarna, E, Mendis, P & Zhang, L (2019) A Proposed Method for the Use of the IBIS-FS in Experimental Modal Analysis of Buildings, in Zhou Y, Wahab M, Maia N, Liu L & Figueiredo E (eds) Data Mining in Structural Dynamic Analysis, Springer, Singapore, pp. 147-169.

BOOKS 2019–20

1. Leavesley, A, Wouters, M & Thornton, R (2020) Prescribed Burning in Australasia: The

APPENDIX 1: PUBLICATIONS

10. Towers, B, Christianson, A & Erksen, C (2019) Impacts of Wildfire on Children, in Manzello S (eds) Encyclopedia of Wildfires and Wildland-Urban (WUI) Interface Fires, Springer, Cham.
11. Towers, B & Gough, A (2019) New school: a modern approach to disaster risk reduction and resilience education for children, in Peek L (eds) Research Counts: Children and Disaster, Natural Hazards Centre/United States Centre for Disease Control and Prevention, Colorado.
12. Weir, J, Sutton, S & Catt, G (2020) The Theory/Practice of Disaster Justice: Learning from Indigenous Peoples' Fire Management, in Lukasiewicz A & Baldwin C (eds) Natural Hazards and Disaster Justice Palgrave Macmillan, Singapore, pp. 299-317.



Prof Mehmet Ulubasoglu speaking at AFAC19, August 2019.

APPENDIX 2: ADDITIONAL RESEARCH

TACTICAL RESEARCH FUND

TITLE	AGENCY
A guide to develop bushfire case studies – A case study of cropland fires	Country Fire Authority, VIC
A strategic analysis of preventable residential fire fatalities	Metropolitan Fire Brigade
AIRSNT data revision and analysis	AFAC
Classifying outcomes of inquiries & reviews: what can we learn?	AFAC
Climate-Challenged World	AFAC
Maintaining Positive Mental Health & Wellbeing for Young Adult ES Volunteers	AFAC
Mapping approaches to community engagement for preparedness in Australia	Victoria SES, AFAC Community Safety Group, Tasmania Fire Service, Red Cross, Inspector-General Emergency Management Queensland, NSW SES, Queensland Fire and Emergency Services, Department of Fire and Emergency Services WA, Tablelands Regional Council QLD, City of Ipswich, Cairns Regional Council
Predicting fire danger ratings from physical measures of fire behaviour	NSW Rural Fire Service, AFAC, National Fire Danger Ratings System National Board, Office of Environment and Heritage NSW, Bureau of Meteorology
Re-imagining program evaluation for community resilience outcomes	Emergency Management Victoria
Risk assessment of non-compliant building materials on buildings	AFAC
SES physical fit for task	Australian Council of State Emergency Services
Skin Absorption Project	Country Fire Authority (SA), Metropolitan Fire Service (SA), State Emergency Service (SA), Queensland Fire and Emergency Services
Smoke Alarm Standards	Fire and Rescue New South Wales
Using pre and post fire LiDAR to assess the severity of the 2019 Tasmanian Bushfires	Department of Primary Industries, Parks, Water and Environment (Tasmania), Tasmanian Fire Service, Tasmanian Parks and Wildlife Service, NSW Office of Environment and Heritage, Department of Environment, Land, Water and Planning (Vic), Sustainable Timber Tasmania

APPENDIX 2: ADDITIONAL RESEARCH

DELWP

TITLE
Application of Self-Evacuation Archetypes
Bushfire Reconstruction
Creation of a grassland curing and GFDI dataset
Cropland Fire Behaviour Research
Development of Seasonal Fire Prediction Tools
Dynamic Smoke Modelling and Community Impacts of Smoke
Ecosystem Resilience – Establishment of collection and analysis for the third out of 11 priority EFGs
Ecosystem Resilience – Establishment of collection and analysis for two priority Ecological Fire Groups (EFG)
Ecosystem Resilience – Technological Advancements
Effectiveness of resources to suppress bushfire: Aerial and Ground-Based
Evaluation of Ecosystem Resilience Data
Framework for using and updating ecological models to inform bushfire management planning
Human Dimensions of Environmental Crime
Identify planned burn windows
Making a Difference – Conceptual framework to show benefits of compliance
Multi-platform comparison to map burn extent and severity & Planned Burn Mapping in Victoria using Remote Sensing
Plume and Air Quality Modelling (Cobden Peat Fire Reconstruction)
Understanding smouldering for better AQFx system modelling
Understanding the impact of climate change on fire weather variables
User interface platform for the Victorian Historical Fire Weather Gridded Dataset
Wood and Water (Update of 2008 Report)

COMMISSIONED RESEARCH

TITLE	AGENCY
An Integrated Support Tool for Understanding and Responding to Current and Future Flood Risk – Gawler River Catchment	Gawler River Floodplain Management Authority, University of Adelaide
Assessment of Resilience Indicators for Emergencies – The Casestudy of Maroondah City Council and Knox City Council	Yarra Ranges Shire Council
Develop a decision support system for Western Australia	Department of Fire and Emergency Services, Western Australia
Improving understanding of building codes and their application that enhance resilience in NSW in response to the 2017 SLERA	NSW Office of Emergency Management
Mitigation Exercise Trial	South Australian Fire and Emergency Services Commission, Crisis Management Australia, University of Adelaide
Quantifying catastrophic bushfire consequence	Energy Networks Australia
Synoptic Weather Features SE Australia & Tasmania Stage 1	University of Tasmania

QUICK RESPONSE FUNDING

TITLE	RESEARCH ORGANISATION
Assessment of Post-fire recovery of Sub alpine shrublands after the 2019 World Heritage Area Fires	University of Tasmania
Effects of the January 2020 bushfire on the estuarine systems of Kangaroo Island	University of Adelaide
Impact of 2019 bushfires on Whian Whian State Conservation Area	Southern Cross University
Informing post-fire recovery planning of northern NSW rainforests	Macquarie University
NSW Bushfire Post Event	Risk Frontiers
Re-measurement of Burnt Permanent Plots in Tasmanian Wet Eucalypt Forest	University of Tasmania

APPENDIX 3: INTERNATIONAL COLLABORATION

INTERNATIONAL COLLABORATION HIGHLIGHTS BY PROJECT

PROJECT	INTERNATIONAL COLLABORATIONS
Child-centred disaster risk reduction	<p>CUIDAR: Cultures of Disaster amongst children and young people (EU Horizon 2020) Project led by Lancaster University. Dr Briony Towers, Research Advisor. https://www.lancaster.ac.uk/cuidar/en/</p> <p>Natural Hazards Centre CONVERGE Working Group on COVID-19, Children, Youth and Schools. Dr Briony Towers, Working Group Lead https://converge.colorado.edu/resources/covid-19/working-groups/population-groups-organizations-social-institutions/covid-19-and-children-youth-and-schools</p> <p>Stockholm Environment Institute 2020 Regional Environmental Event Strategic Collaborative Fund Phase 2 (SCF2), SEI Asia Pacific Researchers, Practitioners and Policymakers in Dialogue with Children and Youth. Dr Briony Towers, Technical Advisor.</p> <p>Power, Prestige & Forgotten Values: A Disaster Studies Manifesto (International Research Collaboration led by Prof JC Gaillard, University of Auckland). Dr Briony Towers, Founding Member. https://www.ipetitions.com/petition/power-prestige-forgotten-values-a-disaster</p>
Mapping bushfire hazards and impacts	<p>University of Maryland, United States</p> <p>Council of Scientific and Industrial Research, South Africa</p> <p>University of Montpellier, France</p> <p>Instituto de Agua y Clima, Argentina</p> <p>Center of landscape and climate research, University of Leicester, United Kingdom</p> <p>University of Alcalá, Spain</p> <p>University of California – Davis, United States</p> <p>Spanish National Research Council, Spain</p> <p>Xingwen Quan, University of Electronic Science and Technology of China</p>
Tools supporting fire management in northern Australia	<p>Global Observations of Forest Cover and Land-use Dynamics (GOF-C-GOLD), multinational.</p>

PROJECT	INTERNATIONAL COLLABORATIONS
Improving flood forecast skill using remote sensing data	<p>Remote Sensing Solutions Inc, United States.</p> <p>School of Geographical Sciences, University of Bristol, United Kingdom.</p> <p>Department of Environment, Land and Infrastructure Engineering; Polytechnic University of Turin, Italy.</p> <p>Department of Civil, Chemical, Environmental, and Materials Engineering; University of Bologna, Italy.</p> <p>Delft Institute for Water Education, Hydroinformatics Chair, Delft, The Netherlands.</p>
Improving land dryness measures and forecasts	<p>NASA Land Information System team, United States.</p> <p>Met Office Unified Model consortium, United Kingdom.</p>
Optimisation of fuel reduction burning regimes	<p>Polytechnic of Torino, Italy.</p> <p>University of Padova, Italy.</p> <p>University of California – Davis, United States.</p> <p>Michigan State University, United States.</p>
Fire coalescence and mass spotfire dynamics	<p>University of Coimbra, Portugal.</p> <p>University of Sheffield, United Kingdom.</p> <p>San Jose State University, United States.</p> <p>Missoula Fire Lab, United States.</p> <p>US Naval Research Laboratory, United States.</p> <p>University of Science and Technology of China, China.</p> <p>SCION (NZ Forestry Research), New Zealand.</p> <p>Service Départementale d'Incendie et de Secours des Bouches-du-Rhône, France</p> <p>Los Alamos National Laboratory, United States</p>

APPENDIX 3: INTERNATIONAL COLLABORATION

PROJECT	INTERNATIONAL COLLABORATIONS
Threshold conditions for extreme fire behaviour	<p>Large scale international wildfire experiment in the Pyrenees, Spain, to understand fires in canyons. The research team includes several universities and countries (US, UK, Spain, Portugal, France and Canada).</p> <p>International Network-to-Network Collaborations NSF Program "AccelNet: FIRENET: An international network of networks for prediction and management of wildland fires" (Australia, Canada, Chile, Hong Kong, Italy, Netherlands, New Zealand, Norway, Portugal, Spain, UK and US).</p> <p>Collaboration on fire spotting modelling with the Environmental Ministry, Andalucía Government, Spain.</p> <p>Collaboration with San Jose State University on fire coalescence, United States.</p> <p>Collaboration with the Tomsk State University on generation and transport of firebrands, Russia.</p> <p>Collaboration with Worcester Polytechnic Institute and University of Edinburgh on wildfire dynamics and fire performance of materials. United States, United Kingdom.</p> <p>Collaboration on fire safety with University of Maryland, Lund University, University of Edinburgh, United States, United Kingdom.</p>
Improved decision support for natural hazard risk reduction	<p>University of Amsterdam, The Netherlands.</p> <p>Research Institute for Knowledge Systems, The Netherlands.</p> <p>Risklayer, Germany.</p> <p>Centre for Disaster Management and Risk Reduction Technology, CEDIM, Germany.</p>

PROJECT	INTERNATIONAL COLLABORATIONS
Cost-effective mitigation strategy development for building related earthquake risk	<p>University of Auckland on seismic retrofit, New Zealand.</p> <p>University of Pavia on seismic performance of masonry structures, Italy.</p> <p>Swiss Federal Institute of Technology Lausanne on experimental tests of reinforce concrete structural systems, Switzerland.</p>
Australian Natural Disaster Resilience Index	Resilient Organisations, New Zealand.
Improving the resilience of existing housing to severe wind events	<p>University Florida, United States.</p> <p>University of Western Ontario, Canada.</p> <p>Institute for Business and Home Safety, United States.</p> <p>University of Moratuwa, Sri Lanka.</p>
Improved predictions of severe weather to reduce community impact	UK Met Office; HIWeather Project (IVR Task Team); National Oceanic and Atmospheric Administration – national Severe Storms Laboratory and Storm Prediction Center, high-res hazard modelling, United Kingdom.
Recovery capitals	<p>Massey University, New Zealand.</p> <p>University of Auckland, New Zealand.</p>

APPENDIX 4: STUDENTS

SCHOLARSHIP STUDENTS

NAME	UNIVERSITY	COMMENCEMENT	PROJECT NAME
Kate Akers	Massey	Jan-19	Understanding the need for, availability of, and interpretation of information by the public during large scale hazard events
Avianto Amri	Macquarie	Jul-14	Connecting communities: Integration of disaster preparedness measures at household, school, and community level, using a child-centered approach
Shauntelle Benjamin	UNE	Jan-17	Why do people decide to drive through floodwater? Utilizing virtual reality to assess motivations and behaviour associated with driving through floodwater
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
Dario Rodriguez-Cubillo	UTas	Dec-16	Landscape ecology of fire: lessons from Tasmanian wilderness
Amila Dissanayake	RMIT	Jul-15	Fire resilience of existing composite steel plate girder bridges
Joel Dunstan*	South Australia	Apr-19	Development of an occupational fitness evaluation – the identification and quantification of criterion tasks performed by South Australian professional urban firefighters
James Furlaud	UTas	Jun-15	How do wet eucalypt forests burn: managing Tasmania's most dangerous fuel type
Matthew Henry	CQU	Jan-16	Comprehensive school safety: developing a participatory approach to school bushfire management
Mitchell Humphreys	JCU	Feb-16	Wind induced internal pressures in industrial buildings
Sue Hunt	ANU	Feb-14	Implementing policy to enable disaster resilience in the Australian Federation
Greg Ireton	Melbourne	Sep-19	Long-term impact of disasters on school children
Saimum Kabir	Melbourne	Aug-18	Exploring the urban form – resilience nexus in flood risk reduction: an integrated approach
Matthew Kyng	VU	Jun-20	Parameterisation for a simplified short-range firebrand model from physics-based modelling
Mercy Ndalila	UTas	Feb-15	The 2013 Forcett-Dunalley fire: a geospatial analysis of fire severity, smoke transport and emissions
Mayeda Rashid	CQU	Jul-15	Teacher-delivered, child participatory disaster resilience education program for children
Alex Redshaw*	South Australia	Apr-19	Defining and assessing movement capacities associated with modern Australian urban firefighting
Wavne Ridders	Western Australia	Mar-19	Rescuers at Risk: tackling the barriers to mental help-seeking in first responders experiencing PTSD and high psychological distress
Kim Robinson	UTas	Dec-19	Developing a flash flood warning system for short duration catchments using rain fields data, 2D hydrodynamic modelling and best-practice emergency communication
Heather Simpson	Wollongong	Jul-15	Productivity and effectiveness of suppression resources and tactics on large fires

APPENDIX 4: STUDENTS

NAME	UNIVERSITY	COMMENCEMENT	PROJECT NAME
Michael Storey	Wollongong	Mar-16	Empirical analysis of spot-fire and ember behaviour during extreme fire weather conditions
Stephen Sutton	CDU	Jan-15	Cultural drivers of disaster response behaviour and their cross-cultural applicability
Katherine van Wezel	CDU	Mar-15	Women caring for Waanyi and Garawa country
Houzhi Wang	Adelaide	Jan-15	Initiation of biomass smouldering combustion
Li Zhao	ANU	Jun-16	Spatially forecasting coupled litter and root moisture dynamics for bushfire management

COMPLETED 2014-15

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

COMPLETED 2015-16

NAME	UNIVERSITY	STUDENT TYPE	COMMENCEMENT	COMPLETION	PROJECT NAME
Veronique Florec	Western Australia	Scholarship	Jul-11	May-16	Economic analysis of prescribed burning in the south-west of Western Australia
Brianna Larsen	Deakin	Associate	Jan-12	Oct-15	Simulated self-paced wildfire suppression work in different thermal conditions
Philip Stewart	Queensland	Associate	Apr-13	Jan-16	Changing fire regimes in tropical and subtropical Australia
Rene van der Sant	Melbourne	Associate	Jun-11	May-16	Aridity index as a predictor of the hydrogeomorphic response of burnt landscapes
Alex Wolkow	Deakin	Associate	Jan-12	Dec-15	Sleep restriction across a simulated firefighting deployment: the impact on acute stress responses

APPENDIX 4: STUDENTS

COMPLETED 2016-17

NAME	UNIVERSITY	STUDENT TYPE	COMMENCEMENT	COMPLETION	PROJECT NAME
Cathy Cao	Western Australia	Associate	Apr-11	Mar-17	Effective communication of household wildfire risk through WebGIS: considerations in content, representation and design
George Carayannopoulos	Sydney	Associate	Jul-11	Feb-17	Whole of government and crisis management: understanding coordination in a time of crisis
Yang Chen	Monash	Scholarship	Aug-13	Jun-17	LiDAR application in forest fuel measurements for bushfire hazard mitigation
Amanda Chong*	Melbourne	Associate	Mar-15	Dec-16	Accurate location of buildings and its importance in bushfire damage assessment
Raven Cretney	RMIT	Associate	Aug-13	Mar-17	The post-disaster city: urban crisis politics and social change in community led earthquake recovery
Graham Dwyer	Melbourne	Scholarship	Mar-15	Jun-17	We have not lived long enough: sensemaking and learning from bushfires in Australia
Dolapo Fakuade	Canterbury	Associate	Oct-13	Apr-17	Integrated response as a process for enhancing the incident command system
Gemma Gray*	Melbourne	Associate	Jul-15	Jul-16	Spontaneous volunteers in the emergency management sector
Vaibhav Gupta	RMIT	Associate	Jul-11	Dec-16	Remote sensing of fire severity in Australian dry sclerophyll forests
Billy Haworth	Sydney	Scholarship	Jan-14	Feb-17	Assessing the potential, application, and implications of volunteered geographic information in disaster risk reduction
Megan O'Donnell	ANU	Associate	Jan-13	Jan-17	Effects of bushfire exposure on prenatal and early life development in humans: a life history perspective
Rachael Quill	UNSW	Scholarship	Jul-14	Jan-17	Statistical characterisation of wind fields over complex terrain with applications in bushfire modelling
Ken Strahan	RMIT	Associate	Aug-13	Apr-17	Factors influencing householder self-evacuation in two Australian bushfires
Caroline Wenger	ANU	Scholarship	Jan-13	May-17	Flood management in a changing climate

*Masters by Research

APPENDIX 4: STUDENTS

COMPLETED 2017-18

NAME	UNIVERSITY	STUDENT TYPE	COMMENCEMENT	COMPLETION	PROJECT NAME
Melanie Baker-Jones	QUT	Scholarship	Feb-14	Sep-17	Social media in emergencies: an examination of government accountability for risk communication and warning
David Barton	RMIT	Associate	Jan-10	Jan-18	Disaster in relation to attachment, loss, grief and recovery: the Marysville experience
Douglas Brown	Sydney	Associate	Mar-10	Feb-18	Domestic architecture and the perception of risk in bushfire-prone areas
Sarah Hall	Deakin	Scholarship	Mar-14	Sep-17	Sleep and stress in on-call fire and emergency service workers
Roozbeh Hasanzadeh Nafari	Melbourne	Scholarship	Jul-14	Jan-18	Flood damage assessment in urban areas
Alexander Holmes	Monash	Scholarship	Mar-15	Feb-18	Investigating the effect of soil moisture, temperature and precipitation extremes on fire risk and intensity in Australia
Ryan Hoult	Melbourne	Scholarship	Oct-14	Sep-17	Seismic assessment of reinforced concrete walls in Australia
Farook Kalendher	RMIT	Scholarship	Jul-13	Oct-17	Synthetic damage curves for concrete girder bridge decks under flood hazard
Charles Newland	Adelaide	Scholarship	Mar-14	Feb-18	Improved calibration of spatially distributed models to simulate disaster risk
Tetsuya Okada	Macquarie	Associate	Aug-12	Oct-17	Post-disaster recovery following recent natural hazard events and risk reduction measures in Australia and Japan
Kamarah Pooley	QUT	Scholarship	May-15	Mar-18	An evaluation of youth justice conferencing for youth misuse of fire
Nicholas Read	Melbourne	Associate	Jan-14	May-18	Models for lightning-caused wildfire ignition
Mittul Vahanvati	RMIT	Associate	Jan-12	May-18	Owner-driven housing reconstruction as a means of enhancing disaster resilience of at-risk communities in India
Sonja Mareevan Nieuwenhoven*	Melbourne	Associate	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
Houzhi Wang	Adelaide	Scholarship	Jan-15	Dec-17	Initiation of biomass smouldering combustion
Ashley Wright	Monash	Scholarship	Mar-14	Sep-17	Estimating areal rainfall time series using input data reduction, model inversion, and data assimilation
Yang Zhang	UNSW	Associate	Sep-14	Apr-18	Understanding spatial patterns of wildfire occurrence in south eastern Australia

*Masters by Research

APPENDIX 4: STUDENTS

COMPLETED 2018-19

NAME	UNIVERSITY	STUDENT TYPE	COMMENCEMENT	COMPLETION	PROJECT NAME
Joji Abraham	Federation	Associate	Jan-15	Jul-18	Fire and heavy metals: when wild and controlled fires transform un-rehabilitated mining waste
Anita Amirsardari	Melbourne	Associate	Jan-14	Aug-18	Seismic assessment of reinforced concrete buildings in Australia including the response of gravity frames
Fatemeh Bahri	UNSW	Associate	Jul-13	Dec-18	Sensitivity of the empirical mode decomposition and its application to environmental data
Bill Calcutt	Wollongong	Scholarship	Feb-14	Jun-19	Valuing volunteers: better understanding the primary motives for volunteering in Australian emergency services
Wasin Chaivaranont	UNSW	Associate	Mar-14	Aug-18	How does remotely sensed degree of curing and fuel load vary in grasslands and effect modelled fire spread?
Zoe D'Arcy*	RMIT	Associate	Jul-17	Dec-18	Community engagement in the post-disaster landscape
Grigorij Goldbergs	CDU	Scholarship	Dec-14	May-19	Remote sensing of tree structure and biomass in North Australian mesic savanna
Angela Gormley*	Sydney	Associate	Jan-16	Feb-19	Effects of Sydney coastal dry sclerophyll forest litter on fuels and fire behaviour in Hornsby Shire
Fiona Jennings	RMIT	Scholarship	Aug-14	Jan-19	Navigating uncertainty: a qualitative study of resident involvement in the 2013 Forcett Tasmania bushfire disaster
Thomas Kloetzke	Queensland	Scholarship	Jul-15	Jun-19	Analysis and simulation of surface wind fields during landfalling tropical cyclones
Lauren Kosta	Melbourne	Associate	Dec-13	Dec-18	Parenting after Black Saturday: lived experiences since the 2009 Victorian bushfires
Diana Kuchinke	Federation	Associate	Dec-10	Feb-19	Investigating bird responses to fire in the Heathy Dry Forests of Victoria, Australia
Peter Middleton*	CSU	Associate	Feb-18	Oct-18	Enhancing public information practice in Tasmania's emergency services
Lucy Ockenden*	Melbourne	Associate	Jan-17	Dec-18	Changes to urban planning's bushfire risk management approach in Victoria and future directions
Korah Parackal	JCU	Scholarship	Mar-15	Dec-18	The structural response and progressive failure of batten to rafter connections under wind loads
Gabriela Raducan	RMIT	Scholarship	Mar-14	Dec-18	The impacts of bushfires on water quality
Timothy Ramm	Tasmania	Scholarship	Feb-15	Aug-18	Improving adaptation planning for future sea level rise and coastal flooding
Bambang Setiawan	Adelaide	Associate	Jul-13	Dec-18	Quantifying the seismic and site amplification characteristics of Adelaide's regolith
Emma Singh	Macquarie	Scholarship	Jan-14	Jan-19	Modelling the impact of lifeline infrastructure failure during natural hazard events

APPENDIX 4: STUDENTS

NAME	UNIVERSITY	STUDENT TYPE	COMMENCEMENT	COMPLETION	PROJECT NAME
Kaitlyn Watson	QUT	Associate	Feb-16	Jun-19	The roles of pharmacists in disaster health management in natural and anthropogenic disasters
Rachel Westcott	WSU	Scholarship	Jul-14	Dec-18	Advancing public health in the context of natural hazards: normalising preparedness within a framework of adapted protection motivation theory
Chathura Wickramasinghe	RMIT	Associate	May-15	Jun-19	Multi-resolution, high temporal fire monitoring and intensity mapping using AHI
Mengran Yu	Sydney	Scholarship	Mar-15	Oct-18	Approaches for investigating wildfire impacts on catchment hydrology

*Masters by Research

COMPLETED 2019-20

NAME	UNIVERSITY	STUDENT TYPE	COMMENCEMENT	COMPLETION	PROJECT NAME
Heather Bancroft	Melbourne	Scholarship	Jun-14	Oct-19	Wellbeing of firefighters: the impact of individual factors, potentially traumatic event exposure, and operational and organisational factors on mental health outcomes
Andrew Clarke	CQU**	Scholarship	Oct-15	Oct-21	A mixed methodological evaluation of the effectiveness of key safety messages in dealing with stressful structural fire environments
Alan Green	Wollongong	Associate	Feb-14	Jul-19	Sprinkler systems for the protection of buildings from wildfire
Bryan Hally	RMIT	Scholarship	Mar-15	Sep-19	Methods for background temperature estimation in the context of active fire detection
Maryam Nasim	RMIT	Scholarship	Jul-15	Dec-19	Investigation into the behaviour of a U-slab bridge due to flood
Ismail Qeshta	RMIT	Associate	Aug-15	Oct-19	Fragility and resilience of bridge structures subjected to extreme wave-induced loads
James Ricketts	Victoria	Associate	Mar-14	Nov-19	Understanding the nature of abrupt regional shifts in a changing climate
Graeme Riddell	Adelaide	Scholarship	Feb-14	Dec-19	Foresight for risk – using scenarios for strategic risk assessment and management of emergent disaster risk
Sesa Singha Roy	Victoria*	Associate	Feb-17	Oct-19	Development of an interface using penalisation method for improving computational performance of bushfire simulation tools
Christopher Thomas	UNSW	Scholarship	Sep-15	Oct-19	An investigation of the dynamics of fire-fire interactions using a coupled fire-atmosphere model
Rahul Wadhvani	Victoria	Scholarship	Nov-14	Oct-19	Refinement of the sub-models of pyrolysis and firebrand transport and undertaking experiments to validate those for a physics-based bushfire prediction model
Ali Reza Zabihi	Swinburne	Associate	Sep-15	Apr-20	Seismic retrofitting of RC beam-column joints using metallic haunch

*Masters by Research **Graduate Certificate in Research

APPENDIX 4: STUDENTS

ASSOCIATE STUDENTS

NAME	UNIVERSITY	COMMENCEMENT	PROJECT NAME
Sumayyah Ahmad	Curtin	Feb-18	An investigation of spontaneous volunteers' social media engagement in emergency disaster management
Veronica Berjon	Sydney	Jul-17	Dynamics of litterfall and fine fuels after fire in sclerophyll forests and woodlands
Nicolas Borchers Arriagada	Tasmania	Jun-18	Assessment framework for the elevation of wildfire risk reduction strategies
Karen Bradley	QUT	Nov-17	Strategies to develop a national incident management system for emergencies - improving the response to disasters by enhancing the incident command system
Heidi Chappelow*	Newcastle	Feb-18	Community engagement for disaster risk reduction through embedding DRR values
Zoe D'Arcy	RMIT	Mar-20	Towards fire adaptive communities in Australia
Antara Dasgupta	Monash	Jul-15	Towards a comprehensive data assimilation framework for operational hydrodynamic flood forecasting
Sarah Dickson-Hoyle	British Columbia	Sep-18	Wildfire as a catalyst for co-management: Indigenous knowledge, stewardship and restoration of (post)fire landscapes
Russell Dippy	Charles Sturt	Jan-18	What human capacity demands should inform the development and appointment of an emergency
Darryl Dixon*	CSU	Jun-12	The exposure of emergency service personnel to asbestos
Sonam Dorji	QUT	Nov-19	Effects of masonry in flat-slab structures
Martyn Elliott	USC	Dec-16	Economic evaluation of prescribed fire as a bushfire risk mitigation tool in southeast Queensland
Hannah Etchells	Western Australia	Mar-17	The impacts of catastrophic wildfire on ecological interactions among regenerated vegetation, fungi and small foraging marsupials
Saadmann Eusuf*	UNSW	Feb-19	Voxel-based approach to estimate the volume of fuel load from point cloud data for hazard reduction burning
Gretel Evans	Melbourne	Mar-14	The persistent past: flood, fire and migrant memories of natural disasters in Australia
Jay Evans	CDU	Jul-17	Savanna fire management, resources, methods, effectiveness
Thomas Fitzgerald	Sydney	Aug-13	What is the acceptable risk in the coastal zone: perspectives on coastal hazards and decision making
Vivien Forner	Wollongong	Sep-12	Leading with self-determination theory
Akvan Gajanayake	RMIT	Aug-16	Measuring social, environmental and economic consequences of road structure failure due to natural disasters

APPENDIX 4: STUDENTS

NAME	UNIVERSITY	COMMENCEMENT	PROJECT NAME
Steve Glassey	Otago	Feb-18	Animal emergency management in New Zealand
Constanza Gonzalez Mathiesen	Melbourne	Jan-16	Urban planning and resilience to bushfires
Lesley Gray	Otago	Sep-16	Preparing for the big one: disaster risk reduction for morbid obesity
Eike Hamers	Adelaide	Jul-18	Flooding in South Australia – improved approach for flood risk reduction by joint consideration of structural, land use planning and community resilience
Bruce Hankinson	QUT	Jul-16	Network enabled agility: A model for filling the strategic void in interoperability thinking
Jessica Hellier*	Melbourne	Nov-19	Land use planning treatment of flood risk in cities
Sam Hillman	RMIT	Mar-17	The utility of point clouds to estimate fuel hazard
Nina Homainejad	UNSW	Jan-20	Unmanned Aircraft Systems (UAS) for 3D bushfire mapping
Jasmine Innocent	VU	Jul-16	Physics based simulations of grassfire propagation in patchy fuel beds and sloped terrain- A parametric study
Tony Jarrett	CQU	Jan-18	Agency experts supporting bushfire disaster resilience education with primary school students: a case study from New South Wales, Australia
Nouman Khattak	QUT	Aug-19	Seismic retrofit of unreinforced masonry building facades with FRP composites
Revathi Krishna	Monash	Mar-16	Coping with disasters by children and families who live in poverty
John Mason	Monash	Mar-18	Giving voice to our givers: a phenomenological study addressing the perceptions of RFS volunteers
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	Developing a spatial approach to model sediment transfer in catchments affected by bushfire
Prananda Navitas	QUT	Oct-15	Improving disaster risk communication in various disaster scenarios
Ben Ollington	Melbourne	Oct-19	Coexisting with fire: Integrating resilient landscape design principles within broader urban place making policy for bushfire risk reduction in Australia
Liberty Pascua	Sydney	Jul-16	Precarious places, precarious knowledges: disaster risk reduction education in Australia, the Philippines, and Vanuatu

APPENDIX 4: STUDENTS

NAME	UNIVERSITY	COMMENCEMENT	PROJECT NAME
Greg Penney	ECU	Jan-18	Through the flames – quantitative analysis of strategic and tactical wildfire suppression
Nick Popov	Wollongong	Feb-13	The impact of leadership development on organisational citizenship behaviour and social capital: an intervention using self-determination theory
Shahriar Rahman	Macquarie	Apr-16	Development of a stochastic fire effect model in predicting the impacts of fire severity on vegetation
Saim Raza	Swinburne	Aug-16	Collapse behaviour of limited ductile high-strength RC column
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
Sami Shah	ANU	Feb-18	Development of an integrated method to predict bushfires hazard using remote sensing data and GIS
Rifka Sibarani	CDU	Mar-19	Disaster risk communication the new media landscape: an exploratory case study of northern Tasmania and Lombok
Hayley Squance	Massey	Jun-14	Enhancing multiagency collaboration for animal welfare emergency management
Aye Thandar Phyo Wai	Melbourne	Apr-18	The role of urban planning in urban fire mitigation
Jane Urquhart	LaTrobe	Feb-18	Locating gendered knowledge and practices in Aboriginal fire ecology
Sean Walsh	Melbourne	Jun-16	Improving decision support tools for conservation of fire-adapted ecosystems in southern Australia, through integrated simulation of reproductive ecology and landscape dynamics
Jane Williamson	ACU	Mar-17	Are prescribed fire intervals maintaining fauna habitat?
Bin Xing	Melbourne	Feb-18	Prioritisation strategy for seismic retrofit of reinforced concrete building in Australia
Belinda Young	Melbourne	Dec-17	The viability of shared responsibility in relation to wildfire prevention in Victoria and California
Sergio Zarate	Queensland	Feb-18	Physical and fire behaviour characterisation of bushland fuels

*Masters by Research

APPENDIX 5: MEDIA

KEY BUSHFIRE AND NATURAL HAZARDS CRC MEDIA 2019-20

8 August 2019

The CEO is quoted in *The Sydney Morning Herald* on fire risk in a story about the latest Intergovernmental Panel on Climate Change report

28 August 2019

Live broadcast of the media conference at the AFAC19 powered by INTERSCHUTZ conference to release the *Australian Seasonal Bushfire Outlook: August 2019*, hosted by the CEO alongside senior representatives from the Bureau of Meteorology and fire agencies, on ABC TV's News Channel

The CEO appeared live on ABC TV's News Channel Afternoons to talk about the *Australian Seasonal Bushfire Outlook: August 2019*

TV news on the ABC, 9 and 10 across the country cover the *Australian Seasonal Bushfire Outlook: August 2019*

WIN News TV Gippsland cover the *Australian Seasonal Bushfire Outlook*

Dr Mel Taylor (Macquarie University) appeared live in the ABC TV Breakfast studio to discuss her CRC warnings research

The Age, "Dry Gippsland facing above average bushfire threat" quotes the CEO on the *Australian Seasonal Bushfire Outlook: August 2019*

Sydney Morning Herald, "Australia faces 'very active' bushfire season" quotes the CEO on conditions being driven by increased average temperatures and a decline in rainfall

Sydney Morning Herald, "Dry Gippsland facing above average bushfire threat" quotes the CEO on the *Australian Seasonal Bushfire Outlook: August 2019*

The Guardian, "Bushfire season: Australia warned to prepare early amid grim outlook" analyses the *Australian Seasonal Bushfire Outlook: August 2019*

Canberra Times, "'Bigger, harder, longer running': Fire chief warns Canberra should prepare now" references the *Australian Seasonal Bushfire Outlook: August 2019*

ABC Online Brisbane, "Queensland bushfire season expected to last longer, authorities warn" quotes the CEO on the importance of having a bushfire plan

ABC Online, "Bushfire outlook for 2019-20 not good news, but will we heed the warnings?" quotes the CEO on the importance of having a bushfire plan, quotes Dr Mel Taylor (Macquarie University) on why people don't listen to warnings

The CEO appeared on ABC Victoria Country Hour to discuss the *Australian Seasonal Bushfire Outlook: August 2019*

Dr Jeff Keper (Bureau of Meteorology) spoke about his research on South Australia's severe weather in September 2016 on *ABC Adelaide*

Dr Blythe McLennan (RMIT University) spoke about her volunteering research on ABC Newcastle Mornings

Adelaide Now, "Prolonged fire danger season and dusty days ahead for SA" references the *Australian Seasonal Bushfire Outlook: August 2019*

Newcastle Herald, "Australia faces an active bushfire season" quotes the CEO on the *Australian Seasonal Bushfire Outlook: August 2019*

The New Daily, "Earlier, longer and more dangerous: Dire warnings for bushfire season" quotes the CEO on the *Australian Seasonal Bushfire Outlook: August 2019*

Flinders News, "Australia faces an active bushfire season" quotes the CEO on the *Australian Seasonal Bushfire Outlook: August 2019*

Shepparton News, "Australia faces an active bushfire season" quotes the CEO on the *Australian Seasonal Bushfire Outlook: August 2019*

Nambucca Guardian, "Australia faces an active bushfire season" quotes the CEO on the *Australian Seasonal Bushfire Outlook: August 2019*

Press From, "Queensland bushfire season expected to last longer,

authorities warn" quotes the CEO on the importance of having a bushfire plan

29 August 2019

The CEO appeared live on Channel 7 Sunrise to talk about the *Australian Seasonal Bushfire Outlook: August 2019*

The Australian, "Early start to a long, hot bushfire season" quotes the CEO on conditions being driven by increased average temperatures and a decline in rainfall

ABC Online, "Strathewen Primary school shows the world what kids can do in disasters" quotes Dr Briony Towers (RMIT University) on research into child-centred disaster risk reduction

Nine News, "House fires bigger killer than disasters" references CRC study on residential fire fatalities

The Daily Telegraph, "Fatal fires: Smoking leading cause of preventable residential blaze deaths" on CRC study on residential fire fatalities

The Herald Sun, "Fatal fires: Smoking leading cause of preventable residential blaze deaths" on CRC study on residential fire fatalities

Lucinda Coates (Risk Frontiers) appears on ABC 774 Melbourne Breakfast to discuss the preventable residential fire fatalities research

Adelaide Now, "Fatal fires: Smoking leading cause of preventable residential blaze deaths" on CRC study on residential fire fatalities

The Mercury, "Fatal fires: Smoking leading cause of preventable residential blaze deaths" on CRC study on residential fire fatalities

Seven News, "Smoking the main reason for preventable house fires, study finds" on CRC study on residential fire fatalities

Illawarra Mercury, "The Illawarra faces above normal fire potential for fire this summer, according to new report" analyses the *Australian Seasonal Bushfire Outlook: August 2019*

Geelong Advertiser, "Fatal fires: Smoking leading cause of preventable residential blaze deaths" on CRC study on residential fire fatalities

Bendigo Advertiser, "Bendigo fire season expected to start in October as CFA and emergency agencies urge communities to prepare" quotes the CEO that he expects this year to be potentially very active for fires across the country

Ballina Advocate, "How bad will bushfire season be, and what do you need to do?" references the *Australian Seasonal Bushfire Outlook: August 2019*

Northern Star, "How bad will bushfire season be, and what do you need to do?" references the *Australian Seasonal Bushfire Outlook: August 2019*

The Islander, "Above normal bushfire potential for Kangaroo Island" references the *Australian Seasonal Bushfire Outlook: August 2019*

Crookwell Gazette, "Warm and dry spring likely for most of Australia" references the *Australian Seasonal Bushfire Outlook: August 2019*

Timberbiz, "BNHCRC publishes pre-fire season outlook - it's grim" analyses the *Australian Seasonal Bushfire Outlook: August 2019*

Eyre Peninsula Tribune, "House fires bigger killer than disasters" references CRC study on residential fire fatalities

30 August 2019

The Standard, "Region braces for challenging bushfire season with dry conditions expected to continue" quotes the CEO on conditions being driven by increased average temperatures and a decline in rainfall

The CEO spoke about the *Australian Seasonal Bushfire Outlook: August 2019* and the lessons from research about how and why people should prepare for bushfire season on *Radio Edith Cowen University*

Daily Mail Australia, "Bushfires, searing temperatures and mass fish deaths: Experts predict a 'perfect storm' of conditions will lead to one of the nation's worst summers ever" references the *Australian Seasonal Bushfire Outlook: August 2019*

APPENDIX 5: MEDIA

31 August 2019

[*Daily Examiner*](#), "Bushfire outlook not good for the Valley" analyses the *Australian Seasonal Bushfire Outlook: August 2019*

[*Australian Mine Safety Journal*](#), "Forces of nature" references the *Australian Seasonal Bushfire Outlook: August 2019*

1 September 2019

[*The Age*](#), "'No surge capacity': Dry times take toll on emergency response teams" references the *Australian Seasonal Bushfire Outlook: August 2019*

[*The Brisbane Times*](#), "'No surge capacity': Dry times take toll on emergency response teams" references the *Australian Seasonal Bushfire Outlook: August 2019*

[*The Examiner*](#), "Tasmania's bushfire season expected to begin early" references the *Australian Seasonal Bushfire Outlook: August 2019*

2 September 2019

[*The Conversation*](#) piece by the CEO, "Grim fire season looms but many Australians remain unprepared" on the *Australian Seasonal Bushfire Outlook: August 2019*

[*Insurance News*](#), "Persistent dry, warm spell worsens bushfire risk" references the *Australian Seasonal Bushfire Outlook: August 2019*

[*Hashtag*](#), "Grim fire season looms but many Australians remain unprepared" by the CEO on the *Australian Seasonal Bushfire Outlook: August 2019*

[*Mirage News*](#), "Australia's forest industries to play critical firefighting role this summer" references the *Australian Seasonal Bushfire Outlook: August 2019*

3 September 2019

[*The West Australian*](#), "Call to devise an early bushfire response plan" references the *Australian Seasonal Bushfire Outlook: August 2019*

[*Newcastle Herald*](#), "Grim fire season looms but many Australians remain unprepared" by the CEO on the *Australian Seasonal Bushfire Outlook: August 2019*

[*Goulburn Post*](#), "Warm and dry spring likely for most of Australia" references the *Australian Seasonal Bushfire Outlook: August 2019*

[*Northern Daily Leader*](#), "Grim fire season looms but many Australians remain unprepared" by the CEO on the *Australian Seasonal Bushfire Outlook: August 2019*

[*Town and Country*](#), "Warm and dry spring likely for most of Australia" references the *Australian Seasonal Bushfire Outlook: August 2019*

[*South Western Times*](#), "Call to devise an early bushfire response plan" references the *Australian Seasonal Bushfire Outlook: August 2019*

[*Timberbiz*](#), "Forestry firefighters on call for communities around Australia" references the *Australian Seasonal Bushfire Outlook: August 2019*

4 September 2019

[*Manila Metro*](#), "Grim fire season looms but many Australians remain unprepared" by the CEO on the *Australian Seasonal Bushfire Outlook: August 2019*

5 September 2019

[*Busselton-Dunsborough Times*](#), "Bushfire season red alert" references the *Australian Seasonal Bushfire Outlook: August 2019*

[*The Islander*](#), "Islander editorial - Let's talk about the hot, dry weather" references the *Australian Seasonal Bushfire Outlook: August 2019*

[*Bairnsdale Advertiser*](#), "A bushfire focus area" references the *Australian Seasonal Bushfire Outlook: August 2019*

[*F3News*](#), "'Dead things everywhere': is Australia facing the summer from hell?" quotes the CEO on the ongoing drought driving much of the risk this fire season

6 September 2019

[*Scimex*](#), "EXPERT REACTION: Queensland bushfires" quotes the CEO on the release of the *Australian Seasonal Bushfire Outlook: August 2019*

[*Stock Journal*](#), "High fire risk predicted for Lower EP, KI" quotes the CEO on the importance of having a bushfire plan

[*The Examiner*](#), "Gauge on Climate: Retired Tasmania Fire Service chief speaks out" references the *Australian Seasonal Bushfire Outlook: August 2019*

7 September 2019

[*The Guardian*](#), "'Dead things everywhere': is Australia facing the summer from hell?" quotes the CEO on the ongoing drought driving much of the risk this fire season

8 September 2019

[*The Courier Mail*](#), "How Australian firefighting units battle blazes when there's no water because of drought" cites the *Australian Seasonal Bushfire Outlook: August 2019*

9 September 2019

[*The Sydney Morning Herald*](#), "'I've gone beyond predicting': Bushfire risk higher this summer, warns Suncorp chief" references the *Australian Seasonal Bushfire Outlook: August 2019*

[*Brisbane Times*](#), "'I've gone beyond predicting': Bushfire risk higher this summer, warns Suncorp chief" references the *Australian Seasonal Bushfire Outlook: August 2019*

[*The Guardian*](#), "Like nothing we've seen: Queensland bushfires tear through rainforest" quotes Board member Lee Johnson on the erratic bushfire front into subtropical rainforests

[*Daily Mail Australia*](#), "Swimming pool bans, \$50k fines and dobbing in your neighbours for watering the lawn: How Australians are heading for the world's most BRUTAL water restrictions" cites the *Australian Seasonal Bushfire Outlook: August 2019*

[*Press From*](#), "More than climate change driving Queensland fires, explain climatologists", the CEO warns that even a small ignition source in forests can cause major problems right now

[*Warrandyte Diary*](#), "Prepare now for bushfire season" quotes the CEO on the release of the *Australian Seasonal Bushfire Outlook: August 2019*

[*Insurance News*](#), "High-risk areas not prepared for bushfire threat" quotes the CEO extensively on CRC research into community preparedness and responses

[*Insurance News*](#), "Claims lodged as bushfires rage in NSW and Queensland" references the *Australian Seasonal Bushfire Outlook: August 2019*

The CEO is quoted extensively in "Gold Coast hinterland fire prompts question - can rainforests burn?" in [*Press From*](#) on fire conditions in rainforests

[*Water source*](#), "Scenario planning lessons from a disaster management expert" quotes Prof Holger Maier (University of Adelaide) on mitigation strategies to prevent bushfires

10 September 2019

[*The Sydney Morning Herald*](#), "Fires are burning where they never used to burn", CRC research proves Very High fire danger days are increasing

The CEO is quoted extensively in "Gold Coast hinterland fire prompts question - can rainforests burn?" in [*ABC Online*](#) on fire conditions in rainforests

[*The Guardian*](#), "Australian natural disasters minister David Littleproud: 'I don't know if climate change is manmade'", CRC says the fire danger index increasing is expected to continue

[*The Daily Examiner*](#), "Intense blazes, longer fire seasons 'new normal' for region" quotes NSW fire chief Greg Mullins on CRC research into rising temperatures

[*The Lighthouse*](#), "House fires kill more Australians than all natural hazards" references CRC study into residential fire fatalities

[*Australia's Science Channel*](#), "Queensland bushfires: Is this the new normal?" quotes the CEO on the expected fire season ahead and cites the *Australian Seasonal Bushfire Outlook: August 2019*

11 September 2019

[*The New Daily*](#), "A patchwork of risk: Queensland bushfires just a taste of things to come" cites the *Australian Seasonal Bushfire Outlook: August 2019*

[*Liberation*](#) (France), "In Australia, a 'Herculean' fight against forest fires" quotes the CEO on heading to a very severe fire season

APPENDIX 5: MEDIA

12 September 2019

The CRC and CEO are extensively quoted in [The Australian](#), "And the flames went higher in a spring of fire" on the difficult fire season ahead
[The Age](#), "'It's going to be a bad year': Victoria's bushfire threat looms large" quotes the CEO on the drought indicating a bad fire season

[Brisbane Times](#), "'It's going to be a bad year': Victoria's bushfire threat looms large" quotes the CEO on the drought indicating a bad fire season

[WA Today](#), "'It's going to be a bad year': Victoria's bushfire threat looms large" quotes the CEO on the drought indicating a bad fire season

[BBC Radio](#) interview with the CEO on the early start to the fire season

[Timberbiz](#), "Plantation insurance – the pressure is on" awaits the update to the *Australian Seasonal Bushfire Outlook*

[Asia InfoNews](#), "More than 80 wildfires consume Australia's forests", the CEO warns that even a small ignition source in forests can cause major problems right now

14 September 2019

[The Australian](#), "Tinder-dry forests fuel global fires" quotes the CEO on burning rainforests indicating how dry and dangerous the conditions are

18 September 2019

[The Age](#), "Horror fire season ahead with East Gippsland to bear brunt" references the *Australian Seasonal Bushfire Outlook: August 2019*

[The Islander](#), "Prescribed burn season on KI to begin within four weeks" references the *Australian Seasonal Bushfire Outlook: August 2019*

19 September 2019

The CEO is quoted extensively in "Australia's fire season gets severe" appearing in [China Daily](#) which reported on the upcoming bushfire season

20 September 2019

The CEO is extensively quoted in "Australia gets ready for potentially catastrophic fire season" in [Al-Jazeera](#) on firefighter strategies and the bushfire season

[PR Wire](#), "Emergency management sector continues to grow, diversify and ride the waves of change at largest AFAC yet" announces the release of the *Australian Seasonal Bushfire Outlook: August 2019*

[Press From](#), "Australia gets ready for potentially catastrophic fire season" quotes the CEO extensively on firefighter strategies and the bushfire season

21 September 2019

[United News](#) (The Philippines), "Australia's fire season gets severe" quotes the CEO extensively on Australia running about 1°C above the long-term average, meaning extreme weather will be more extreme

23 September 2019

[Geelong Indy](#), "Bushfire 'risk' for livelihoods", CRC forecast an above normal fire potential for Victoria this summer

24 September 2019

The CRC is cited in "Disasters pose home loan risks" in [The Australian](#) on the risks that disasters pose to home insurance

30 September 2019

Both the CEO and the *Australian Seasonal Bushfire Outlook: August 2019* are quoted in "Braced for summer of flame" in [The Australian](#) that looks at overlapping bushfire seasons

[Insurance News](#), "Industry urged to heed climate change warnings" quotes the CEO on the signs for the upcoming fire season presenting a concern

[UK Fire Magazine](#), "A successful AFAC 19 – Emergency managers preparing for the future" comments on the CRC's Research Forum at AFAC19

1 October 2019

[Asia Pacific Fire](#), "AFAC19 powered by INTERSCHUTZ Conference and exhibition review" announces the launch of the *Australian Seasonal Bushfire Outlook: August 2019*

4 October 2019

The CEO is quoted in [The Advertiser](#) in "Greta or Tony? It's the burning issue of the age" on how climate change is affecting where bushfires are burning

[ABC Radio AM](#) interviews Prof David Bowman (University of Tasmania) preparing for the upcoming fire season and the future of the CRC

6 October 2019

The CEO appeared on [ABC Radio National's](#) Background Briefing in an episode covering bushfires, where he spoke about the role of the CRC

7 October 2019

The CEO is quoted in a feature article, "Australia is not prepared to fight the bushfires of the future, experts warn", appearing on [ABC Online](#) that examines the future of bushfires

[Warrandyte Diary](#), "Prepare now for bushfire season" quotes the CEO on the *Australian Seasonal Bushfire Outlook: August 2019*

8 October 2019

[Campus Morning Mail](#), "CRCs are supposed to come and go, but some stay and stay" on the interest in securing future funding for the CRC

9 October 2019

[24heures](#) (Switzerland), "A 'Herculean' fight against forest fires" quotes the CEO on heading to a very severe fire season

[Lematin.CH](#) (Switzerland), "A 'Herculean' fight against forest fires" quotes the CEO on heading to a very severe fire season

[Oman Daily Observer](#), "'Herculean' efforts save homes as Australia fires rage" quotes the CEO on the concern of the current bushfire severity

11 October 2019

[Mirage News](#), "Preparation key to saving lives this bushfire season: International Day for Disaster Reduction", media release on CRC project into bushfire preparedness to provide emergency services and councils with a way to enable communities to save lives and properties

13 October 2019

[MENAFN](#), "Australia could see fewer cyclones, but more heat and fire risk in coming months" references the *Australian Seasonal Bushfire Outlook: August 2019*

14 October 2019

[The Conversation](#), "Australia could see fewer cyclones, but more heat and fire risk in coming months" references the *Australian Seasonal Bushfire Outlook: August 2019*

15 October 2019

ABC National TV news features the Research Director discussing the *Australian Seasonal Bushfire Outlook: August 2019*

The CEO appeared on ABC TV Afternoons to discuss the *Australian Seasonal Bushfire Outlook: August 2019* and how people understand fire risk

ABC Radio PM features the Research Director discussing the *Australian Seasonal Bushfire Outlook: August 2019*

The CEO discussed *Australian Seasonal Bushfire Outlook: August 2019* on ABC News Radio

The Research Director appeared on ABC Adelaide Drive to discuss how people understand fire risk

[ABC Online](#), "'If this is the new reality', will more Australians need to ask: am I in a bushfire zone?" quotes the Research Director on the early start to the bushfire season

[News Pronto](#), "Australia could see fewer cyclones, but more heat and fire risk in coming months" references the *Australian Seasonal Bushfire Outlook: August 2019*

The CRC is cited in [NIKKEI Asian Review](#) in "Australian farm exports wither under 'worst drought in 50 years'" looking at the early

APPENDIX 5: MEDIA

start to the bushfire season due to drought, high temperatures and strong winds

17 October 2019

The CEO and the *Australian Seasonal Bushfire Outlook: August 2019* are quoted in [The Age](#) in an article detailing fire drills in outer Melbourne, "Three towns to be evacuated in one of state's biggest ever fire drills"

The *Australian Seasonal Bushfire Outlook: August 2019* is pictured in "Bushfire season brought forward as authorities react to rising risk" in [NT News](#) that looks at the fire risk and early start to the bushfire season in South Australia

18 October 2019

The Hon Minister David Littleproud MP discussed the CRC in an interview with [ABC Landline](#) about increased fires and resources

19 October 2019

The *Australian Seasonal Bushfire Outlook: August 2019* was cited by [ABC Landline](#) as they looked at unprecedented bushfires and the early onset of the bushfire season for Australia's east coast

23 October 2019

[Future Directions International](#), "Australia must learn from past lessons to increase firefighting efficiency" references the *Australian Seasonal Bushfire Outlook: August 2019*

[Architecture Design](#), "James Hardie gets your home ready for bushfire season", CRC predicts an above average fire threat

24 October 2019

[NT News](#), "Country Fire Service battling a spate of grass fires ahead of cool change" referenced the *Australian Seasonal Bushfire Outlook: August 2019*

28 October 2019

The Research Director discusses how people understand their fire risk on ABC Goulburn Murray Victoria Mornings

10 November 2019

The CEO appeared live on ABC TV's weekend breakfast to discuss the bushfire season

The CEO appeared live on CNN International to discuss the bushfire season

The CEO appeared live on BBC World News to discuss the bushfire season

11 November 2019

[ABC AM](#) interviews the CEO on warnings to residents living in bushfire prone areas

[3AW Mornings](#), Neil Mitchell interviews the CEO on the current and future fire seasons

[ABC Brisbane Mornings](#) interviews the CEO on the current and future fire seasons

[ABC NSW Statewide Drive](#) interviews the CEO on the current and future fire seasons

[WA Today](#), "PM praises 'great spirit' of firefighters as blazes claim three lives" quotes the CEO on the *Australian Seasonal Bushfire Outlook: August 2019*

[SBS News](#), "How to protect yourself and your property on a 'catastrophic' bushfire danger day" quotes the CEO on warnings to residents living in bushfire prone areas

[The Guardian](#), "Dear Michael McCormack: the only 'raving lunatics' are those not worrying about climate change" quotes the CEO on Australia running about 1°C above the long-term average, meaning more frequent and severe fires

[BBC Australia](#), "Is climate change to blame for Australia's bushfires?" quotes the CEO on Australia running about 1°C above the long-term average, meaning more frequent and severe fires

[The Lighthouse](#), "Get out now: Why Sydney's first catastrophic fire warning will save lives" extensively quotes Dr Mel Taylor (Macquarie University) on catastrophic fire danger ratings

[Renew Economy](#), "Climate experts call 'BS' as government offers only 'thoughts and prayers' for fire crisis" quotes the CEO on the complexity of the bushfire issue, and quotes Andrew Gissing (Risk Frontiers) on climate projections of severe bushfire weather

[Landscape Architecture Aotearoa](#), "Climate change and wildfires" quotes the CEO on Australia running about 1°C above the long-term average, meaning more frequent and severe fires

12 November 2019

Dr Mel Taylor (Macquarie University) appears on 10 Daily National News discussing bushfire preparedness

[The Daily Telegraph](#), "Bushfire crisis must be a climate wake-up call for Australia's leaders" quotes the CEO that climate change can make weather conditions conducive to large fires

[News.com.au](#), "NSW and QLD bushfires: How to save your home" quotes the CEO on not contemplating fighting off property during a bushfire

[SBS News](#), "Scientists say the NSW mega fires are linked to climate change. Here's how" quotes the CEO that the cumulative fire danger during a fire season is higher, and references the *Australian Seasonal Bushfire Outlook: August 2019*

[NewScientist News](#), "Worsening bushfires cause Australia to declare state of emergency" quotes the CEO on conditions for bushfire

[NZ Herald](#), "Australia fires: NSW and Queensland residents brace for 'catastrophic' fire danger as weather conditions worsen" quotes Andrew Gissing (Risk Frontiers) on the danger Sydney residents could face

[Stuff.co.nz](#), "Australia's east coast is in for 'catastrophic' fire conditions. Here's what they can expect" quotes the CEO on conditions for bushfire

[Stuff.co.nz](#), "Australia's bushfires: Sydney's most at-risk postcodes for NSW's fires" quotes Andrew Gissing (Risk Frontiers) on the risk of bushfires expected to grow in future

[The Australian National University's](#) Dr Marta Yebra is helping the NSW Rural Fire Service make informed decisions about fire spread using CRC research

[Global News](#), "Hot, dry and dangerous: Australia's 'catastrophic' bushfires creep toward Sydney" quotes the CEO on Australia running about 1°C above the long-term average, meaning more frequent and severe fires

[Pacific Scoop](#), "Bushfires rage along Australian East Coast - Expert Reaction" quotes the CEO on the *Australian Seasonal Bushfire Outlook: August 2019* showing the fire season had the potential to be devastating, Andrew Gissing (Risk Frontiers) on property damage and loss of life, Prof David Bowman (University of Tasmania) on fire activity, and Prof Ross Bradstock (University of Wollongong) on the situation in northern NSW

13 November 2019

[The Australian](#), "Bushfires: why this season is so different" quotes the CEO on people underestimating bushfire risk, and references the *Australian Seasonal Bushfire Outlook: August 2019*

[The Courier Mail](#), "Australia in 'uncharted territory' with bushfire risk this summer, with the worst yet to come" quotes the CEO on the *Australian Seasonal Bushfire Outlook: August 2019*, Prof Ross Bradstock (University of Wollongong) on the scale of the fires, and Prof David Bowman (University of Tasmania) on the likelihood of bushfire risk intensifying

[News.com.au](#), "Australia in 'uncharted territory' with bushfire risk this summer, with the worst yet to come" quotes the CEO on the *Australian Seasonal Bushfire Outlook: August 2019*, Prof Ross Bradstock (University of Wollongong) on the scale of the fires, and Prof David Bowman (University of Tasmania) on the likelihood of bushfire risk intensifying

[News.com.au](#), "Worst bushfire conditions ever seen: Unprecedented danger is 'a firefighter's nightmare'" quotes the CEO on the *Australian Seasonal Bushfire Outlook: August 2019* and Prof David Bowman (University of Tasmania) on the most serious bushfire threat ever seen

[The New Daily](#), "Facing up to those 'big C' words the PM can't bring himself to utter" quotes the CEO on demographic changes impacting severe weather, Andrew Gissing (Risk Frontiers) on bushfire weather severity and Prof David Bowman (University of Tasmania) on adapting to climate change driven bushfires

[Xinhua Net](#), "Further casualties avoided but homes lost in Australian bushfires" quotes Andrew Gissing (Risk Frontiers) on managing fire emergencies

APPENDIX 5: MEDIA

14 November 2019

Dr Jim McLennan (LaTrobe University) and Dr Mel Taylor (Macquarie University) are quoted in "Why do some people decide to stay at home during bushfire emergencies?" on [ABC Online](#)

Board member Lee Johnson is quoted in an article on *7 News* and *The Age* on how emergency services are managing the future fires of Australia

Board member Lee Johnson and Andrew Gissing (Risk Frontiers) are extensively quoted in an article appearing in *The Guardian* on the changes in Australia's bushfire season

16 November 2019

The CEO and Prof Mehmet Ulubasoglu (Deakin University) are quoted in "Australia bushfires: too early to estimate losses from climate change disaster, warnings of catastrophic disaster" in [The International Business](#)

17 November 2019

Dr Josh Whittaker and Dr Katharine Haynes (University of Wollongong) co-author "In the path of disaster: The big causes of bushfires that most of us are missing" in [The Sydney Morning Herald](#) on bushfire risk and land use planning, quoting the CEO and Prof Alan March (University of Melbourne)

18 November 2019

The Research Director appears on [ABC Melbourne's Conversation Hour](#) alongside Emergency Management Victoria Commissioner Andrew Crisp and La Trobe University's Prof Jim McLennan to discuss bushfire risk, planning and preparation for fire and staying to defend or leave early.

Dr Mel Taylor (Macquarie University) appears on ABC Radio Brisbane Mornings to talk about animals and their role in how people prepare for a bushfire

19 November 2019

Prof David Bowman (University of Tasmania) co-authors "Our land is burning, and western science does not have all the answers" in [The Conversation](#)

20 November 2019

The CEO and Prof Vivienne Tippet (Queensland University of Technology) are quoted extensively in [The Australian](#), "Keeping message simple during a bushfire emergency" on messages and warnings during an emergency

[The Australian](#), "Alarmists insist that where there's fire there are facts" quotes the CEO on rising temperatures

The Research Director appears on ABC Canberra Mornings to discuss the impacts of the CRC

The Research Director appears on BBC Radio 5 Live to discuss Australia's bushfire season

[The Conversation](#) article by Dr Danielle Every (CQUniversity) and Dr Mel Taylor (Macquarie University), "It's hard to breathe and you can't think clearly - if you defend your home against a bushfire, be mentally prepared"

[SBS News](#), "If you stay to defend your home from a bushfire - this is what you need to know" by Dr Danielle Every (CQUniversity) and Dr Mel Taylor (Macquarie University)

[The Conversation](#), "Climate change will make fire storms more likely in southeastern Australia" by A/Prof Jason Sharples (University of New South Wales)

[Manila Metro](#), "Climate change will make fire storms more likely in southeastern Australia" by A/Prof Jason Sharples (University of New South Wales)

21 November 2019

[SBS News](#), "Why do Australia's bushfire defences rely on tens of thousands of volunteers?", Neil Bibby (Country Fire Authority) calls for increased funding to the CRC

[Business Daily](#), "It's hard to breathe and you can't think clearly - if you defend your home against a bushfire, be mentally prepared" by Dr Danielle Every (CQUniversity) and Dr Mel Taylor (Macquarie University)

[UNSW Newsroom](#), "Climate change will make fire storms more likely in southeastern Australia" by A/Prof Jason Sharples (University of New South Wales)

[Big News Network](#), "Climate change will make fire storms more likely in southeastern

Australia" by A/Prof Jason Sharples (University of New South Wales)

23 November 2019

[The Washington Post](#), "As Australia bushfires rage, country offers lessons for the wildfire-prone western U.S." quotes the CEO on emergency services' warnings and bushfire policy

27 November 2019

[The Conversation](#) piece by Dr Blythe McLennan (RMIT University), "As bushfires intensify, we need to acknowledge the strain on our volunteers"

2 December 2019

[Particle](#), "Burning the country at both ends" quotes the Research Director on fire conditions worsening and the importance of understanding the risks

3 December 2019

[Sydney Morning Herald](#) opinion piece by Jenna Price "As a grandma-to-be I can no longer stay out of this debate" quotes the CEO on the bushfire season getting longer and cumulatively worse

[The Age](#) opinion piece by Jenna Price "As a grandma-to-be I can no longer stay out of this debate" quotes the CEO on the bushfire season getting longer and cumulatively worse

[Mirage News](#), "Past research points to potential economic impacts of recent bushfires", Prof Mehmet Ulubasoglu (Deakin University) discusses the outcomes of his CRC project

4 December 2019

[ABC NewsRadio](#) interviews the CEO on bushfires and smoke

[MSN News](#), "Jodi McKay says the NSW firefighting is budget facing a \$40 million cut. Is that correct?", Dr Veronique Florec (University of Western Australia) said she was not aware of an index to measure the rising costs of firefighting

5 December 2019

[ABC Fact Check](#), "Jodi McKay says the NSW firefighting is budget facing a \$40 million cut. Is that correct?", Dr Veronique Florec (University of Western Australia) said she was not aware of an index to measure the rising costs of firefighting

10 December 2019

[ABC News](#), "Smoke and bushfires are the new norm, so how do we beat the 'airpocalypse'?" quotes the CEO that there are things we can do in terms of fuel reduction, also quotes Prof David Bowman (University of Tasmania) on the smoke haze indicating an issue with our fire management

[The Conversation](#), "To save koalas from fire, we need to start putting their genetic material on ice" cites the *Australian Seasonal Bushfire Outlook: August 2019*

16 December 2019

[ABC News](#), "Bushfire outlook update makes for more grim reading for summer ahead" quotes the CEO on updates to the *Australian Seasonal Bushfire Outlook*

"Australia needs a national crisis plan, and not just for bushfires" writes Andrew Gissing (Risk Frontiers) and A/Prof Michael Eburn (Australian National University) in [The Conversation](#)

[The Guardian](#), "Australia fires: up to 20 buildings feared lost near Sydney as extreme heat forecast", the CRC warned that NSW is facing a long and challenging fire season ahead in the *Australian Seasonal Bushfire Outlook: December 2019*

[Al-Jazeera](#), "Record heat heightens Australia's fire hazard" quotes the CEO on updates to the *Australian Seasonal Bushfire Outlook: December 2019*

[Newcastle Herald](#), "Doctors urge PM, premier to act on smoke" references the *Australian Seasonal Bushfire Outlook: December 2019*

[EMV](#) media release "Above normal conditions in Central Victoria and Gippsland" analyses the *Australian Seasonal Bushfire Outlook: December 2019*

[Insurance News](#), "Above-normal fire threat remains, new report says"

APPENDIX 5: MEDIA

analyses the *Australian Seasonal Bushfire Outlook: December 2019*

Redland City Bulletin, "NSW properties feared lost after backburns", the CRC warned that NSW is facing a long and challenging fire season ahead in the *Australian Seasonal Bushfire Outlook: December 2019*

Toorak Times, "Australia needs a national crisis plan, and not just for bushfires" writes Andrew Gissing (Risk Frontiers) and A/Prof Michael Eburn (Australian National University)

Up News, "Record heat increases Australia's fire hazard" quotes the CEO on updates to the *Australian Seasonal Bushfire Outlook: December 2019*

Unilad, "Guy donates crate of beer to exhausted firefighters battling raging bushfire" quotes the CEO on considering action plans in the face of a challenging season

17 December 2019

7 News, "NSW firefighters desperate to contain blazes ahead of worsening conditions in heatwave", the CRC warned that NSW is facing a long and challenging fire season ahead in the *Australian Seasonal Bushfire Outlook: December 2019*

The Age, "Victoria braces for hottest ever December day" cites the *Australian Seasonal Bushfire Outlook: December 2019*

Daily Telegraph, "Record-breaking heatwave set to elevate NSW's fire risk", the CRC warned that NSW is facing a long and challenging fire season ahead in the *Australian Seasonal Bushfire Outlook: December 2019*

The Advertiser, "Significant bushfire threat in SA this summer as prolonged hot and dry conditions take hold" analyses the *Australian Seasonal Bushfire Outlook: December 2019*

Cairns Post, "Record-breaking heatwave set to elevate NSW's fire risk", the CRC warned that NSW is facing a long and challenging fire season ahead in the *Australian Seasonal Bushfire Outlook: December 2019*

Barossa Herald, "Heatwave set to elevate NSW fire risk", the CRC warned that NSW is facing a long and challenging fire season ahead in the *Australian Seasonal Bushfire Outlook: December 2019*

The Courier, "Heatwave set to elevate NSW fire risk", the CRC warned that NSW is facing a long and challenging fire season ahead in the *Australian Seasonal Bushfire Outlook: December 2019*

The Standard, "Heatwave set to elevate NSW fire risk", the CRC warned that NSW is facing a long and challenging fire season ahead in the *Australian Seasonal Bushfire Outlook: December 2019*

Western Magazine, "Heatwave set to elevate NSW fire risk", the CRC warned that NSW is facing a long and challenging fire season ahead in the *Australian Seasonal Bushfire Outlook: December 2019*

Stawell Times, "Heatwave set to elevate NSW fire risk", the CRC warned that NSW is facing a long and challenging fire season ahead in the *Australian Seasonal Bushfire Outlook: December 2019*

Katherine Times, "Heatwave set to elevate NSW fire risk", the CRC warned that NSW is facing a long and challenging fire season ahead in the *Australian Seasonal Bushfire Outlook: December 2019*

MSN News, "Boy, 12, drives through a burning paddock to escape raging bushfire that spread to his home as residents are evacuated and mega blaze continues to burn", the CRC warned that NSW is facing a long and challenging fire season ahead in the *Australian Seasonal Bushfire Outlook: December 2019*

Star 104.5, "Firefighters brace for dangerous conditions as heatwave hits NSW" quotes the CEO on heatwave temperatures driving down humidity, creating a dry landscape with more fuel for fires

Insurance Asia, "Further damage in New South Wales as 20 buildings destroyed", *Australian Seasonal Bushfire Outlook: December 2019* indicates above-normal fire risk for the eastern region

18 December 2019

The Land, "Fire threat rolls into dry 2020" analyses the *Australian Seasonal Bushfire Outlook: December 2019*

Insurance News Magazine, "Spring blazes promise a summer from hell" quotes the CEO on research into pyrocumulonimbus

systems, also quotes Prof David Bowman (University of Tasmania) on the extent of the toll of the ongoing drought on the environment in the article, *Fiery omens*

My Style News, "Australia records hottest day since 2013 amid heatwave, fires" quotes the *Australian Seasonal Bushfire Outlook: December 2019*

20 December 2019

The CEO appeared live on BBC World News TV to discuss Australia's bushfire risk

23 December 2019

The CEO Magazine, "Australia's biggest fire destroys area seven times the size of Singapore" quotes the CEO that there is an above-normal fire potential for the rest of summer

The Daily Examiner, "Bushfire outlook for summer released" announces the release of the *Australian Seasonal Bushfire Outlook: December 2019*

27 December 2019

SBS News, "Hunter/hunted: when bushfires burn, what happens to predators?" writes A/Prof Euan Ritchie and Dr Tim Doherty (Deakin University)

31 December 2019

The Sydney Morning Herald, "Experts warn extreme bushfire weather risk growing" references a Bushfire CRC 2009 study, *Assessing the impact of climate change on extreme fire weather events over south-eastern Australia*

1 January 2020

ABC Radio National Breakfast interviews A/Prof Jason Sharples (University of New South Wales) about fire thunderstorms

The Canberra Times, "Australian bushfire insurance claims set to soar as toll mounts", the CRC warned to expect an extended and protracted bushfire season, driven by the drought, high temperatures, strong winds and dry vegetation

2 January 2020

"I can still picture the faces": Black Saturday firefighters want you to listen to them, not call them 'heroes'", writes Dr Graham Dwyer (Swinburne University) in *The Conversation*

3 January 2020

3AW Mornings Neil Mitchell interviews the CEO on whether devastating bushfires are the new normal

The Australian, "Strategy needed to mitigate fire risks", agencies including the CRC have clear ideas on what can be done to help reduce the impact of natural hazards

Sri Lanka Guardian, "What are some of the effects of the Australian bushfires?" quotes the CEO on Australia running about 1°C above the long-term average and seasons are starting earlier

4 January 2020

The Australian, "Doing more of the same on fires will not mitigate disaster impact", CEO opinion piece on the road to recovery following the fire season

Geelong Advertiser, "Scott Morrison in damage control but far from terminal" references the *Australian Seasonal Bushfire Outlook: August 2019* warnings

5 January 2020

Medium, "What brought hell to Australia" references the warnings of the *Australian Seasonal Bushfire Outlook: December 2019*

6 January 2020

ABC 7.30 interviews Andrew Gissing (Risk Frontiers) on the need for nationwide responses to catastrophic events

The Australian, "Bushfires: Insurers seek funds for research centre", the Insurance Council of Australia urges the federal government to commit to funding the CRC further

ABC Triple J Hack, "Why wasn't there more prescribed burning, and would it have helped?" interviews the CEO on the complexity of the hazard reduction issue

APPENDIX 5: MEDIA

[Liberation](#) (France), "The fires will have serious consequences for health, especially at the psychological level" quotes the CEO on the health consequences of fires on emergency service workers and volunteers

[Yahoo Finance](#), "Local businesses, economies burnt by Australian bushfires", references the Australian Disaster Resilience Index

[Global Travel Media](#), "As bushfire and holiday seasons converge, it may be time to say goodbye to the typical Australian summer holiday" writes Prof David Bowman (University of Tasmania) on the risk of holidaying in peak fire seasons

7 January 2020

[The Sydney Morning Herald](#), "Prescribed burning: what is it and will more reduce bushfire risks?" quotes the CEO on the extent of prescribed burning being done, also quotes Prof Ross Ross Bradstock (University of Wollongong) on the rate of spread and intensity of fires

[The Atlantic](#), "How long will Australia be livable?" quotes the CEO on the effectiveness of the new message to leave early for survival

[The Weather Channel](#), "24 charged with deliberately starting bushfires in Australia" quotes the CEO on Australia running about 1°C above the long-term average, meaning more frequent and severe fires

[The Herald](#) (Scotland), "Investing in fossil-fuel firms is not as immoral as it seems" quotes the CEO that the cumulative fire danger during a fire season is higher

[John Menadue's blog](#), "What sort of inquiry should come after these fires?" writes Dr Michael Eburn and Prof Steven Dovers (Australian National University)

[The Conversation](#) article by Prof David Bowman (University of Tasmania), "A crisis of underinsurance threatens to scar rural Australia permanently" on miscalculating rebuilding costs after disasters

[Terra Daily](#), "Ferocious fires in Australia intensify", *Australian Seasonal Bushfire Outlook: August 2019* warned above normal bushfire potential for large fires to take hold

[Redland City Bulletin](#), "Hazard reduction 'not only solution'" quotes the CEO on the complexity of the hazard reduction issue

[The Conversation](#) piece by Prof David Bowman (University of Tasmania), "There's no evidence 'greenies' block bushfire hazard reduction but here's a controlled burn idea worth trying" on using the Landcare model for bushfire hazard reduction

[Press From](#), "The only answer to Australia's bushfires" quotes the CEO on the effectiveness of the new message to leave early for survival

[News Week](#), "Australia's wildfires are so intense they're creating 'firestorms': 'everything that goes into these phenomena are at their worst'" references the article, Predicting fire thunderstorms, from Issue One 2018 of *Fire Australia*

[China Daily](#), "A hot, dry country caught between fire and a coal face", *Australian Seasonal Bushfire Outlook: August 2019* warned of a clear trend for fire seasons to become more intense and fire danger to occur earlier

8 January 2020

[The Age](#), "We have the power to address climate change" references the Bushfire CRC 2005 report *Climate change impacts on fire-weather in south-east Australia*

[The Guardian](#), "Hazard reduction burns are not a 'panacea' for bushfire risk, RFS boss says" quotes the CEO that the cumulative fire danger during a fire season is higher

[ABC Radio The World Today](#) interviews the CEO on about fuel management and hazard reduction burns

[Federal Labor Leader Media Releases](#), "Ecological audit needed following national disaster" calls on the Government to guarantee continued funding for the CRC

[The Conversation](#) article co-authored by Prof David Bowman (University of Tasmania), "A season in hell: bushfires push at least 20 threatened species closer to extinction" on recovering from environmental losses of the fire season

[The New Daily](#), "Hazard reduction not a 'panacea': RFS boss" quotes the

CEO that the cumulative fire danger during a fire season is higher

[Daily Mail](#), "Hazard reduction not a panacea: RFS boss" quotes the CEO that the cumulative fire danger during a fire season is higher

[MSN News](#), "How long will Australia be livable?" quotes the CEO on the effectiveness of the new message to leave early for survival

[Business Scoop](#), "Australian bushfires continue to blaze - Expert Reaction" quotes the CEO on the complexities of hazard reduction burning, and quotes Andrew Gissing (Risk Frontiers) on the need to consider the changing nature of emergency services during a catastrophe

9 January 2020

[7 News](#), "Hazard reduction failure not cause of devastating fires according to experts" quotes the CEO that the cumulative fire danger during a fire season is higher

[Western Sydney University](#), "Experts offer comment on national bushfire crisis" features Dr Jessica Weir (Western Sydney University)

[Slate](#), "Australia was warned" references the Bushfire CRC 2009 study on rare weather events fuelling fires

[Mama Mia](#), "Amelia lost her firefighter husband at 27. Years later, she learned his job may have killed him" references a Bushfire CRC report on the respiratory health of firefighters

[China.org](#), "Australian bushfires destroy wildlife, huge tracts of land amid slow gov't response" quotes Andrew Gissing (Risk Frontiers) on the need to consider the prospect of future bushfire crises

11 January 2020

[The Australian](#), "Cool heads needed to craft response to bushfire crisis" references the CEO warning that Australia is staring at a difficult fire season following above-average temperatures and severe drought

[Daily Mail Australia](#), "Bushfires bring fears of 'new normal' to life Down Under" quotes the CEO on climate change causing more frequent catastrophic fire conditions

[Terra Daily](#), "Bushfires bring fears of 'new normal' to Australia as death toll mounts"

quotes the CEO on climate change causing more frequent catastrophic fire conditions

12 January 2020

[BBC News](#), "Australia fires: Aboriginal planners say the bush 'needs to burn'" quotes the CEO on cultural burning being integrated with other strategies in some states

[The Independent](#), "Bushfires bring fears of 'new normal' to life Down Under" quotes the CEO on climate change causing more frequent catastrophic fire conditions

[Today Online](#), "Bushfires bring fears of 'new normal' to life Down Under" quotes the CEO on climate change causing more frequent catastrophic fire conditions

13 January 2020

[MSN News](#), "Blue Mountains resident fought for permission to hazard reduction burn for two and a half years" quotes the CEO on the complexity of the hazard reduction issue

[MSN News](#), "Why Aboriginal planners say the bush 'needs to burn'" quotes the CEO on cultural burning being integrated with other strategies in some states

[Daily Times](#), "Bushfires bring fears of 'new normal' to life Down Under" quotes the CEO on climate change causing more frequent catastrophic fire conditions

[1 Source News](#), "Australia fires: Aboriginal planners say the bush 'needs to burn'" quotes the CEO on cultural burning being integrated with other strategies in some states

[Asia Pacific Fire](#), "Understanding preventable residential fire fatalities" by Lucinda Coates (Risk Frontiers) on identifying people most at risk of dying in residential fires

[Asia Pacific Fire](#), "Predicting fire thunderstorms" by Dr Kevin Tory (Bureau of Meteorology) on diagnosing the minimum fire heat required for fire thunderstorm development

[Asia Pacific Fire](#), "Spot fires - a dynamic interaction" by A/Prof Jason Sharples (University of New South Wales) on the role pyroconvective interactions and spot-fire dynamics play in the spread of fires

APPENDIX 5: MEDIA

14 January 2020

[Brisbane Times](#), “Science Minister says climate denial a waste of time in wake of fires”, science roundtable will include scientists from the CRC

[The Conversation](#) article by Prof David Bowman (University of Tasmania), “As bushfire and holiday seasons converge, it may be time to say goodbye to the typical Australian summer holiday” on the risk of holidaying in peak fire seasons

[The Conversation](#) article by A/Prof Geoff Cary (Australian National University), “Some say we’ve seen bushfires worse than this before. But they’re ignoring a few key facts” on climate change influencing Australia’s bushfires

[Scoop](#), “Ecological grief, ecocide and the Australian bushfires” quotes the CEO on Australia running about 1°C above the long-term average, meaning more frequent and severe fires

[Daily Mail Australia](#), “Smoke from Australia’s deadly bushfires is circling the globe and will make it BACK to the country, NASA says”, references the CRC’s definition of pyrocumulonimbus events

15 January 2020

[ABC Radio PM](#) interviews the Research Director about the Bushfire Science Roundtable meeting with Minister Karen Andrews to discuss practical ideas for future bushfire seasons

[ABC NewsRadio](#) interviews the Research Director about the Bushfire Science Roundtable meeting with Minister Karen Andrews to discuss practical ideas for future bushfire seasons

[SBS News](#), “Australia’s science minister calls for end to debate over whether climate change is real”, science roundtable will include scientists from the CRC

[Vox](#), “Australia’s weird weather is getting even weirder”, [Australian Seasonal Bushfire Outlook: August 2019](#) warned the potential of the fire season to be an active one

[Women’s Agenda](#), “No more time for climate deniers says Minister Karen Andrews”, science roundtable will include scientists from the CRC

[myGC](#), “Science Roundtable will discuss ways to prevent another bushfire crisis”, the Research Director will attend Minister Karen Andrews’

Science Roundtable to discuss better ways to address bushfires around the country

[bdnews24.com](#), “The world saw this Australian beach town burn. It’s still cut off” quotes Andrew Gissing (Risk Frontiers) on the need to consider the prospect of future bushfire crises

16 January 2020

[Thomson Reuters Foundation](#), “Wildfire-hit countries in need of new strategies to tame burning threat” quotes the CEO on not rebuilding after a large event in the same way or in the same places

[Particle](#), “When bushfires create their own weather system” quotes Dr Kevin Tory (Bureau of Meteorology) on the formation of pyrocumulonimbus events

[Phys.org](#), “When bushfires create their own weather system” quotes Dr Kevin Tory (Bureau of Meteorology) on the formation of pyrocumulonimbus events

[Australian Strategic Policy Institute](#), “Do we need a bushfire royal commission?” references a 2017 review by the CRC that lists 55 major bushfire and disaster inquiries since 2009

17 January 2020

[Climate Home News](#), “Australia’s climate change polarisation hampers long-term bushfire fixes” quotes the CEO on the importance of rethinking where and how Australians live

[Daily Mail Australia](#), “Wildfire-hit countries in need of new strategies to tame burning threat” quotes the CEO on not rebuilding after a large event in the same way or in the same places

[The Peninsula](#), “Wildfire-hit countries in need of new strategies to tame burning threat” quotes the CEO on not rebuilding after a large event in the same way or in the same places

[Open Forum](#), “Do we need a bushfire royal commission?” references a 2017 review by the CRC that lists 55 major bushfire and disaster inquiries since 2009

18 January 2020

[Insurance Business](#), “New approach needed to mitigate bushfires, say researchers” quotes the CEO on not rebuilding after a large event in the same way or in the same places

20 January 2020

[The Washington Times](#), “‘Gross mismanagement’: Green forestry policies blamed for fuelling Australian bush fires” quotes the CEO on the continued fire danger into February

[BBC News](#), “Australia fires: Storms wreak damage but bushfires ‘far from over’” quotes the CEO on the continued fire danger into February

[Her Campus](#), “Put down your AirPods, Australia is air-dropping carrots to animals affected by the fires”, [Australian Seasonal Bushfire Outlook: August 2019](#) warned the potential of the fire season to be an active one

21 January 2020

[Biography Daily](#), “Australia fires: Storms wreak damage to the fire-affected regions” quotes the CEO on the continued fire danger into February

[Business Ghana](#), “Australia fires: Storms wreak damage but bushfires ‘far from over’” quotes the CEO on the continued fire danger into February

22 January 2020

[The Conversation](#), “Bushfire education is too abstract. We need to get children into the real world”, Dr Briony Towers and Prof Annette Gough (RMIT University) on the importance of bushfire prevention, mitigation, preparedness and response education

[The London Free Press](#), “Burned by wildfire losses, insurance industry rethinks risks” quotes the CEO on older homes seeing the highest losses during bushfire events

[Internewscast](#), “Bushfire education is too abstract. We need to get children into the real world”, Dr Briony Towers and Prof Annette Gough (RMIT University) on the importance of bushfire prevention, mitigation, preparedness and response education

23 January 2020

Prof David Bowman (University of Tasmania) and Prof Ross Bradstock (University of Wollongong) co-authored a piece for [The Conversation](#), “Australia needs a national fire inquiry – these are the 3 key areas it should deliver in” on the need for a national response in the form of a national inquiry into bushfires

[Independent Australia](#), “Coalition Government’s \$2 billion climate fund could attract more problems” recognises the CRC as a good beginning for a national plan on beating climate change

[Reuters](#), “Burned by wildfire losses, insurance industry rethinks risks” quotes the CEO on older homes seeing the highest losses during bushfire events

[Daily Mail Australia](#), “Burned by wildfire losses, insurance industry rethinks risks” quotes the CEO on older homes seeing the highest losses during bushfire events

[The Peninsula](#), “Burned by wildfire losses, insurance industry rethinks risks” quotes the CEO on older homes seeing the highest losses during bushfire events

[The Morning Bulletin](#), “Rocky man slams backburning claims: ‘It’s a falsehood’”, the CRC records that Australia had held over 100 Royal Commissions, inquiries and audits into bushfire management

24 January 2020

[Brisbane Times](#) & [WA Today](#), [Good Weekend](#), “The ‘Forever fires’ and Australia’s new reality” interviews the CEO on fire cycles and impacts

Thomas Duff’s (University of Melbourne) article in [The Conversation](#) breaking down fire status descriptions in “Out of control, contained, safe? Here’s what each bushfire status actually means”

[Media Week](#), “Good Weekend special bushfire edition for Australia Day weekend” introduces [Good Weekend](#) featuring interview with the CEO on fire cycles and impacts

[Bandt](#), “Good Weekend unveils special bushfire edition” introduces [Good Weekend](#) featuring interview with the CEO on fire cycles and impacts

[Community and Public Sector Union](#), “Crisis highlights CSIRO bushfire research and response”, CSIRO and CRC to convene several industry sessions to improve communication between businesses and government

[MENAFN](#), “Burned by wildfire losses, insurance industry rethinks risks” quotes the CEO on older homes seeing the highest losses during bushfire events

APPENDIX 5: MEDIA

25 January 2020

[Sydney Morning Herald](#) & *The Age, Good Weekend*, "The 'Forever fires' and Australia's new reality" interviews the CEO on fire cycles and impacts

[The Gulf Times](#), "Wildfire losses: insurance industry rethinks risks" quotes the CEO on older homes seeing the highest losses during bushfire events

27 January 2020

[Tagg](#) article by Dr Thomas Duff (University of Melbourne), "Out of control, contained, safe? Here's what each bushfire status actually means" breaking down fire status descriptions

28 January 2020

[The Conversation](#) piece by Dr Mittul Vahanvati (RMIT University), "Rebuilding from the ashes of disaster: this is what Australia can learn from India" on how we can reconstruct differently after the unprecedented summer of bushfires

[The Conversation](#) piece by Prof Don Driscoll (Deakin University), "Pulling out weeds is the best thing you can do to help nature recover from the fires" on the criticality of weeding post-fires

[Scienmag](#), "Forum to make sense of Australia's bushfire crisis" introduces the Queensland University of Technology forum, Clearing the air: making sense of Australia's bushfire crisis featuring the CEO as a guest speaker

[News Medical](#), "QUT forum to address Australia's catastrophic fire season" introduces the Queensland University of Technology forum, *Clearing the air: making sense of Australia's bushfire crisis* featuring the CEO as a guest speaker

[The National Interest](#), "Here's how you can help after a wildfire - pull out weeds" article by Prof Don Driscoll (Deakin University) on the criticality of weeding post-fires

29 January 2020

[In Daily](#), "Your views: on Centrelink, schools, coronavirus and bushfires" encourages wider awareness of the CRC, particularly A/Prof Kevin Tolhurst's (University of Melbourne) research outcomes

30 January 2020

[ABC Radio National's](#) Richard Aedy interviews Prof Mehmet Ulubasoglu (Deakin University) on *The Money* about the total economic cost of Australia's fires

31 January 2020

[Sunshine Coast Daily](#), "It will turn nasty" Fire Chief warns of danger ahead" quotes Board member Lee Johnson on the impacts of climate change

[In Daily](#), "Your views: on planning, city council, Centrelink and bushfires" commends the "excellent work" of the CRC

1 February 2020

[The Scarlet](#), "Australian wildfires devastate cities and wildlife" quotes the CEO on the difficulty to attribute climate change impacts to a specific event

3 February 2020

[Insurance News](#), "Hellish predictions come to pass" quotes the CEO on the severity of fires and the difficulty to attribute climate change impacts to a specific event

[Sight Magazine](#), "Disaster response: burned by wildfire losses, insurance industry rethinks risks" quotes the CEO that older homes see the highest losses during bushfires

[ZDNet](#), "ANU develops vegetation monitoring system to help firefighters on the frontline" explains the Australian Flammability Monitoring System that provides real-time information on moisture content of 'live fuel' and quotes the Research Director on the prototype having the potential to extend existing system

6 February 2020

[Swinburne University](#), "Bushfire research at Swinburne" acknowledges researchers involved with the CRC addressing optimisation of fuel reduction burning regimes and fire risk management

7 February 2020

[Brisbane Times](#), "Good Weekend letters to the editor" expresses hopes that the CRC has a

voice that is heard and acted on to the benefit of all who are involved in bushfire-prone areas

9 February 2020

[The Canberra Times](#) article by Dr Marta Yebra (Australian National University) who calls on better use of satellites to provide more information on fire spread in "Dr Marta Yebra says Australia can do better to support fire management"

[The Canberra Times](#) editorial, "Space technology to fight fires worth the cost", Dr Marta Yebra (Australian National University) calling for better use of satellites to provide more information on fire spread

13 February 2020

[The Australian](#), "Scorched land safe from fires for years, says CSIRO" quotes the Research Director on preparing for future risks now

[The Guardian](#) interactive feature, "Inside Australia's climate emergency: the new fire zone" quotes the CEO on risk perception and climate change

[John Menadue's blog](#), "High stakes gambling" mentions the CRC as a leading science agency who are right about climate change

16 February 2020

[Bushfire Volunteers](#), "Science Roundtable meets on bushfires", Bushfire Science Roundtable acknowledged the improvements research has made to keep Australia safer from natural hazards

[Planeta.com](#), "Bushfires in Australia (2020)" features the *Australian Seasonal Bushfire Outlook: December 2019*

17 February 2020

[Greenie Watch](#), "This fire season, areas of Australia have burnt that used to be too wet to burn" quotes the CEO on risk perception and climate change

[Medium](#), "The dark shadow of resilience" references the Inquiries and Reviews Database

19 February 2020

Gabi Mocatta, Rebecca Harris and Tomas Remenyi (University of Tasmania) have written "Yes, the Australian bush is recovering from bushfires - but it may never be the same" on [The Conversation](#) on landscape regrowth post-fires

20 February 2020

[ABC News Radio's](#) Glen Bartholomew interviews Kevin Tolhurst (University of Melbourne) about the Bushfires Royal Commission

[The Conversation](#) article by Euan Ritchie, "How you can help - not harm - wild animals recovering from bushfires" on how we can help native wildlife recover post-disasters

21 February 2020

[News Letter](#), "Amid the bushfire horror, a community spirit emerges" quotes the CEO on fire seasons starting earlier and cumulative fire danger in many areas growing

24 February 2020

[SBS News](#) article by Euan Ritchie, "How you can help - not harm - wild animals recovering from bushfires" on how we can help native wildlife recover post-disasters

27 February 2020

Prof Mehmet Ulubasoglu (Deakin University) writes that the income gap routinely increases after a natural hazard in [The Conversation](#), "Natural disasters increase inequality. Recovery funding may make things worse"

28 February 2020

Prof Mehmet Ulubasoglu (Deakin University) writes that the income gap routinely increases after a natural hazard in [Viv](#), "Natural disasters increase inequality. Recovery funding may make things worse"

[The Conversation](#) piece by A/Prof Euan Ritchie (Deakin University) on how digging fuel loads can reduce fire risk in "One little bandicoot can dig up an elephant's worth of soil a year - and our ecosystem loves it"

APPENDIX 5: MEDIA

2 March 2020

[Riot Act](#) quotes A/Prof Jason Sharples (University of New South Wales) in "Assembling evidence from a disastrous summer: can we link climate change to bushfires?" on lessons learned about bushfires this summer

[About Regional](#) quotes A/Prof Jason Sharples (University of New South Wales) in "Assembling evidence from a disastrous summer: can we link climate change to bushfires?" on lessons learned about bushfires this summer

[Scimex](#) promotes a journal article published in the *International Journal of Wildland Fire* by Michael Storey, Dr Owen Price (University of Wollongong), A/Prof Jason Sharples (University of New South Wales) and Prof Ross Bradstock (University of Wollongong) in "Bushfire area a factor in spot fires developing a long way from the fire front"

3 March 2020

[Sydney Morning Herald](#), "Race to understand fire lessons as another 'significant' season looms" quotes the CEO on CRC research prioritising communities living in bushfire zones and featuring Indigenous burning practices more, also quotes Ross Bradstock (University of Wollongong) on the need to prioritise creating fire models for rainforests and focusing on prescribed burning

[The Age](#), "Race to understand fire lessons as another 'significant' season looms" quotes the CEO on CRC research prioritising communities living in bushfire zones and featuring Indigenous burning practices more, also quotes Ross Bradstock (University of Wollongong) on the need to prioritise creating fire models for rainforests and focusing on prescribed burning

[Brisbane Times](#), "Race to understand fire lessons as another 'significant' season looms" quotes the CEO on CRC research prioritising communities living in bushfire zones and featuring Indigenous burning practices more, also quotes Ross Bradstock (University of Wollongong) on the need to prioritise creating fire models for rainforests and focusing on prescribed burning

4 March 2020

[The Guardian](#) covers the Senate estimates in "Frydenberg defends Coalition's economic

record after national accounts – as it happened" including David Wilson's announcement that funding for the CRC ends in June 2021

[The New Daily](#), "Bushfire research centre on brink of closure despite deadly summer fires" quotes Senator Kim Carr calling for long-term funding for the CRC

[Times Higher Education](#), "Funding extinguished for Australian bushfire research centre" covers the conversations on future funding for the CRC

5 March 2020

[ABC Online](#), "Australia's dedicated bushfire research centre on the brink of closure despite deadly summer fires" quotes Senator Kim Carr calling for long-term funding for the CRC

[SBS News](#) covers the Twitter conversation between Senator Kim Carr and Minister Karen Andrews on future funding for the CRC in "Labor's Kim Carr says funding for bushfire research centre must be secured past next year's deadline"

[Campus Morning Mail](#), "Policy and politics in bushfire research" quotes The Hon Karen Andrews MP on the government considering future funding for the CRC's work to continue

[Mirage News](#), "Government must fund ongoing bushfire research", the Climate Council calls on the Federal Government to provide funding for ongoing research into bushfires

[Medianet](#), "Government must fund ongoing bushfire research", the Climate Council calls on the Federal Government to provide funding for ongoing research into bushfires

[RMIT University](#) highlights Dr Briony Towers' (RMIT University) research on helping children find their role in disaster risk reduction in "Meet the women helping to improve how we live in cities and with nature"

[Timber Trader News](#), "Bushfire recovery" highlights the value of the CRC since its launch in 2013 amid conversations about future funding

[Fire Protection Water Tanks](#) references the Bushfire CRC and CSIRO research project on water tanks in bushfire conditions

6 March 2020

[Research Professional News](#), "Minister rejects 'fearmongering' over future of bushfire research", the CRC is in discussions with the federal government about ongoing research from 1 July 2021

9 March 2020

ABC Radio South East NSW interviews Dr Josh Whittaker (University of Wollongong) on findings from the 2018 Reedy Swamp fire research

[Bega District News](#), "Tathra bushfire coronial inquiry awaits expert reports to confirm start date" references *Hazard Note 69* on the 2018 Reedy Swamp fire

[Bega District News](#), "Tathra bushfire report finds lack of preparation, inadequate information" summarises *Hazard Note 69* on the 2018 Reedy Swamp fire

11 March 2020

[Medium](#), "Nothing changes if nothing changes", the Inquiries and Reviews Database points to the recurrent nature of findings across over 100 years of post-incident investigations

12 March 2020

The [University of Adelaide](#) media release "Our researchers features in *The Advertiser* about the Kangaroo Island fires" references Prof Holger Maier who wants to see greater investment in risk mitigation

The Hon Michaelia Cash MP says the government is actively engaging with the CRC on future funding arrangements in "CSIRO bushfire research in Senate spotlight", [CSIRO Staff Association](#)

18 March 2020

[Bega District News](#), "Two years after the flames: 'There's been no real effort to address the lessons' references *Hazard Note 69* on the 2018 Reedy Swamp fire

19 March 2020

[Shared](#), "Australia's New South Wales bushfires are finally out for the first time in 240 days" quotes Senator Kim Carr on the

need for further funding for the CRC, the only dedicated bushfire research centre

20 March 2020

[Beauresort Times](#), "Two years after the flames: 'There's been no real effort to address the lessons' references *Hazard Note 69* on the 2018 Reedy Swamp fire

25 March 2020

[Asia Pacific Fire Magazine](#), "Database crucial for learning lessons from the past", republished article on the Inquiries and Reviews Database

[Asia Pacific Fire Magazine](#) analyses the August and December 2019 *Australian Seasonal Bushfire Outlooks* in "2019-20: Australia's worst fire season on record"

26 March 2020

[The Daily Advertiser](#), "Dunns Road bushfire smoke could have caused deaths in Wagga and Snowy Valleys", research projects bushfire smoke contributed to more than 400 deaths

01 April 2020

[Australian Institute of Company Directors](#), "Climate risk: who is responsible?", mentions CRC research on addressing ownership of risk

03 April 2020

[Times Higher Education](#), "Australian emergency fund offers no relief for bushfire research"

06 April 2020

[Insurance News](#) covers the autumn update to the *Australian Season Bushfire Outlook 2020* in "Bushfire potential 'remains higher during autumn'"

11 April 2020

[The Canberra Times](#), "Fire safety advances, but no silver bullet" quotes the CEO on the readjustment of thinking in the emergency service and land management agencies over the decade since Black Saturday, and Prof Alan March (University of Melbourne) on the worsening threat and risk of bushfires

APPENDIX 5: MEDIA

17 April 2020

Dr Tim Neale (Deakin University) writes in [Inside Story](#) that the opportunity for change should not be lost now that non-Indigenous people have yet again rediscovered Aboriginal land management practices

23 April 2020

[GC Capital Ideas](#), "Wildfire: protecting our planet and the public purse" references the CEO on how traditional fire seasons in NSW are starting earlier and the cumulative fire danger is growing

18 May 2020

[Research Professional News](#), "Urgent need to fund bushfire research institute, Senate told" on the need for funding for a permanent national bushfire research institute

22 May 2020

[Bushfire Volunteers](#), "Creating psychologically safe teams and managing cognitive bias in strategic decision making", republished *Hazard Note 73* by A/Prof Benjamin Brooks and Dr Steven Curnin (University of Tasmania)

27 May 2020

[7 News](#), "Authorities warned of 'dire' fire season" references the CEO at the Senate inquiry on how some parts of the country may be unsuitable to live in in the near future

[The Canberra Times](#), "Authorities warned of 'dire' fire season" references the CEO at the Senate inquiry on how some parts of the country may be unsuitable to live in in the near future

[Daily Mail Australia](#), "Authorities warned of 'dire' fire season" references the CEO at the Senate inquiry on how some parts of the country may be unsuitable to live in in the near future

[Great Lakes Advocate](#), "Authorities warned of 'dire' fire season" references the CEO at the Senate inquiry on how some parts of the country may be unsuitable to live in in the near future

[Jimboomba Times](#), "Authorities warned of 'dire' fire season" references the CEO at the Senate

inquiry on how some parts of the country may be unsuitable to live in in the near future

28 May 2020

[The Conversation](#), "Australia, you have unfinished business. It's time to let our 'fire people' care for this land", Prof David Bowman (University of Tasmania) writes that Aboriginal knowledge is essential to tackling future bushfire crises

1 June 2020

[Collaborate Innovate Magazine 2020/2021](#), "Adapting to angry summers" highlights the benefits of the CRC's cyclones research program, quotes the CEO on the work of the CRC in reducing bushfire death tolls, quotes Amisha Mehta (Queensland University of Technology) on risk communication during natural hazards and quotes Dr Josh Whittaker (University of Wollongong) on community awareness and preparedness of bushfire risk

3 June 2020

[The Guardian](#), "Australian bushfires: how the Morrison government failed to heed warnings of catastrophe", *Australian Seasonal Bushfire Outlook: August 2019* warned the above-normal fire potential forecast across Australia

[Press From](#), "Australian bushfires: how the Morrison government failed to heed warnings of catastrophe", *Australian Seasonal Bushfire Outlook: August 2019* warned the above-normal fire potential forecast across Australia

[Yahoo! News](#), "Australian bushfires: how the Morrison government failed to heed warnings of catastrophe", *Australian Seasonal Bushfire Outlook: August 2019* warned the above-normal fire potential forecast across Australia

[The Armenian Reporter](#), "Australian bushfires: how the Morrison government failed to heed warnings of catastrophe", *Australian Seasonal Bushfire Outlook: August 2019* warned the above-normal fire potential forecast across Australia

18 June 2020

[Canberra Times](#), "Bureau of Meteorology funding better than 'flashy new trucks': ACT fire official", Neil Cooper (ACT Parks and

Conservation Service) on the need for further funding for a national bushfire research centre

[The Land](#), "Bureau of Meteorology funding better than 'flashy new trucks': ACT fire official", Neil Cooper (ACT Parks and Conservation Service) on the need for further funding for a national bushfire research centre

[Bay Post - Moruya Examiner](#), "Bureau of Meteorology funding better than 'flashy new trucks': ACT fire official", Neil Cooper (ACT Parks and Conservation Service) on the need for further funding for a national bushfire research centre

28 June 2020

[ABC Online](#), "Australian bushfire season's long-term health effects subject of UTS study" announces the *Australian Seasonal Bushfire Outlook: July 2020* to be released soon

[MSN News](#), "Australian bushfire season's long-term health effects subject of UTS study" announces the *Australian Seasonal Bushfire Outlook: July 2020* to be released soon

29 June 2020

[The Monthly](#), "Weathering the cost" references the Disaster Inquiries Database

Find more online

OUTPUTS FROM EVENTS AND ACTIVITIES 2014 TO 2020

Slide presentations, research posters, video and audio, and other resources including:

- Annual Conference Research Forum
- Research Advisory Forums
- 12th Australasian Natural Hazards Management Conference, Canberra 2019
- Showcase 2017 – Research Driving Change, Adelaide
- North Australia Fire Managers Forums
- International Days for Disaster Risk Reduction
- 5th International Fire Behaviour and Fuels conference, Melbourne 2016
- 6th International Fire Behaviour and Fuels conference, Sydney 2019
- National Fire Fuels Science webinars
- Many other activities with CRC research presentations

bnhcrc.com.au/events

PUBLICATIONS FROM PROJECTS

Journal articles, reports, books and book chapters, conference papers and theses

bnhcrc.com.au/publications/overview

PEOPLE AND PROJECTS

Researchers, students, partner representatives and outputs

bnhcrc.com.au/research

NEWS AND VIEWS, CASE STUDIES, RESEARCH, DISCUSSION

Hazard Notes, Hazards News, Hazard Channel and Fire Australia

bnhcrc.com.au/news

Australian Journal of Emergency Management

knowledge.aidr.org.au/ajem

Bushfire and Natural Hazards CRC

Level 1, 340 Albert Street East Melbourne VIC 3002

t +61 3 9412 9600 **e** office@bnhcrc.com.au

w www.bnhcrc.com.au

Sign up for news and research briefs:
HAZARD **NEWS** and HAZARD **NOTES**

   @bnhcrc



Australian Government
Department of Industry, Science,
Energy and Resources

Business
Cooperative Research
Centres Program