Australian Government
Australian Research Council

Engagement and Impact 2018

University of Wollongong

WOL05 (HLS) - Impact

Overview

Title

(Title of the impact study)

Protecting people, property and the environment with research for effective management of bushfire risk

Unit of Assessment

05 - Environmental Sciences

Additional FoR codes

(Identify up to two additional two-digit FoRs that relate to the overall content of the impact study.)

06 - Biological Sciences
04 - Earth Sciences

Socio-Economic Objective (SEO) Codes

(Choose from the list of two-digit SEO codes that are relevant to the impact study.)

96 - Environment
92 - Health

Australian and New Zealand Standard Industrial Classification (ANZSIC) Codes

(Choose from the list of two-digit ANZSIC codes that are relevant to the impact study.)

77 - Public Order, Safety and Regulatory Services
75 - Public Administration

Keywords

(List up to 10 keywords related to the impact described in Part A.)

Risk mitigation

Cost-effective management

Biodiversity

Carbon global change

Smoke

Sensitivities

Commercially sensitive

No

Culturally sensitive

No

Sensitivities description

(Please describe any sensitivities in relation to the impact study that need to be considered, including any particular instructions for ARC staff or assessors, or for the impact study to be made publicly available after EI 2018.)

Aboriginal and Torres Strait Islander research flag

(Is this impact study associated with Aboriginal and Torres Strait Islander content?
NOTE - institutions may identify impact studies where the impact, associated research and/or approach to impact relates to Aboriginal and Torres Strait Islander peoples, nations, communities, language, place, culture and knowledges and/or is undertaken with Aboriginal and Torres Strait Islander peoples, nations, and/or communities.)

No

Science and Research Priorities

(Does this impact study fall within one or more of the Science and Research Priorities?)

Yes

Science and Research Priority	Practical Research Challenge
Soil and water	New and integrated national observing systems, technologies and modelling frameworks across the soil-atmosphere-water-marine systems.
Soil and water	Minimising damage to, and developing solutions for restoration and remediation of, soil, fresh and potable water, urban catchments and marine systems.

Environmental change	Improved accuracy and precision in predicting and measuring the impact of environmental changes caused by climate and local factors.
Environmental change	Options for responding and adapting to the impacts of environmental change on biological systems, urban and rural communities and industry.

Impact

Summary of the impact

(Briefly describe the specific impact in simple, clear English. This will enable the general community to understand the impact of the research.)

Only effective fire management can resolve the problem of mitigating risk to human life and property whilst concurrently mitigating risk to environmental values e.g. biodiversity, air quality, and carbon stocks. Bushfire research by the University of Wollongong (UOW) has provided the knowledge and capacity to help resolve the complex trade-offs required to meet this immense challenge. Specifically it has improved fire management decision making by addressing risk management policies and strategies used by fire agencies in Australia and overseas. Results have been incorporated into policy and strategy revisions with the outcome that fire management strategies in NSW and Victoria have been transformed to provide better protection for property and ecosystems.

Beneficiaries

(List up to 10 beneficiaries related to the impact study)

Rural Fire Service (NSW)

Office of Environment and Heritage (NSW)

Department of Land Water and Planning (VIC)

Sydney Catchment Authority

NSW Local Land Services

Australian Department of Environment and Energy

US Geological Survey

European Union

Australasian Fire Authorities Council (AFAC)

Countries in which the impact occurred

(Search the list of countries and add as many as relate to the location of the impact)

Australia
United States of America
Spain
Portugal
France
Greece
Italy
Turkey
Algeria

Details of the impact

(Provide a narrative that clearly outlines the research impact. The narrative should explain the relationship between the associated research and the impact. It should also identify the contribution the research has made beyond academia, including:
- who or what has benefitted from the results of the research (this should identify relevant research end-users, or beneficiaries from industry, the community, government, wider public etc.)
- the nature or type of impact and how the research made a social, economic, cultural, and/or environmental impact
- the extent of the impact (with specific references to appropriate evidence, such as cost-benefit-analysis, quantity of those affected, reported benefits etc.)
- the dates and time period in which the impact occurred.

NOTE - the narrative must describe only impact that has occurred within the reference period, and must not make aspirational claims.)

Bushfire research by the Centre for Environmental Risk Management of Bushfires (CERMB), led by Prof Ross Bradstock and through our long-term partnerships with State, Federal and International agencies, had a wide-reaching impact on bushfire management strategies at ecological, environmental, economic, and community levels. Benefits have been most apparent in NSW and Victoria, but the influence of UOW research was also felt internationally. In particular, research via collaborators in Europe and the USA directly influenced the development of policies dealing with climate change adaptation and risk management for protection of people and properties from wildfires. Impacts were in four main areas:

1. BUSHFIRE RISK MANAGEMENT: Research provided critical evidence of the efficacy of land management strategies on bushfire spread and severity. Research directly influenced the specifications for deployment of strategic prescribed burning as a key risk mitigation activity via various policy and planning initiatives. Pivotal to this was Bradstock's involvement as a member of the Expert Panel on Land Management at the 2009 Victorian Bushfires Royal Commission and the subsequent 2014 review panel for the Victorian Bushfire Reform Process. The Royal Commission produced recommendations concerning strategic prescribed burning for risk mitigation (along with recommendations on protecting environmental values) that resulted in ongoing policy responses and operational changes in various Australian states. For example:

i) Victoria adopted the prescribed burning targets recommended by the Royal Commission in 2010 and subsequently revised these to shift from an area or percentage target approach to a risk based approach. CERMB research was pivotal in shaping these formal policy shifts via the Expert Panel and the 2014 Review of the Bushfire Reform Process.

ii) As result of knowledge generated by CERMB research, implementation of prescribed burns at positions close to developments was defined as a key priority in the 2021 NSW State Plan. Subsequent evaluation and endorsement of this approach was performed by the NSW Hazard Reduction Audit committee, which included Bradstock as a Committee member. Recommendations of this Committee were transferred into relevant policies of the NSW Bushfire Co-ordinating Committee, which define the basis for risk management planning (undertaken by the NSW RFS) and operational activities for bushfire risk management in NSW.

iii) Implementation of the NSW Environmental Assessment Code for Hazard reduction in NSW, which specifies minimal intervals for burning in different vegetation communities, was directly based on research and tools developed by Bradstock and CERMB, such as the NSW Fire Response database. Minimum fire interval analysis

techniques (i.e. GIS tools) developed by Bradstock and CERMB are used to derive key layers contained in bushfire risk management plans developed by NSW RFS and NSW NPWS.

2. PREDICTION MAPPING OF LANDSCAPE FUEL MOISTURE PATTERNS AND THE RISK OF FIRE OCCURRENCE AND IMPACT: Research in this domain assisted the Victorian and NSW Governments (e.g. Vic. DELWP, NSW RFS) in preparing for high impact fire days. Research generated predictive models that triggered these agencies to review and improve their practice, and dynamic mapping is now routinely used to pinpoint landscapes that are critically dry and thus primed for major fires. Furthermore, CERMB were approached by Vic DELWP to develop mapping software for operational monitoring.

3. FACTORS RELATED TO EFFECTIVE BUSHFIRE PREPAREDNESS: Research at UOW led to the development of a web-based application (The Bushfire Householder Assessment Tool: assessmyrisk.rfs.nsw.gov.au) hosted by NSWRFS. This application (currently reaching 1,300 users) enables householders to assess how well prepared they are for bushfire, and evaluate potential risk to life and property. Furthermore, research by CERMB on fuel accumulation was used by the NSW RFS as a key part of their development approval, fire prediction and risk management planning capabilities. Development applications in fire prone areas in NSW are scrutinised according to potential fire intensity scenarios generated by modelling which draws on this fuel accumulation information as a key input. The same fuel information is used by the NSW RFS in operational fire spread prediction and long-term risk modelling for Bushfire Risk Management Plans, via inputs into spatial fire behaviour models. Fuel maps based on this fuel accumulation information are contained in NSW RFS Bushfire Risk Management Plans that are routinely consulted by the fire services (e.g. NPWS, Forestry Corp).

4. ECOLOGICAL RESPONSES TO FIRE REGIMES: Research in this domain was used to assess the state of fire regimes (e.g. fire frequency and intensity) in relation to quantitative fire regime management guidelines for vegetation communities and threatened plant and animal species. Research by CERMB generated fire regime mapping and guidelines contained in bushfire risk management strategies and plans produced by NSW NPWS. As a direct outcome, ecological considerations are now incorporated into operational planning, and have transformed the ‘on ground’ tactical decision making process. This change has strengthened the ability of bushfire management agencies to minimise ecological damage, with the ultimate outcome that threatened species have been afforded a higher level of protection.

NSW RFS Commissioner, Shane Fitzsimmons, summarised the impact of CERMB research in his speech at the launch of the NSW OEH Bushfire Risk Management Research Hub: “I’m very proud of the fact that the RFS, particularly over the last decade or so, has invested enormously in research and research programs and partnerships with organisations. Our work with the Centre for Environmental Risk Management of Bushfires, in partnership with the OEH, has been a wonderful example.”

Associated research

(Briefly describe the research that led to the impact presented for the UoA. The research must meet the definition of research in Section 1.9 of the EI 2018 Submission Guidelines. The description should include details of:
- what was researched
- when the research occurred
- who conducted the research and what is the association with the institution)

Associated research included:

EFFECTIVENESS OF FIRE MANAGEMENT: included empirical analysis of historical fire maps, focussing on fire spread, area and severity, and research using fire simulation (computer experiments). Risk estimation and mapping was approached by combining results from empirical studies, and by simulation. Similarly, research on effects of climatic change and other future influences progressed via use of multiple methodologies, including use of climate modelling, fire simulations and wide ranging analyses of empirical data.

SMOKE: research matched remotely sensed smoke plumes to state air-quality monitoring data, and involved collaboration with the Office of Environment and Heritage and the University of Tasmania. Fuel moisture was mapped by combining satellite imagery with physical plant moisture models, collaborating with Western Sydney University. Preparedness of the public and fore managers was researched using expert workshops and a collaboration with the company ‘Bayesian Intelligence’.

ECOLOGICAL RESEARCH: Often the focus of postgraduate projects, with clear applied aims for fire, biodiversity, carbon management. Many are undertaken in close collaboration with land management agencies (e.g. projects

on logging and burning in state forests).

UOW researchers included Ross Bradstock, Owen Price, Trent Penman, Hamish Clarke, Luke Collins, Michael Bedward, Penny Watson, Meaghan Jenkins, and Chris Gordon.

FoR of associated research

(Up to three two-digit FoRs that best describe the associated research)

05 - Environmental Sciences
06 - Biological Sciences

References (up to 10 references, 350 characters per reference)

(This section should include a list of up to 10 of the most relevant research outputs associated with the impact)

1.Bradstock, R, Penman, T, Boer, M, Price, O, Clarke, H (2014) Divergent responses of fire to recent warming and drying across south-eastern Australia Global Change Biology 20, 1214-1228.

2.Bradstock, RA, Cary, GJ, Davies, I, Lindenmayer, DB, Price, O, Williams, RJ (2012) Wildfires, fuel treatment and risk mitigation in Australian eucalypt forests: insights from landscape-scale simulation. Journal of Environmental Management 105, 66-75.

3.Collins, L, Bradstock, RA, Tasker, EM, Whelan, RJ (2012) Impact of fire regimes, logging and topography on hollows in fallen logs in eucalypt forest of south eastern Australia. Biological Conservation 149, 23-31.

4.Gordon, CE, Price, OF, Denham, A, Tasker, EM (2017) Acacia response to high severity wildfire: implications for fire hazard and conservation management. Science of the Total Environment 575, 858–868.

5.Penman, TD, Bradstock, RA, Price, O (2014) Reducing wildfire risk to urban developments: simulation of cost-effective fuel treatment solutions in south eastern Australia Environmental Modelling and Software 52, 166-175.

6.Price, OF, Borah, R, Bradstock, R, Penman, T (2015) An empirical wildfire risk analysis: the probability of a fire spreading to the urban interface in Sydney, Australia. International Journal of Wildland Fire 24, 597-606.

7.Price, OF, Bradstock, RA (2011) Quantifying the influence of fuel age and weather on the annual extent of unplanned fires in the Sydney region of Australia. International Journal of Wildland Fire 20, 142-151.

8.Price, OF, Williamson, GJ, Henderson, SB, Johnston, F, Bowman, DJMS (2012) The relationship between landscape fire activity from Modis Hotspots and particulate pollution levels in Australian cities. Plos One 7, e47327.

9.Sawyer, R, Bradstock, R, Bedward, M, Morrison, RJ (2017) Fire intensity drives post-fire temporal pattern of soil carbon accumulation in Australian fire-prone forests. Science of the Total Environment 610-611, 1113-1124.

10.Thomas, PB, Watson, PJ, Bradstock, RA, Penman, TD, Price, OF (2014) Modelling litter fine fuel dynamics across climate gradients in eucalypt forests of south-eastern Australia Ecography 37, 827–837.

Additional impact indicator information

Additional impact indicator information

(Provide information about any indicators not captured above that are relevant to the impact study, for example return on investment, jobs created, improvements in quality of life years (QALYs). Additional indicators should be quantitative in nature and include:
- name of indicator (100 characters)
- data for indicator (200 characters)
- brief description of indicator and how it is calculated (300 characters).)