



Australian Government
National Emergency Management Agency

Australian Institute for
Disaster Resilience



Australian Journal of Emergency Management

SUPPORTING A DISASTER RESILIENT AUSTRALASIA

VOLUME 41 NO. 4 OCTOBER 2026 ISSN: 1324 1540

About the journal

The *Australian Journal of Emergency Management* is Australia's premier journal in emergency management. Its format and content are developed with reference to peak emergency management organisations and the emergency management sectors—nationally and internationally. The journal focuses on both the academic and practitioner reader. Its aim is to strengthen capabilities in the sector by documenting, growing and disseminating an emergency management body of knowledge. The journal strongly supports the role of the Australian Institute for Disaster Resilience as a national centre of excellence for knowledge and skills development in the emergency management sector. Papers are published in all areas of emergency management. The journal encourages empirical reports but may include specialised theoretical, methodological, case study and review papers and opinion pieces. The views in the journal are not necessarily the views of the Australian Government, Australian Institute for Disaster Resilience or its partners.

Aboriginal and Torres Strait Islander peoples are advised that this publication may contain images of deceased people.

Publisher

The *Australian Journal of Emergency Management* is published by the Australian Institute for Disaster Resilience with financial assistance from the Australian Government. The journal is published online at www.knowledge.aidr.org.au.

Editorial Advisory Board

Details of members of the advisory board are provided on the website at www.knowledge.aidr.org.au/collections/australian-journal-of-emergency-management.

Editor-in-Chief

Associate Professor Melissa Parsons, University of New England

Editorial Committee

John Richardson, Australian Institute for Disaster Resilience
Blythe McLennan, Australian Institute for Disaster Resilience
Oscar Parry, NHRA
Ana Moreno, AFAC
April Hawksworth, AFAC
Christine Belcher, Managing Editor

Production

Design, typesetting and production: Ann Marie Duane

Cover Image: What helps communities not just survive disruption, but thrive? Visual reflections from the Australian Disaster Resilience Conference 2026.

Peer reviewers

The AJEM Editorial Committee recognises the efforts of researchers and practitioners who serve as peer reviewers of articles submitted to the journal. Peer reviewers play an essential role in ensuring the quality of research published. Their contribution is critical to the success of the journal and, more importantly, to the field of emergency management and disaster resilience.

Circulation

Digital subscribers: 4337

Website engagements: 679,430 (in 2025)

Website downloads: 16,780 (in 2025)

Copyright

Articles in the *Australian Journal of Emergency Management* are provided under a Creative Commons Attribution Non Commercial (CC BY-NC 4.0) licence that allows reuse subject only to the use being non-commercial and to the article being fully attributed (creativecommons.org/licenses/by-nc/4.0).



© Australian Institute for Disaster Resilience 2026.

Permissions information for use of journal content can be found at <https://knowledge.aidr.org.au/ajem>

Submissions

The *Australian Journal of Emergency Management* welcomes submissions for News and Views and Research articles. The Contributors' Guidelines are available at <https://knowledge.aidr.org.au/ajem>. The guidelines provide word limits for articles. Submissions exceeding those limits will be returned to authors. Articles are to be submitted as a Word file. High resolution photographs, graphs and tables should be submitted in their original software applications as separate files.

Research articles must contain an abstract, university ethics statement as appropriate and a short biographical paragraph about each author. A Copyright Release form and the Editorial Policy are available on the website. Authors should familiarise themselves with the journal before making a submission. Contributions should be forwarded electronically to ajem@aidr.org.au. All research articles are peer reviewed. The *Australian Journal of Emergency Management* is indexed by several indexing organisations.

Subscriptions

Online access to all content is available free. Subscribe to the journal at <https://knowledge.aidr.org.au/ajem>.

Contact us

Mail: Australian Journal of Emergency Management
Australian Institute for Disaster Resilience
Tenancy 10A, Level 10, South Tower,
485 La Trobe Street, Melbourne, 3000

Email: enquiries@aidr.org.au

Phone: +61 3 9419 2388

Contents

AJEM - Celebrating 40 years

Foreword	4
The Australian Journal of Emergency Management (2016-2025): the fourth decade	5
AJEM readership favourite papers	8
Looking back, thinking ahead: interview	11

Opinion

Bold thinking is key to resilience <i>Andrew Gissing</i>	12
How the Australian Disaster Resilience Conference reflects the rise of resilience <i>Amanda Leck</i>	14

Research

Enabling fire-safe gardens: a case study from Greater Hobart <i>Dr Anna Marie Gjedrem, Dr Stefania Ondej, Associate Professor Owen F Price, Dr Grant J Williamson, Professor David M J S Bowman</i>	16
Community-led disaster recovery: a new tool to support community recovery committees <i>Dr Kate Brady, Dr H Colin Gallagher, Hannah Morrice, Professor Lisa Gibbs</i>	26
Land-based search and rescue training: evolution and simplification <i>Aly Curd, Dr Lauren Vinnell, Hannah Morrice, Associate Professor Raj Prasanna</i>	36
How Australian fire and rescue service personnel would like to improve their decision-making learning and training programs <i>Adjunct Professor Jim McLennan, Dr Peter Hayes, Dr Chris Bearman, Dr Greg Drummond, Dr Rhona Flin, Dr Philip Butler</i>	51
Professionalism: the Australian Emergency Management Uniform Minimum Dataset <i>Dr Russell Dippy</i>	63

Reports

Building the skills of multilingual community connectors: strengthening emergency communications in regional Victoria <i>Rachel Leigh Taylor, Sue Sheldrick, Josie Matthiesson, Dr Leah Gerbe, Liz Frazer</i>	71
The Nature-led Community Resilience Toolkit: including people and nature in emergency management <i>Kate Lee, Amanda Lamont, Lily van Eeden, Craig Whiteford, Fern Hames</i>	76

Book review

Resilient recovery from disasters <i>Reviewed by Richard Mowll</i>	81
---	----

Contributions in the Research section of the *Australian Journal of Emergency Management* are peer reviewed to appropriate academic standards by independent, qualified reviewers.

Foreword



EMCAP Network Executive Committee

The challenges facing Australia's hazards and disaster resilience sectors are becoming increasingly complex. Climate change is intensifying risk, communities are navigating compounding hazards, and researchers and practitioners are making decisions in environments characterised by public scrutiny and resource scarcity and increasing uncertainty. Meeting these challenges requires more than new knowledge; it requires new ways of working together.

In 2024, Natural Hazards Research Australia established the Early and Mid-Career Academics and Practitioners (EMCAP) Network to bring together those helping shape the future of the Australian emergency services and disaster resilience sector through research, practice and collaboration. Led by an executive team of 12 diverse researchers and practitioners from across Australia, the network hosted a 'Tomorrow Party' at the 2025 Natural Hazards Research Forum in Adelaide. EMCAP members were invited to imagine Australia's natural hazards research landscape in 2030. Their vision was one where research and practice are seamlessly connected, collaboration is prioritised over competition, communities are active and informed partners, and Indigenous knowledges are valued alongside Western scientific approaches. To realise this vision, they identified 4 key priorities: strengthening research translation, fostering more collaborative ways of working, creating equitable opportunities for career development, and building a more supportive and enabling sector culture.

These priorities speak directly to the conditions required for effective disaster recovery and management. Research must be accessible, useful and responsive to the needs and knowledge gaps facing the sector. Agencies, practitioners and researchers must work together to identify these gaps and co-design practical and implementable solutions. Complex challenges also demand broader perspectives, including those of Indigenous peoples, communities, young people, gender-diverse voices, and the social sciences and humanities.

Developing tomorrow's workforce requires strong relationships, supportive mentoring, and space to collaborate, experiment and build expertise. Many parts of the sector are already taking on this responsibility. Members of the EMCAP Network Executive Committee have experienced this support personally and seen its impact on colleagues through mentoring, collaboration and meaningful opportunities. These practices should be recognised and celebrated as the norm, rather than a nice-to-have aspiration.

Financial uncertainty and job insecurity across Australia's research sector pose a risk to national capability in disaster resilience, recovery and preparedness. Without sustained investment in early and mid-career researchers, Australia's hazards and disaster resilience sectors risks losing knowledge, capability and talented people to other industries and countries. Research capability cannot be rebuilt overnight. Waiting until the next major disaster to recognise its importance may mean the expertise and relationships needed are no longer readily available.

The EMCAP network's vision is ambitious, but practical. Australia's future natural hazards landscape will be shaped by the choices we make now about relationships, funding, institutions and whose knowledge is genuinely valued. EMCAPs play an important role in that transformation – not simply as the future of the sector, but as active contributors to changing it today.

As AJEM's 40th anniversary draws to a close with this edition, the journal continues its role as a forum for sharing ideas, challenging assumptions and connecting research with practice. The perspectives presented here demonstrate why supporting emerging voices and fostering collaboration across the sector has never been more important.

The Australian Journal of Emergency Management (2016-2025): the fourth decade



John Richardson

Executive Director,
Australian Institute for
Disaster Resilience



© 2026 by the authors.
License Australian Institute for
Disaster Resilience, Melbourne,
Australia. This is an open
source article distributed
under the terms and conditions
of the Creative Commons
Attribution (CC BY) licence
(<https://creativecommons.org/licenses/by/4.0>). Information
and links to references in this
paper are current at the time of
publication.

The fourth decade of the *Australian Journal of Emergency Management* (AJEM) coincided with the Australian Institute for Disaster Resilience assuming responsibility for publication. It was a challenging decade of severe drought, the 2019–20 bushfires, the COVID-19 pandemic and record flooding in Queensland, New South Wales and Victoria. It also produced Australia's first systematic national account of what is at risk through [Profiling Australia's Vulnerability](#), leading into the [National Disaster Risk Reduction Framework](#).

Community resilience and shared responsibility

Shared responsibility and a broader conception of the emergency management sector were central themes. [McLennan et al.](#) (2019:3) identify joint decision-making, administration, autonomy, mutuality and trust as indicators of shared responsibility. [Hunt](#) (2016 31:1) applies [Norris et al.'s](#) networked adaptive capacities to government's role in community capacity. Meanwhile, [Ramsey et al.](#) (2016 31:2) and [Mason et al.](#) (2016 31:3) show how leadership, an existing resilience agenda, emergency management focus, diverse participation and skilled facilitation support a scorecard approach to community resilience assessment. [Ogie and Pradhan](#) (2020:1) instead emphasise strengths: focus on 'what is strong, and not what is wrong'.

[Smith et al.](#) (2016:3) examine a smartphone resilience-rating tool and caution that human decisions are not solely financial. [Webber et al.](#) (2017:2) and [Redshaw et al.](#) (2017:2) demonstrate participatory and street-level approaches to community planning. [Kanakis and McShane](#) (2016:2), [Every et al.](#) (2018:4) and [Richardson et al.](#) (2023:2) connect preparedness with perceived threat, appropriate information, social connection, psychological readiness,

psychosocial support, adaptive capacity and behaviour change. [Hou et al.](#) (2025:1) add a humanistic communication model grounded in connectivity, diversity and interactivity.

[Cornes et al.](#) (2019:1) challenge household-preparedness myths and proposes a new approach to community engagement for disaster risk reduction, while [Taylor et al.](#) (2020:1) find uneven understanding and commitment in evaluating community engagement. [McLennan](#) (2016 31:1) considers emergency services ceding control, [Lorenzoni et al.](#) (2022:3) identify limitations in government preparedness measures, and [Westacott](#) (2017:4) proposes public health framed "fire fitness" as a concept for preparedness. [Lakhina et al.](#) (2019:2) show refugee-background communities leading resilience initiatives; [Whittaker](#) (2019:2) synthesises post-Black Saturday preparedness research; and [Vahanvati](#) (2020:1) defines resilience through local lived experience, as 'developing the necessary capabilities to confidently address the future'.

Understanding the consequences of disaster

The decade broadened understanding of disaster consequences. [Handmer et al.](#) (2018:2) update national disaster-cost estimates and identify the growing contribution of bushfires. [Ulubasoglu and Beaini](#) (2019:2) examine Black Saturday's income effects. [FitzGerald et al.](#) (2019:1) describe immediate and short-term health consequences of the 2011 Queensland floods, while [Daneshjoo et al.](#) (2024:1) identify increased high-triage and out-of-area emergency department presentations 2 months after Hawkesbury-Nepean flooding. [Forbes et al.](#) (2018:1) and [Williams et al.](#) (2021:2) show the importance of acknowledging young adults' experiences and

the support offered through virtual communities. [King et al. \(2020:3\)](#) link indirect disruption after Cyclone Debbie flooding with adverse mental health outcomes.

Inclusion, equity and diverse voices

Themed editions brought disability, gender, children, young people, animals and homelessness into sharper focus. [Osborn et al. \(2019:1\)](#), [Brookfield and Fitzgerald \(2018:4\)](#), and [Every et al. \(2021:4; 2020:1\)](#) examine preparedness, service organisations, heat stress and peer co-design for people experiencing homelessness. [Quaill et al. \(2018:3\)](#) synthesise evidence on disability and resilience.

For children and young people, [Treichel \(2020:2\)](#) links child-centred climate adaptation with household resilience. [Le De et al. \(2020:2\)](#), [Gampell \(2020:2\)](#), [Bird \(2020:2\)](#), and [Kaiser and Boersen \(2020:2\)](#) demonstrate participatory mapping, games, film and bicultural tsunami education. [Pooley et al. \(2021:4\)](#) identify fire-safety practices; [MacDonald et al. \(2023:4\)](#) reposition young people as disaster-risk-reduction decision-makers, using the Sendai Framework as a guide; [Gribble \(2024:2\)](#) highlights evacuation-planning gaps for parents of children aged 0-4; and [Tipflier et al. \(2017:1\)](#) identifies ambiguity in New Zealand school disaster risk reduction policy.

McCarthy and Taylor (2018:2), [Bigelow \(2018:4\)](#), [Trigg et al. \(2021:3\)](#), [Kelman \(2013:3\)](#), [Best \(2021:3\)](#), [Vroegindewey and Kertis \(2021:3\)](#), and [Glassey and Thompson \(2020:1\)](#) extend emergency planning to animals, including legal status, veterinary wellbeing and search markings. [Parkinson et al. \(2017:1; 2022:1\)](#), [Leonard et al. \(2022:1\)](#), [Sohrabizadeh and Parkinson \(2022:1\)](#), [Chowdhury et al. \(2022:1\)](#), [Larin \(2024:2\)](#), and [Parsons \(2024:2\)](#) advance gender and sexuality-aware analysis of resilience. [Hayes and Ryan \(2024:2\)](#), [Kelly et al. \(2024:2\)](#), and [Teo et al. \(2018:1\)](#) examine inclusive engagement with multicultural and socioeconomically disadvantaged communities.

Recovery as a discipline

Recovery continues to develop as a more structured and complex discipline. [Hallwright and Brady \(2016 31:1\)](#) describe collaborative co-working; [Owen \(2018:1\)](#) considers government support for community leadership; and [Rich et al. \(2016 31:1\)](#) evaluate strengths-based support. [Young and Jones \(2018:1\)](#) argue recovery should shape what is valued in risk management, while [Scott et al. \(2018:1\)](#) apply asset-based community development to recovery programming. [Collins \(2018:1\)](#) examines legal consequences for Christchurch tenants denied access to commercial premises after the earthquake. [Eriksen et al. \(2020:4\)](#) explore insurance's important but contradictory role.

[Ripley et al. \(2020:3\)](#) apply a recovery-capitals framework to develop the Wellington Region's Recovery Framework, extended by [Quinn et al. \(2022:2\)](#) into guidance for practitioners. [Pope and Harms \(2022:4\)](#) consider insider

community participation; [Ogie et al. \(2022:4\)](#) analyse Twitter's benefits and risks in recovery; [Eyre \(2017:3\)](#) stresses validation in personal experiences in psychosocial programs; and [Watkins \(2017:3\)](#) describes sub-clinical peer support groups after traumatic events. [Vosz et al. \(2025:3\)](#), [Yell and Duffy \(2018:2\)](#), [Kothe and Butler \(2025:3\)](#), [Brady et al. \(2025:3\)](#), and [Russ et al. \(2025:3\)](#) address youth recovery, social media, legal assistance, environmental groups and place-based agencies.

Decision-making, learning and professionalisation

Knowledge of professionalisation, learning and decision support accelerated throughout the decade. [Woodman et al. \(2021:3\)](#) examine skill maintenance and decay. [Dippy \(2020:4; 2022:2; 2025:1; 2025:3\)](#) develops practitioner roles, certification and disciplinary. [Zarghami and Dumrak \(2021:1\)](#) consider artificial intelligence in bushfire management; [Poblet et al. \(2017:2\)](#) examine microtasking; and [Donalson et al. \(2016 31:1\)](#) model cross-sector resource allocation.

[Bearman et al., Penney et al., Butler et al. and McLennan et al. \(2024:4\)](#) examine cognitive aids, decision challenges and training. [Bradley-Smith et al. \(2024:1\)](#), [Bearman et al. \(2017:1\)](#), [Brooks et al. \(2016:4\)](#), and [Launder and Penney \(2023:4\)](#) emphasise non-technical skills, teamwork monitoring, strategic judgement and the operational SPAR(CD) model.

[Mees et al. \(2016 31:2\)](#) and [Klockner \(2017:4\)](#) address organisational resilience and mindful organising. [Owen et al. \(2017:4; 2018:2; 2020:3\)](#) examine research use and organisational learning. [Jackson \(2016 31:1\)](#), [Medbury et al. \(2021:2\)](#), [Eburn and Dovers \(2017:4\)](#), [Eburn, Dovers and Cole \(2018:2\)](#), and [Spencer et al. \(2018:2\)](#) develop lessons management, inquiry and restorative approaches. [Krajt et al. \(2018:4\)](#), [Berry and Jones \(2018:4\)](#), [Young and Jones \(2019:4\)](#), [Malinen et al. \(2021:4\)](#), [McLennan et al. \(2016 31:1\)](#), and [Grant et al. \(2019:3\)](#) address volunteer expectations, diversity, return, coordination and integration. [Ryan \(2017:1\)](#) charts the continuing significance of communication.

Climate adaptation, complex risk and the rise of risk reduction

Risk reduction increasingly intersected with climate adaptation, planning and institutional change. [Owi et al. \(2024:4; 2025:1; 2025:3\)](#) identify fragmentation, difficulties using risk information, stakeholder demands and culture as institutional constraints to further disaster risk reduction. [Taylor et al. \(2025:3\)](#) expose a gap between shared-responsibility policy and grassroots practice. [Florec et al. \(2017:4\)](#) place a value on intangible flood-mitigation benefits; [Beccari \(2020:3\)](#) identifies gaps in local-government research; [Turner and Couture \(2024:1\)](#)

describe advocacy for severe-wind risk; and [Mirfenderesk et al. \(2016:2\)](#) develop flood decision support. [Osbaldiston et al. \(2019:1\)](#) examine underinsurance, while [Ellis and Bajracharya \(2023:4\)](#) call for strategic reconsideration of coastal relocation.

[Neale et al. \(2016:2\)](#) and [English \(2016:2\)](#) examine scientific and tacit fire knowledge. [March and Kornakova \(2025:1\)](#), [Penny et al. \(2024:4\)](#), [March et al. \(2020:3\)](#), [Bajracharya and Hastings \(2020:3\)](#), [Gonzalez-Mathiesen et al. \(2019:3\)](#), [Huggins et al. \(2020:3\)](#), and [Kornakova and March \(2017:1\)](#) address professional capability, wildland-urban policy, land-use planning, developer engagement and defensible space in land use planning for bushfires.

[Schroeter et al. \(2021:1\)](#), [Smith et al. \(2017:4\)](#), [Harwood et al. \(2016:4\)](#), and [Livock and Swinbourne \(2021:4\)](#) examine impact based forecasting, damage assessment, insurance-linked mitigation and storm-surge awareness. [Sullivan-Taylor et al. \(2022:3\)](#), [Payne et al. \(2020:4\)](#), and [Thomas et al. \(2020:3\)](#) address earthquake and tsunami planning. [Gallina and Sidle \(2018:3\)](#), [Gissing et al. \(2018:3\)](#), and [Cawood et al. \(2018:2\)](#) connect coastal risk, levees and flood warning. [Pregauskas \(2016:4\)](#) identifies building professionals' contribution to post-traumatic growth.

Indigenous knowledge and cultural resilience

Indigenous knowledge and cultural resilience came to the fore. [Sangha et al. \(2019:2\)](#) identify the exclusion of remote Indigenous communities from Northern Territory planning. [Morley et al. \(2016:4\)](#) assess community strengths and priorities, noting disaster risk was not the highest priority facing the communities, while [Sithole et al. \(2019:1\)](#) place ceremony at the centre of hazard management.

The first Indigenous-edited AJEM edition appeared in April 2025. [Vercoe et al. \(2025:2\)](#) bridge engineering and cultural infrastructure. [Richardson et al. \(2025:1\)](#) show how Māori practices can address environmental challenges. [Kaiser and Kenney \(2025:2\)](#) examine Māori participation; [Hamilton et al. \(2025:2\)](#) consider climate adaptation in Māori-led tourism; [Taylor et al. \(2025:2\)](#) identify culturally centred public-health support; [Mate et al. \(2025:2\)](#) set out considerations for Indigenous youth fire intervention; and [Djiringanj Country et al. \(2025:2\)](#) document collaborative fire-risk action research with the Merrimans Local Aboriginal Land Council.

Human behaviour and risk ownership

Human behaviour and risk ownership became more prominent. [Young and Jones \(2016:4\)](#) show the challenge of risk ownership and making resilience everyone's business. [Dufty \(2021:2\)](#) identifies optimism bias in flood preparedness; [Adedokun et al. \(2023:4; 2024:2\)](#) examine self-evacuation incentives and reasons for living in bushfire-prone areas, while [Koksal et al. \(2020:1\)](#) show residents valuing bushland living despite bushfire risk.

[Ratnam et al. \(2016:4\)](#) link place attachment with risk acceptance.

[Paton et al. \(2017:1\)](#) examine tsunami-risk rejection. [Gissing et al. \(2016:2\)](#) and [Taylor et al. \(2020:4\)](#) investigate driving through floodwater. [Madsen \(2019:3\)](#) interprets risk-taking through social narrative and memory,

What is an emergency: beyond the traditional focus

The decade expanded what counts as an emergency. [Cuthbertson et al. \(2017:3\)](#) highlight the lack of engagement with non-traditional threats, and [Clune and Eburn \(2017:3\)](#) identify wider threats to community safety, citing femicide and drug epidemics as examples. [Clark and Strong \(2024:1\)](#) challenge the treatment of dust storms as novelties. [Overton \(2016:3\)](#) analyses the H1N1 influenza response, while [Jackson \(2024:4\)](#) draws lessons from South Australia's COVID-19 response.

[Loridan et al. \(2016:4\)](#) and [Nairn and Fawcett \(2017:1\)](#) develop and test the Excess Heat Factor; [Bailey et al. \(2025:3\)](#) explore school heat through citizen science. [Parsons \(2016 31:1\)](#) calls for alignment between mine and community emergency plans. [Calverley et al. \(2025:1\)](#) and [Lawes et al. \(2025:3\)](#) examine beach patrols and emerging lifesaving challenges. [Curd et al. \(2025:1\)](#) highlight the wider role of non-government search-and-rescue organisations, while [Schwartz \(2022:2\)](#) and [Dacey et al. \(2022:4\)](#) examine wilderness search practice and agent-based modelling.

As we close out this fourth decade of the journal, we see how it has grown from a humble 8-page newsletter with practical guidance for practitioners to a journal that tackles a range of new and emerging themes and strengthens existing practice. We also see it transition from a purely operational and hazard focus to a more systemic and nuanced emergency management approach. Bodies of work on health, risk management, exotic animal disease, community engagement, media and communications, recovery, animals, disability, gender, youth and Indigenous peoples were highlighted in special editions. The recognition of the importance of getting policy levers right also emerges through the four decades. The journal has been backed by an increasingly complex body of research generated first by the Bushfire Cooperative Research Centre (CRC), then the Bushfire and Natural Hazards CRC, and finally Natural Hazards Research Australia.

The first edition I settled down to read was back in [December 1997](#). This edition covered an eclectic mix of topics, including disability rights, risk management, online conferencing and the medical management of Port Arthur victims. That breadth continues today, as we grapple with sharing the growing knowledge generated every day across our sector, so you can help reduce disaster risk and support people to live their lives with less disruption from hazards.

AJEM readership favourite papers



**Associate Professor
Melissa Parsons**

University of New England
AJEM Editor-in-Chief

Since 1986, the *Australian Journal of Emergency Management* (AJEM) has published an estimated 2,000 peer-reviewed research papers from Australia, New Zealand and around the world.

This growing body of knowledge has documented the tremendous expansion in emergency management planning and policy, the growth in rigour in academia and practice, the transfer of research within the sector and the adoption and testing of improved approaches to much of how we plan, respond and renew after disaster events. In its 40th year of publication, AJEM is publishing reflections from readers around the world to recall their favourite and most influential paper(s).

The psychological impact of responding to agricultural emergencies

By Meredith Jenner

Volume 22(2): 25-31, 2007

<https://search.informit.org/doi/pdf/10.3316/agispt.20072387>

Submitted by Nathalie Brown

Victorian Department of Energy, Environment and Climate Action (DEECA)

Why is this paper significant to you and why has it held your attention?

I found this paper the first I had read about the impact of agricultural emergencies. We speak about the impact of emergencies on firefighters and to the community, but the agricultural aspect wasn't as obvious. I was working with Agriculture Victoria (within the Department of Natural Resources and Environment) from 2000-2010 and there were so many impacts to our staff.

How has this paper influenced your work? Or, how has this paper had a significant influence in this area of emergency management?

I was able to use this learning to help prepare staff for emergency response. I circulated to many of my regional colleagues, specifically the livestock teams. It helped ensure that during the 2009 fires we had Employee Assistance Program councillors on site at every morning and afternoon briefing to discuss how staff were going, offering tips and eventually spending time with a few highly impacted staff. It is possibly the catalyst for my focus on supporting the supporters years later,

improving how DEECA (formerly DELWP) looked after the recovery wellbeing of their staff.

Beyond 2026, what's next in this field of research or practice that builds on this paper?

With emergencies becoming more frequent and severe, I think it is critical that we continue to look at new ways to look after our emergency responders, including during the recovery phase, to ensure that they are not traumatised and there is growth in the way we do things.

The psychological impact of responding to agricultural emergencies

Meredith Jenner overviews the literature on the unique psychological impacts of responding to agricultural emergencies

Abstract

It has increasingly been recognised that emergency responders may suffer stress and adverse psychological reactions to their exposure to traumatic events and the nature of the work they are expected to perform. However, little previous research has focused on the psychological impact of responding to agricultural emergencies. While these types of emergencies have some stressors in common with traditional emergencies, there are a number of factors that are more specific to agricultural emergencies. These are explored in the context of the existing literature and interventions or preventative measures suggested to mitigate the possible negative impact of responding to agricultural emergencies.

Most people are familiar with the stereotype of the 'superhuman' emergency responder, able to work tirelessly in extreme conditions whilst remaining invulnerable to stress and emotion¹. However, in recent years there has been increasing recognition that emergency responders can be affected by their exposure to traumatic events. While emergency responders 'display an implicit willingness to expose [themselves] to potentially distressing situations and the associated risks to [their] well-being'² through choosing to work in the field, the effects of this exposure can range from feeling overwhelmed and overwhelmed during the event to the development of long-term psychological difficulties such as anxiety, depression, anger or aggression³, and even post-traumatic symptoms similar to those seen in the 'victims' of the event⁴.

An emergency scene is, by its very nature, a dynamic and ever-changing work environment, which 'bring[s] together some of the most distressing aspects of human experience'⁵. Emergency responders work 'under stressful and chaotic conditions, face unprecedented personal demands'⁶ and may even be faced with

situations that threaten their own lives and safety. There may also be the threat of further events impacting on and worsening the situation. Time pressures are high, with rapid and effective action essential, work hours may be long and resources may be limited or stretched to capacity.

Emergency responses involve the breakdown of routine and familiar frameworks and may require emergency responders to perform unfamiliar tasks. Communication problems may also be a source of stress⁷, particularly at the start of a response when the situation is unclear. Despite all this, emergency responders must operate under the rules and expectations of their organisation⁸ to ensure that the response is coordinated and achieves its objectives.

Due to the high profile of many emergency events, this may be compounded by 'politically motivated demands for immediate and effective action, accompanied by intense administrative pressure'⁹. All of these factors combine to present an intense experience for emergency responders and may cause them to experience stress reactions of various degrees.

Stress is distress caused by a physical or mental strain¹⁰ and results in a state of extreme emotional and physical arousal. Once stress becomes overwhelming and reaches a level where performance deteriorates and personal well-being is seriously impaired, this can have serious implications for emergency management organisations. Most seriously, exposure to a life-threatening situation can lead to the development of Post-Traumatic Stress Disorder (PTSD). The prevalence of PTSD in the general population is 1-2% but has been reported as being as high as 30% or more in emergency responders after serious incidents¹¹. PTSD is characterised by several potentially debilitating symptoms which, if left untreated, can continue for months or even years and severely impact on the quality of life of sufferers.

The majority of the literature on stress reactions in emergency responders focuses on the traditional first responders such as fire fighters, police, ambulance attendants and other rescue personnel. These are the emergency responders most likely to encounter life-threatening situations as part of fulfilling their duties.

The epistemological non-sense of disaster studies and some more sensible prospects

By JC Gaillard

Volume 37(1): 14-15, 2022

<https://knowledge.aidr.org.au/resources/ajem-january-2022-the-epistemological-non-sense-of-disaster-studies-and-some-more-sensible-prospects>

Submitted by Mark Trudinger

Northland Civil Defence Emergency Management Group, Northland Regional Council, New Zealand

Why is this paper significant to you and why has it held your attention?

This paper stands as a landmark in disaster studies, primarily in terms of questioning the very epistemology of the field, the dominance of Western hegemony and the importance of people who are affected by disasters, especially those 'at the margins'.

How has this paper influenced your work? Or, how has this paper had a significant influence in this area of emergency management?

As someone who is profoundly interested in the intersection of theory, practice, and guidance (or ideas, praxis, and co-research), this paper challenged – and continues to challenge – my thinking and practice. The paper should have had a far greater influence on emergency management than it has – the fact that it hasn't is not a reflection on the paper, but on the very issues with both the disaster studies and emergency management fields, that the paper explores.

Beyond 2026, what's next in this field of research or practice that builds on this paper?

Both research and practice could benefit from being more widely exposed to the disaster studies Manifesto and the Accord – 2 documents that are foundational for, in turn, understanding JC's paper from AJEM. Overall, both research and practice need to put communities first - not bureaucracies, methodologies, theories, and programs from on high.

The Manifesto and Accord are available here: <https://www.radixonline.org/manifesto-accord>

NEWS AND VIEWS

The epistemological non-sense of disaster studies and some more sensible prospects

JC Gaillard

The University of Auckland,
Auckland New Zealand
North-West University,
South Africa

*Terms such as 'masculine' and 'feminine' are notoriously changeable; there are social histories for each term; their meanings change radically depending upon geopolitical boundaries and cultural constraints on who is imagining whom, and for what purpose. J. Butler**

OPEN

© 2022 by the authors
Licensee Australian Institute
for Disaster Resilience,
Melbourne, Australia. This
is an open access article
distributed under the terms
and conditions of the Creative
Commons Attribution
4.0 International License
(CC BY) (<https://creativecommons.org/licenses/by/4.0/>)

There is a puzzling paradox in disaster studies. Many, if not most of its proponents, claim that disasters are social constructs. However, we, in our vast majority, also resort to concepts, methodologies and broader epistemologies that we take for universal. For instance, we use and apply concepts such as 'disaster', 'vulnerability', 'resilience' and 'risk', which share a Latin etymology, in all sorts of contexts around the world, assuming that they help us understand how people across very diverse cultures and societies make sense of what we call 'natural hazards'. This is antithetical, an epistemological non-sense.

This tension between, on the one hand, our theoretical claims, and, on the other hand, our actual epistemological approaches reflects the hegemony of Western, Eurocentric discourses on disaster. So hegemonic that they have become common sense in Gramsci's lingo: "According to feminist scholar Ferguson":

...the questions we can ask about the world are enabled, and other questions disabled, by the frame that orders the questioning. When we are busy arguing about the questions that appear within a certain frame, the frame itself becomes invisible; we become enframed within it.

In disaster studies, this frame is a Western one and reflects a scholarly legacy that dates back to the Enlightenment ages. Contemporary disaster studies can be tracked to Europe in the 18th Century when disasters were explicitly positioned at the interface of nature and society, or hazard and vulnerability in the jargon of the field. It is then that the project of modernity made it a priority to free people from the hazards of nature so they could live a prosperous life: "Since then, the nature/hazard-society/

vulnerability binary, celebrated in the famous mnemonic 'disaster = hazard x vulnerability' (or any iteration of this), has polarised disaster studies. This is true in the West, where the binary makes sense, but beyond, its relevance is rather dubious. Nonetheless, the binary between hazard and vulnerability and the different paradigms it sustains have been considered as the only relevant truth wherever in the world; the 'imperial truth of the West' in Eboussi-Boulaga's words."

The study of gender in disasters reflects the same Western legacy. It is predominantly framed through the dialectical lens of the categories of man and woman in a binary interpretation of the world that some have brought under an overarching polarisation of nature and society/culture akin to the dominant understanding of disasters.^{1,2} Furthermore, the dominant view that both gender and disasters are intertwined social constructs is at odds with the near-universal prominence given to biological dimorphism in underpinning gender identities. It becomes hard to disagree with Nigerian gender scholar Oyèwùmí³ that:

...if gender is socially constructed, then gender cannot behave in the same way across time and space. [...] From a cross-cultural perspective, the significance of this observation is that one cannot assume the social organization of one culture (the dominant West included) as universal or the interpretations of the experiences of one culture as explaining another one.

The hegemony of such Western discourses on both gender and disaster results from unequal power relationships between researchers around the world; a legacy of centuries of colonialism and imperialism on the side of Europe. Disaster studies

The influence of organisational culture on learning lessons: implementing a lessons management life cycle

By Lisa Marie Jackson

Volume 31(1): 18-23, 2016

<https://knowledge.aidr.org.au/resources/ajem-jan-2016-the-influence-of-organisational-culture-on-learning-lessons-implementing-a-lessons-management-life-cycle>

Submitted by Russell Buzby

Captain, NSW Rural Fire Service (RFS)

Why is this paper significant to you and why has it held your attention?

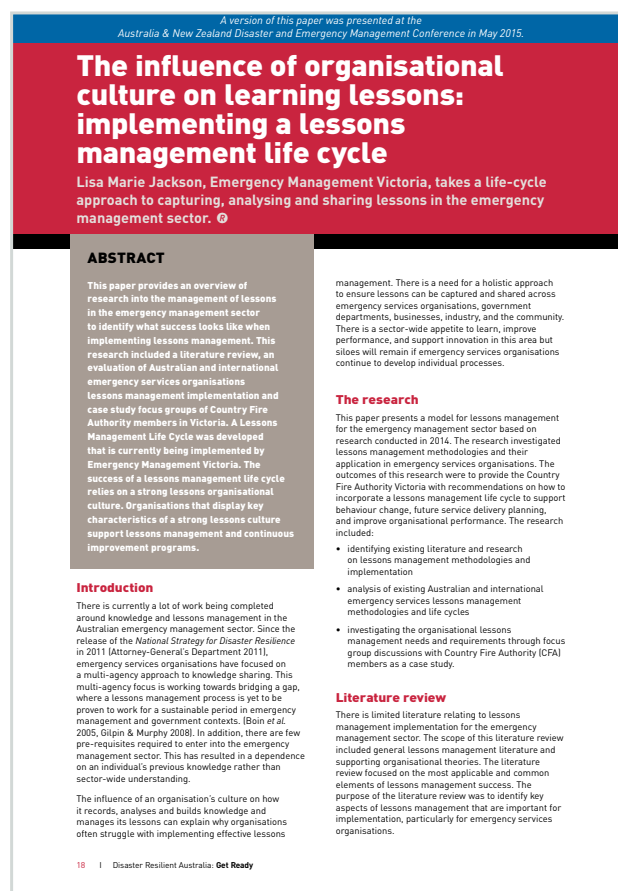
I came to it from two directions at once. I am a volunteer with a rural brigade in southern New South Wales, where I run training, and I spend my working life on organisational change in the Commonwealth. Jackson's paper is the only thing I have read that speaks to both without translating between them. Her conclusion is that the lessons management life cycle works where a lessons culture already exists, and stalls where it does not. That is an uncomfortable finding, because it says the process is not the intervention. It has held my attention for a decade because every organisation I have worked in since has proved her right, and none of them wanted to hear it.

How has this paper influenced your work? Or, how has this paper had a significant influence in this area of emergency management?

It changed what I do after an incident, and it changed what I sell. At brigade level I stopped treating the debrief as the lesson. A debrief produces material; whether anything becomes a lesson depends on what the brigade does with it over the following season, and whether the people who were there believe it is safe to say what actually happened. In consulting, it made me ask a question I did not used to ask: before designing a process that produces lessons, can this organisation hold one? Where the answer is no, a better template makes things worse, because it manufactures evidence of learning that nobody has done.

References

Medbury J, Brooks D and Coole M (2021) 'The efficacy of aligning lessons learnt from significant bushfire incidents to the organisational stratum', *Australian Journal of Emergency Management*, 36(2):26–33. <https://doi.org/10.47389/36.2.26>



Beyond 2026, what's next in this field of research or practice that builds on this paper?

Two lines already run from it. Medbury, Brooks and Coole (2021) argue that lessons sit on a vertical stratum and fail when pitched at the wrong level of work, and Glassey (2025) asks whether artificial intelligence can dissolve the documentation and silo problems that stop lessons landing. Both are agency shaped. What neither addresses – and what I would like to see – is lessons management in a volunteer organisation, where the culture that Jackson identifies as decisive belongs to a brigade of a few dozen people rather than to the agency above them. Cole and colleagues found in 2018 that post-event inquiry recommendations very rarely address volunteers at all. If the culture is where lessons live, and most of the people are volunteers, then most of the research is looking at the wrong stratum.

Glassey S (2025) 'Leveraging Artificial Intelligence for enhanced lessons management: The RAID Model', *Australian Journal of Emergency Management*, 40(4):61–65. <https://knowledge.aidr.org.au/resources/ajem-october-2025-leveraging-artificial-intelligence-for-enhanced-lessons-management-the-raid-model>

Looking back, thinking ahead

In this special segment for AJEM's 40th anniversary issues, we interview past journal contributors about their early articles, what has since changed in the fields they work in, and their ideas and suggestions for the future of AJEM.

The V word

An interview with Dr Mark Crossweller AFSM

My first research paper in the *Australian Journal of Emergency Management* (AJEM) was 'How a change in thinking might change the inevitability in disasters' ([Crossweller 2015](#)). The paper explained why we should approach catastrophic disasters differently by changing the way we think about them. It was pivotal for me as Director General of Emergency Management Australia (2012-2018) and has shaped my thinking, my PhD, my writing and my speaking over the past 10 to 15 years.

When I look back now, the origins of that paper can be traced to a question Alistair Wilson asked me when I became Director General: 'What has your career taught you?' I had no idea how to answer. I'd never really stopped to think about it. When I did stop and reflect, what stuck in my mind was a nagging question: why do we think the way we do when we keep producing the same outcomes?

That thinking grew out of a succession of major events: the Canberra bushfires in 2003, the Victorian bushfires in 2009, the Queensland floods of 2010-11 and the Perth Hills fires in 2012. Looking back, we repeatedly lost public trust without fully understanding why. We had become overconfident in our capabilities, assuming we could handle anything. We couldn't.

What dawned on me was that we weren't prepared to admit we were vulnerable. Until we acknowledged that vulnerability, we couldn't have an honest conversation about the risks we faced or the limits of our capability. That realisation became the foundation of the paper. It was really my first attempt to say: we have a limitation. We look good up to a certain point. Beyond that point, we don't look very good at all.

When I did my PhD, I realised that when you get past the point of severe on the intensity scale, capability doesn't maintain itself. Up to that point, we've got more than enough fire trucks and helicopters. Although our policies and legislation don't work for everybody, they work for most people. Capability is relatively consistent because it exceeds the problem it's trying to deal with.

What I came to see is that there comes a point where the rules change and those systems reach their limit. When that limit turns up, impact starts going up exponentially while capability drops away. That is a space of great vulnerability.

That paper led me to consider what happens when we ignore vulnerability. My conclusion was simple: avoidable suffering follows. Vulnerability matters because it highlights future risks and gives us a chance to reduce them. We can ask: how do we reduce susceptibility and increase adaptation to minimise vulnerability? At the time, the sector, including AJEM, focused on hazards, mitigation and preparedness, but paid far less attention to exposure and the 'V word'. We tended to view vulnerability as a characteristic of disadvantaged people rather than a product of economic, social and structural conditions beyond their control. As a result, our approach to vulnerable people and communities was often paternalistic.

Over time, my thinking has changed a little, but it still fundamentally sits in this space of mutual vulnerability. It's a complex space that ultimately calls on leadership to be relational, to put themselves in the shoes of another and try to understand what it might feel like. The style of leadership that's required is not distant leadership or command and control; it's virtuous leadership that is prepared to entertain the prospect that somebody is suffering and enter their world to see what can be done about it.

I don't think we're as relational as we could be, but I think we're on the path. One of the positive developments I've seen over the years in AJEM is that the conversation has become much more sociological. Dealing with questions of gender and indigeneity, and particularly the spirituality of indigeneity and sense of kinship and connection to land, the Dreamtime, and all those wonderful philosophical insights to culture can only help us to walk that path of relationship. Relationship with land. Relationship with each other. Relationship with animals and the entire planetary ecosystem essentially.

I know it's a big statement, but that's the path we need to walk. I think we're starting to crawl down that road, but we've got to get off our hands and knees and get up on 2 feet and get on with it. Because time is precious.

Bold thinking is key to resilience



Andrew Gissing

Former CEO
Natural Hazards Research
Australia



© 2026 by the authors.
License Australian Institute for
Disaster Resilience, Melbourne,
Australia. This is an open
source article distributed
under the terms and conditions
of the Creative Commons
Attribution (CC BY) licence
(<https://creativecommons.org/licenses/by/4.0>). Information
and links to references in this
paper are current at the time of
publication.

It is no secret that unique and unpredictable climate and natural hazards-related challenges lie ahead for Australian communities. As I leave Natural Hazards Research Australia (the Centre) as CEO, I reflect on the evidence-informed approach to these challenges that can and will give us the best chance of protecting lives and properties across Australia and beyond.

The Centre supports end-user driven research that bolsters decision making by governments, communities and organisations. This includes those that make up the ever-critical and hardworking emergency management sector. The worsening risks from natural hazards are, in part, driven by climate change, increasing exposure to their impacts, rising wealth, heightened complexity of infrastructure systems and environmental degradation.

We live in a time where natural hazard risk is growing faster than investment to manage it.

Natural hazards are an issue of real significance. Over the past decade, we have witnessed severe-to-catastrophic events that have cost lives and dollars and stretched our national capacity to respond and recover. The focus on natural hazards is no longer just a public safety and resilience issue. They are a far greater economic concern nationally. Rising insurance unaffordability makes natural hazards a cost-of-living issue, and increasing recovery expenditure places further pressure on government budgets. Direct and indirect health effects also grow as communities face compounding events, such as growing exposure to extreme heat and bushfire smoke. The environment also continues to be threatened by climate extremes.

There is an urgent need to address natural hazard risk. We cannot just respond our way out of it; we need to think and act differently. Small incremental changes, too, will not cut it—a transformative approach is required.

History shows that we can achieve the change needed. Global natural hazard deaths, for example, have decreased over recent decades due to advances in early warning systems and global telecommunications technology. Research, science and innovation focused on building safer, resilient and sustainable communities has never been more important to support transformative policy and capability.

Fortunately, the Centre's efforts as a global leader continue to improve the lives of people in Australia. In the past five years, we have created an infrastructure that fosters trust and relationships between researchers and practitioners that have literally brought evidence to life. Our research findings and our thought leadership and research findings have shifted the narrative in the sector. By confronting future challenges, our dedicated efforts to increase uptake of research through an end-user driven model enables agencies and communities to better prepare for the future with research that is useful, useable and used.

The Centre's recent report *The Impact of Natural Hazards Research Australia*, available on our website, highlights how research benefit is rarely direct or immediate, yet case studies capture stories of the research. Just a few examples include the Australian Disaster Resilience Index guiding investment in vulnerable communities, transformative scenarios shaping agency strategic planning,

local First Nations research taking place on Country and strengthening cultural confidence and connection to Country, and volunteer research that informs national strategy to ensure the future sustainability of volunteering. The Centre and its predecessors' work is cited in hundreds of policies globally and informs national doctrine and capabilities, such as the Australian Fire Danger Rating System and Australian Warning System.

The Centre's Education and Capability Program fosters the next-generation research workforce—one that is capable, knowledgeable and connected to the sector. After only five years, it is a proud achievement to have supported 100 postgraduate scholars and a network of around 150 researchers and practitioners through the Early and Mid-Career Researcher and Practitioner Network. The research and capability incubated through this program will yield benefits in years to come and innovative and exciting solutions that could change the game.

An exciting pipeline of research exists, with many more projects designed to generate practical knowledge, solutions and innovation that support efforts to enhance the safety, resilience and sustainability of communities in years to come. These initiatives reflect strong foundations and a commitment to translating research into real-world benefit.

When I first joined the Centre, I wanted it to project boldness to encourage big, agile thinking to inform a research program. By big thinking, I mean: what capabilities and policies will we need in 10 to 20 years' time? We must be thinking about what investments and actions are necessary now, which is why the Centre developed the Be Ahead of Ready® initiative to identify big ideas that will drive a resilient, safe and sustainable future and unleash research and science to help get us there.

There are immense opportunities presented by advances in technology. We are witnessing the acceleration of artificial intelligence (AI), autonomous systems, telecommunication and remote sensing capabilities that will rapidly transform capabilities and science. At the same time, we are faced with rising challenges of managing large-scale disaster risk reduction and recovery programs on unprecedented scales. We must ask if our organisations are ready for such transformation. Does the sector have the right governance, workforce and culture to rapidly transform?

Ultimately, we need a national risk-based disaster risk reduction capability road map informed by research. Approaches to building capabilities to address disaster risk reduction vary across different parts of the sector. Such a fragmented approach does not enable the scaling of innovation that will be necessary to Be Ahead of Ready. This road map could assist in aligning future research priorities to ensure that research and innovation are

actively coordinated to contribute to building required capabilities. It would not need to cover every foreseeable capability but focus on those we know will matter most in the future.

The road map would inform national workforce planning to ensure that an appropriately skilled workforce is available to provide a unity of effort, adopting an approach beyond blue and red lights and embracing a whole-of-community approach to disaster risk reduction. This will certainly mean different skill sets and maturing infrastructure to support workforce development. It will also mean investing further in a research and innovation infrastructure that supports bold thinking and research adoption.

We must strive to Be Ahead of Ready. We must accept that the worst consequences of future emergencies and disasters do not need to be inevitable, as they are ultimately the product of our decisions. The message is clear: we can do it; we can make a real difference, but we need to act and continue to invest in research to support a transformed approach through a strong, evidence-informed emergency management sector. This is something in which the *Australian Journal of Emergency Management* (AJEM) plays an important role. As the publication marks its 40th year in 2026, it continues to showcase research making a true difference in the sector, including projects funded by the Centre.

AJEM remains a critical component of the research landscape by providing a vehicle to publish and promote Australian research. Being an open-access journal means it is widely accessible to academics and practitioners. Its peer-reviewed nature ensures that only high-quality research is considered. A challenge and opportunity for AJEM in the future will be the continued evolution of knowledge management in the age of AI as the way we consume research changes. This means the effects of AI must be considered and planned for.

I thank AJEM for 40 years of influence in the emergency management sector and for promoting, sharing and empowering bold and powerful research—research that forms the knowledge and tools we need for the challenges of the next 40 years.

Good luck—think bold and together we can do more.

How the Australian Disaster Resilience Conference reflects the rise of resilience



Amanda Leck

Former Head, Australian Institute for Disaster Resilience



© 2026 by the authors.
License Australian Institute for Disaster Resilience, Melbourne, Australia. This is an open source article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) licence (<https://creativecommons.org/licenses/by/4.0>). Information and links to references in this paper are current at the time of publication.

Having attended the Australian Disaster Resilience Conference 2026 (ADRC26) in Melbourne in August, staged concurrently with AFAC26, Institution of Fire Engineers (IFE) and Women and Firefighting Australasia (WAFA) conferences, I have been reflecting on the rise of resilience in the digital age.

To observe hundreds of ADRC delegates filling 2 conference presentation rooms and watching the general buzz of delegates engaging in conversations with community-based organisations in Resilience Lane, was truly profound for me. This outcome may never have been possible without the foresight and vision of a small group of leaders.

In 2018 in Perth, the Australian Institute for Disaster Resilience (AIDR) staged the inaugural ADRC alongside AFAC18. Then, 80 practitioners came together for the first ever conference focused on disaster resilience in Australia. What was then a single stream conference has, over the intervening 8 years, grown into a disaster resilience movement, with community at the centre of presentations and conversations.

Practitioners come to the ADRC from a range of sectors – emergency management, local councils, not-for-profits, community-based organisations, academia, humanitarian, health, and what they all share is a passion for understanding how best to harness the inherent capacities and capabilities of communities to support and enhance disaster resilience, and to work with communities to support them to prepare, adapt and cope for whatever disaster may unfold.

In my experience, these conversations were not always front and centre in the national discourse. Those working in hazard

preparedness roles in emergency management agencies were often seen as peripheral to the main effort that was focused on response. And while having a capable and effective emergency response capability is critical, so too is the need to invest in communities.

Others were working in roles focused on community engagement and development, capacity building, communications, health promotion, humanitarian aid, and research to name but a few across a disparate range of sectors.

ADRC has created a safe space for these practitioners to come together to share learnings, good practice and knowledge from the myriad programs and initiatives they are working on, to contribute to the national discussion around what it means to be disaster resilient, and gain greater understanding on how we can best support communities to enhance their resilience in the face of increasing impacts from more frequent disasters of greater scale and consequence due to climate change.

But how did we get here? I have been reflecting on the journey that we have collectively been on that has created what I believe to be an unstoppable movement.

I believe the rise of resilience that was demonstrated at ADRC26 originates at the National Strategy for Disaster Resilience (2011) which was endorsed by COAG in February 2011. The Strategy outlined some core principles including that of shared responsibility; that disaster resilience is not solely the domain of emergency services, and that individuals, households, businesses and communities all play a role. A second principle outlined that community and organisation

resilience encouraged proactive planning, preparedness and risk reduction; and a third outlined an inclusive and co-ordinated approach that required co-operation across sectors and jurisdictions.

When AIDR was established in 2015 by AFAC together with the Australian Red Cross and the Bushfire and Natural Hazards Cooperative Research Centre (BNHCRC), a national disaster resilience conference was not part of the initial contracted offering. However, AIDR partners including Emergency Management Australia (EMA), wanted to provide an opportunity for practitioners focused on disaster resilience from across sectors and jurisdictions to come together face-to-face.

It was proposed that AIDR host a single stream disaster resilience conference concurrently with AFAC18 in Perth, an idea that was supported by sector leaders at the time including then AFAC CEO Stuart Ellis, Dr Mark Crosweller, Director General Emergency Management Australia, Dr Richard Thornton, BNHCRC CEO, and Andrew Coghlan, Australian Red Cross, National Manager Emergency Services. Without their leadership this initiative may never have got off the ground. And as the famous line from the 1991 protest song by Australian singer songwriters Paul Kelly and Kev Carmody goes ... from little things, big things grow.

Less than a decade ago, ADRC was a leap of faith: if we created a conference for those working to support disaster resilience, they would come. Keeping registration affordable and providing sponsored places for volunteers and community sector workers have remained core principles over the past 8 years. The conference has grown both in terms of delegate numbers and national influence, and more recent initiatives including Resilience Lane provide a focal point for these conversations and connections to flourish.

Importantly, the conference has never stood alone. Knowledge management has always been a focus for AIDR, and through the *Australian Journal of Emergency Management* (AJEM), the ideas, lessons and innovations shared at ADRC have been captured, extended and shared more broadly across the sector. Together, ADRC and AJEM create a complementary cycle of knowledge exchange: ADRC provides a forum for practitioners, researchers and communities to come together and explore emerging challenges and opportunities, while AJEM provides a lasting record that enables those insights to inform policy, practice and future research long after the conference concludes.

In the digital age when we are all glued to screens and apps, working remotely or in an office, the ADRC provides an important stage for a national conversation on disaster resilience to continue to expand, creating benefit for communities and practitioners. It is only with the benefit of time and experience that we will truly be able to value its impact.

About the author

Amanda Leck GAICD is a respected leader in disaster resilience and emergency management with more than 25 years' experience. Her senior roles have included Head of AIDR, Deputy Commissioner at Emergency Management Victoria, and Deputy Secretary and Group Head at the NSW Reconstruction Authority, leading significant resilience and recovery initiatives.

Abstract

Garden management plays a crucial role in reducing bushfire risk at the wildland-urban interface, yet implementation of fire-safe practices remains challenging. An analysis of garden assessments and in-depth interviews with 23 property owners in Greater Hobart, Tasmania, examined how technical, social and emotional factors influence garden bushfire adaptation decisions. Using the Cynefin framework and complexity theory, this study demonstrates that successful adaptation addresses multiple domains of complexity, from straightforward vegetation management to complex socio-emotional attachments to garden spaces. Findings reveal that while personalised garden assessment reports can motivate change, their success depends on a broader set of conditions. Barriers include practical constraints (e.g. green waste management), emotional attachments to garden elements and difficulties obtaining context-specific guidance. By applying the As Low As Reasonably Practicable (ALARP) principle, this study identified cost-effective interventions across the 4 avenues of institutional support and resource management, individual garden bushfire adaptation, personalised technical guidance and community support networks. This research suggests that creating fire-adapted gardens requires coordinated support systems that address both practical implementation challenges and emotional connections to garden spaces.

Enabling fire-safe gardens: a case study from Greater Hobart

Peer reviewed

Dr Anna Marie Gjedrem^{1,2}

ORCID: 0000-0002-9276-0431

Dr Stefania Onde^{1,2}

ORCID: 0000-0002-2515-3316

Associate Professor Owen F Price^{1,2}

ORCID: 0000-0001-5327-568X

Dr Grant J Williamson^{1,2}

ORCID: 0000-0002-3469-7550

Professor David M J S Bowman^{1,2}

ORCID: 0000-0001-8075-124X

1. University of Tasmania, Hobart, Tasmania.

2. Natural Hazards Research Australia, Melbourne, Victoria.

SUBMITTED
8 April 2025

ACCEPTED
8 January 2026

KEYWORDS
bushfire adaptation, bushfire, defensible space, garden management, interdisciplinary research, wildfire risk mitigation, ALARP principle, Cynefin framework, fire-safe gardens, garden hazard assessment, climate adaptation

DOI
www.doi.org/10.47389/41.4.16



© 2026 by the authors.
License Australian Institute for Disaster Resilience, Melbourne, Australia. This is an open source article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) licence (<https://creativecommons.org/licenses/by/4.0>). Information and links to references in this paper are current at the time of publication.

Introduction

The growing complexity of bushfires reveals how poorly human societies have adapted to natural environments (Cunningham et al. 2025; Bowman 2024). As symptoms of climate change and ecological breakdown, fires present wicked problems that complexity theory can help to better understand and respond to.

Tasmania (Lutruwita¹) presents an ideal opportunity to examine garden bushfire adaptation as 98% of its land area is classified as having bushfire-prone vegetation (Tasmanian Fire Service n.d.). In Hobart (Nipaluna), most households in the wildland-urban interface (the area where settlements are in close proximity to natural environments such as forest and shrubland) are highly susceptible to property loss (City of Hobart 2022).

The region has experienced devastating bushfires throughout its history. In 1967, fires claimed 64 lives and destroyed approximately 1,400 buildings. This is a stark reminder of the area's vulnerability (Haynes et al. 2008; Power and Wettenhall 1970; Richards et al. 2014). As climate projections indicate more frequent high-fire-danger conditions (Fox-Hughes et al. 2014), it is critical to implement effective risk-reduction strategies.

Residential gardens are a critical yet underutilised zone for fire risk reduction. Recent research demonstrates that properly managed gardens can serve as effective asset protection zones, significantly reducing house loss during bushfire events (Gibbons et al. 2018; Onde et al. 2024). However, despite available guidance on garden bushfire risk reduction, a persistent gap remains between awareness and implementation of mitigation measures.

This study aimed to identify pragmatic, complexity-informed pathways for bushfire adaptation of gardens at the wildland-urban interface. Using the Cynefin framework and ALARP principle, the study examined technical, social and emotional dimensions of garden fire risk reduction and proposes interventions across the 4 levels of institutional support and resource

1. Lutruwita is the name for Tasmania in palawa kani, the reconstructed language of the Aboriginal people in Tasmania.

management, individual garden bushfire adaptation, personalised technical guidance and community support networks. The findings will assist decision-makers, fire agencies and practitioners working to support communities to 'live with fire'.

Methods

This study builds on 2 companion studies examining garden fire hazards in Greater Hobart, Tasmania (Ondei et al. 2025 and Gjedrem et al. 2025). These studies investigated options to reduce property vulnerability through garden design which, combined with structural improvements to buildings (e.g. ember-proofing), is a critical component of comprehensive bushfire preparedness (March and Rijal 2015). This research focused on garden management as an accessible, adaptation approach that householders can implement. Fire hazard assessments were based on fuel characteristics (amount, flammability, spatial arrangement) in 21 gardens in the Greater Hobart area. This was combined to obtain a garden risk score (Ondei et al. 2025). Gardens were divided into 4 biophysical categories based on the combination of garden bushfire risk ('Low' or 'High') and landscape bushfire risk ('Low' or 'High') as a benchmark for social science inquiry (Gjedrem et al. 2025). Customised risk-reduction recommendations were provided to residents in these areas during a mixed-methods survey that included mapping, photo-elicitation garden walks and cognitive debriefing. Semi-structured interviews were conducted using a non-violent communication approach (Rosenberg 2015) to create a friendly and empowering interview atmosphere. By combining quantitative and qualitative analyses, we aimed to understand the technical and social dimensions of implementation of garden fire adaptation. More information on the biophysical assessment and the social survey can be found in Gjedrem et al. (2025) and Ondei et al. (2025).

This study identified practical implementation pathways for a range of stakeholders such as local government and fire agencies. This paper presents a framework-informed analysis of insights from Gjedrem et al. (2025). The Cynefin framework and complexity theory (Kurtz and Snowden 2003) and the As Low As Reasonably Practicable (ALARP) principle (Jones-Lee and Aven 2011) were applied as sense-making tools, highlighting 4 avenues of intervention of institutional support and resource management, individual garden bushfire adaptation, personalised technical guidance and community support networks. These avenues provide a thematic overview of different implementation strategies.

Ethics statement

This study received ethics approval from the University of Tasmania Human Research Ethics Committee (Ref. #29988).

Garden bushfire mitigation – a complex system perspective

Bushfires have shaped ecosystems for millions of years, but anthropogenic climate change, loss of traditional landscape management practices, human migration and urban expansion have transformed bushfire from a natural ecosystem process into an increasingly catastrophic hazard, particularly where human settlements meet fiery vegetation at the wildland-urban interface (Bénichou et al. 2021; Johnston et al. 2024). In Australia, the devastating effects of previous fire seasons have highlighted the urgent need for more effective approaches to bushfire risk reduction (Nolan et al. 2021; Haynes et al. 2008; Sturzenegger and Hayes 2011; Campbell et al. 2024). This need is critical given that the majority of Australian disaster funding is allocated to recovery (87%) (Colvin 2024) with the remaining funding allocated to preparedness, prevention, response, resilience and risk reduction.

Figure 1 shows that garden adaptation is part of a broader context of bushfire management (Wise et al. 2014) and involves social, economic and environmental factors that shape the implementation of fire-wise gardens. These adaptation pathways are not linear progressions from bushfire hazard awareness to bushfire hazard mitigation action, but are dynamic journeys shaped by multiple feedback systems between individual decisions, community networks and institutional support systems. Gardens and landscapes are not always carefully designed. They are the product of the interplay between human agency (such as priorities, limitations, opportunities and worldviews), climate and the natural environment.

The residential bushfire adaptation position framework shows the biophysical and social realities that shape fire adaptation pathways (Log et al. 2020) (Figure 1). Social dimensions are shown on the left side and biophysical dimensions are shown on the right side of Figure 1. The social dimension illustrates that a garden's bushfire risk is shaped by the local community's capacity and opportunities to undertake mitigation initiatives. These are shaped by the institutional landscape (e.g. support networks, infrastructure, resources available and regulations). In turn, local circumstances are shaped by global systems and events (e.g. trends, politics, economic systems, collaborations, crisis and path-dependencies). The biophysical dimensions illustrate the residential garden situated within the community, surrounded by neighbouring properties and/or intermingled in the natural landscape; the latter determining bushfire risk, which is dynamically affected by global climatic conditions and local weather.

The complexity of bushfire adaptation is especially evident in high-risk landscapes where garden management interacts with broader vegetation and landscape processes that influence a property's vulnerability. The Cynefin

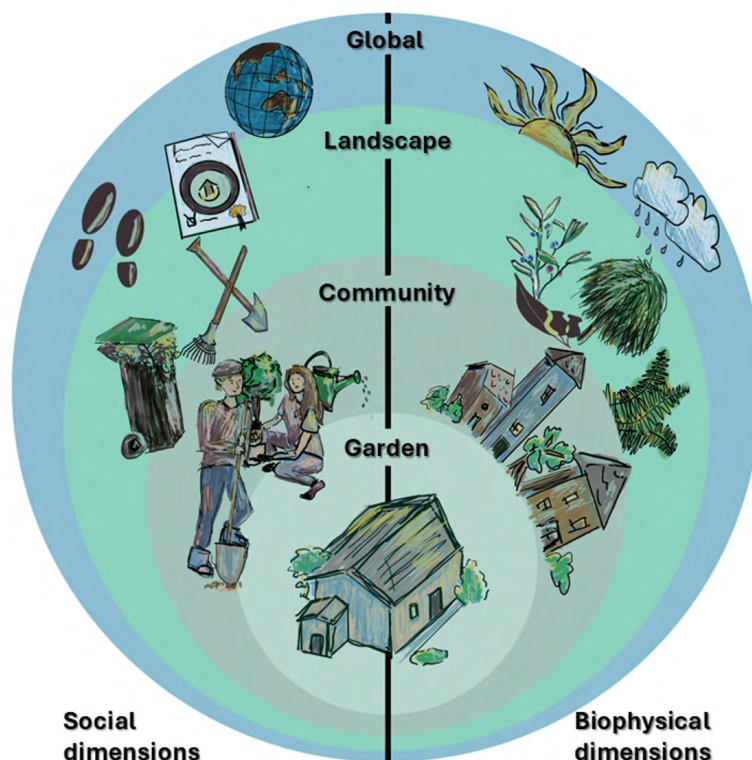


Figure 1: A residential bushfire adaptation position framework shows the social and biophysical domains that span a range of geographic scales.

Image: Gjedrem and authors

(Welsh for ‘habitat’) framework is used to consider the multiple domains of complexity that garden fire adaptation encompasses (see Figure 2) to inform decision-making in times of uncertainty.

The Cynefin framework was developed as a sense-making framework for problem-solving (Kurtz and Snowden 2003) and includes different philosophical domains that inform garden adaptation. Some aspects represent ‘simple’ solutions with clear cause-and-effect relationships, such as clearing dry vegetation (the ‘obvious’ domain). Others require expert knowledge (the ‘complicated’ domain) such as measuring effects of garden characteristics to obtain a detailed understanding of the garden’s bushfire risk and to inform evidence-based risk reducing measures (Ondei et al. 2025). Some adaptations emerge from complex interactions between social, emotional and ecological factors that cannot be predicted (the ‘complex’ domain). These include community initiatives for bushfire risk reduction that are shaped by the resources and experience available. There is also a ‘chaotic’ domain where time-constraints challenge possible solutions, such as situations where a bushfire threatens the home and immediate action is needed such as defending the property or evacuating (Dilworth and Price 2024). Such chaotic situations are outside the scope of this study. A fifth element was introduced by Kurtz and Snowden

(2003) to navigate priorities (the ‘disorder’ domain) that highlight the importance of breaking down tasks and triaging priorities when dealing with complex situations. The Cynefin framework helps explain why bushfire hazard awareness (Gjedrem et al. 2025; Lucas et al. 2022) among householders does not, in itself, dictate outcomes for bushfire garden adaptation.

As the Cynefin framework is an adjustable model, it provides flexibility in its adaptation. Applying this framework to the empirical insights of Ondei et al. (2025) and Gjedrem et al. (2025) helped identify ways to improve garden bushfire adaptation across the complex, complicated and obvious domains. This included 4 interventions of:

- institutional support and resource management (e.g. coordinated services such as green waste collection and equipment provision, which may be delivered by local government)
- individual garden bushfire adaptation (e.g. resident-led property modifications and maintenance practices)
- personalised technical guidance (e.g. tailored expert assessments and property-specific recommendations)
- community support networks (e.g. neighbourhood groups, peer learning systems and collective action initiatives).

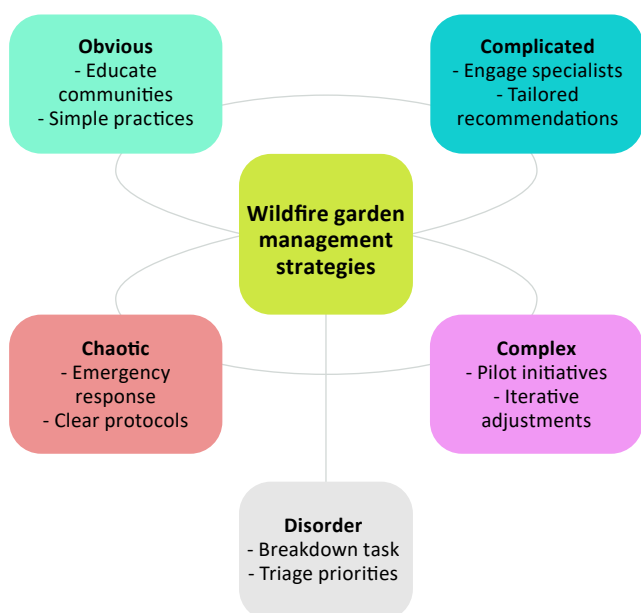


Figure 2: The Cynefin framework can be tailored to investigate pathways for bushfire garden management strategies.

Source: Adapted with permission from Kurtz and Snowden (2003)

Note: Text in bold shows the different complexity dimensions. The bullet points are examples of bushfire garden management strategies.

Figure 3 illustrates that intervention strategies (i.e. institutional support and resource management, individual garden bushfire adaptation, personalised technical guidance and community support networks) may move across different domains of complexity. The roots, symbolising the foundational strategies, are planted in their respective pots. Meanwhile, the trunks of the small trees represent the evolving pathways that move between the complexity domains as they are facilitated. The branches and leaves depict the various initiatives that emerge from these pathways that become entangled and branch out in different directions that shows the dynamic, interconnected nature of the adaptation process. These pathways span multiple domains of complexity, from straightforward vegetation management to complex social and emotional effect on garden adaptation.

Immediate opportunities through the ALARP lens

As apparent in the Cynefin analysis, forging efficient garden bushfire mitigation initiatives depends not only on individual awareness but on technical knowledge, community networks and institutional resources that make adaptation practically achievable while respecting complex

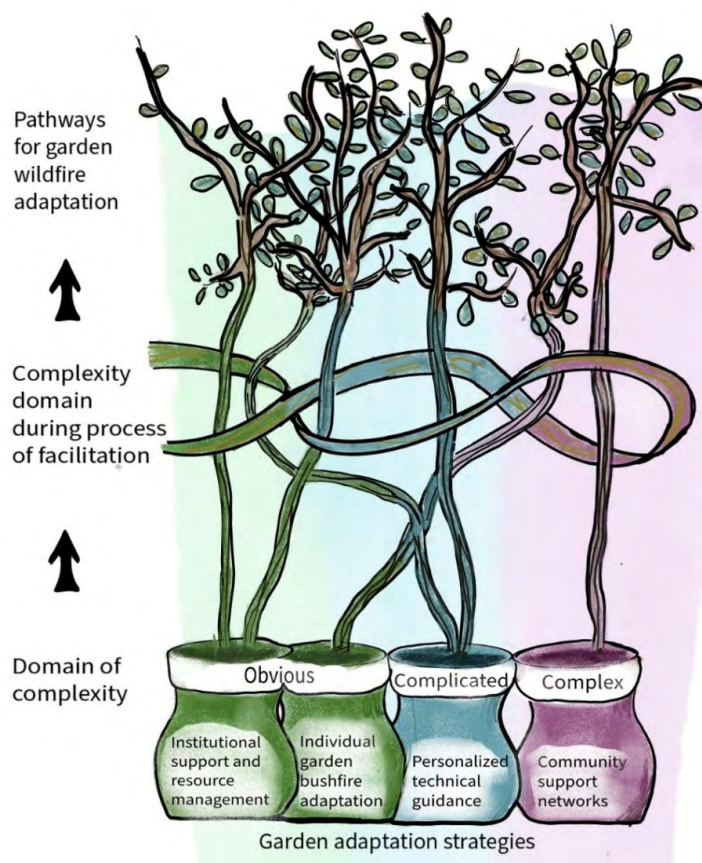


Figure 3: Pathways for garden bushfire adaptation shows how contrasting strategies are shaped by institutional, community and individual knowledge, support and resource availability.

Image: Gjedrem and authors

Table 1: Identified ALARP interventions.

Intervention avenue	ALARP intervention initiatives	Quotes from participants	Cynefin domain of complexity
Institutional support and resource management	- Increased green waste collection during fire season. - Additional green waste bins. - Special collection days for larger materials. - Community green waste drop-off points. - Tool-sharing programs. - Equipment lending libraries. - Grants for arborist services. - Subsidies for fire-resistant plants. - Support for essential equipment purchases. - Incentives for collective neighbourhood initiatives. - Assistance for elderly or disabled residents.	- I think more green waste pickups in the spring and in the middle of summer [would be helpful] so we can get all of this debris out of our gardens. [I would need a] work crew (physical labour and appropriate equipment, e.g. chainsaw) [to make my garden fire safe]. - If they want to do grants to pay an arborist to come around, we'd go for that. - Money [is a challenge]. It would take more financial input. [...] And also, my [physical] balance isn't as good as it used to be [so it is difficult to garden]. - I could spend every day working in the garden and it would make that a lot faster to make it more fire resilient, but time is a factor. And energy too, because it is a sloped property, I can really only do a few hours [at a time].	Obvious initiatives and process for facilitation: Simple initiative that increases span of already existing activities. Obvious initiatives and complicated process for facilitation: Intertwined in layers of processes for decision-making.
Individual garden bushfire adaptation	- Flexible compliance approaches. - Apply non-violent communication (Rosenberg 2015) approaches during citizen engagement. - Integrate multiple objectives in garden bushfire adoption plans. - Account for emotional dimensions of garden adaptation.	[My biggest challenge I face making my property more fire safe is] probably our own willingness to change things and balancing the desire to live in a sort of natural environment with minimising bushfire risk. [My biggest challenge I face making my property more fire safe is] knowing what the best thing to do is. We'd hate to remove trees that we don't need to but [...] if the end of the study, we find out that Eucalypt flowering gum in the corner is a real problem, then we'll think seriously about either pruning it back hard, [...] or removing it. [...] It's a beautiful old tree but, if it has to go, then we'll seriously consider it. - I think there are aspects of the report that will minimise the flammability risk that we can do without removing trees or sort of drastically pruning.	Obvious initiatives: Garden mitigation activities are in a space where individuals have direct agency as change-makers. Complex process for facilitation: Initiatives can fail and succeed. Successful initiatives can be used as an example, but there is no guaranteed blueprint solution.
Personalised technical guidance	- Property-specific hazard assessments and recommendations. - Mobile apps for self-assessment and advice. - Clear visual guides for garden zoning. - Educational programs about the fuel-free zone. - Regular garden assessment programs. - Locally specific plant guides with photos. - Seasonal maintenance checklists. - Expert consultation for complex decisions. - Staged implementation plans. - Clear and accessible guidelines and standards. - Local bushfire-adapted garden demonstrations.	- If you want to try and [mitigate bushfire garden hazard] but you can't even find the information. It's really prohibitive. [My biggest challenge I face making my property more fire safe is] trying to get the right advice about what's – you know what to chop down and what to leave. [My biggest challenge I face making my property more fire safe is to be] better educated regarding the growth and the trees and the species on my block, [and] how they would react in a bushfire. - Information would be really useful about whether there are beautiful things we could be planting that are much safer than our [current plants]. - Some sort of rolling program for annual review and measuring improvement (i.e. hazard assessment) would be beneficial. - The council or government could initialise coming around [...] every 2 years just looking at people's properties and say, 'As part of your rates, we are going to say this is what you should be doing – this is what you can do to help yourself and your neighbours and the community in your yard'.	Complicated initiatives and process for facilitation: Involves expert knowledge and cause and effect can be induced. Complicated initiatives and obvious process for facilitation: Technical and expert knowledge may become 'common sense' and intuitive practises.
Community support networks	- Neighbourhood working bees. - Mentoring systems between experienced and new residents. - Shared labour pools for physical work. - Community skills exchange networks. - Peer learning programs.	- There are a few things [that could be helpful for me in managing bushfire mitigation activities in my garden]. [...] one would be a working bee, that would be helpful. [It would be helpful for me to get] someone to reduce hazards in the garden. [It would be helpful for me if] People [...] came and planted [...] and remov[ed...] flammable trees. [It would be helpful for me too if someone assisted] negotiating with my neighbour so that he's not upset with any outcomes.	Complex initiatives and process for facilitation: Initiatives can fail and succeed. Successful initiatives can be used as an example, but there is no guaranteed blueprint solution.

garden values. Given these challenges, the ALARP principle offers a pragmatic way forward. The ALARP principle suggests that risks should be reduced to a level where further risk reduction would be grossly disproportionate to the benefits gained (Jones-Lee and Aven 2011; Log et al. 2020). Applying this principle to garden fire adaptation, this study identified several immediate, cost-effective interventions that could significantly reduce risk while requiring modest investment compared to expenses associated with bushfire suppression and rebuild.

Table 1 shows 4 intervention avenues (i.e. institutional support and resource management, individual garden bushfire adaptation, personalised technical guidance and community support networks) and ALARP intervention initiatives that were highlighted by participants in Gjedrem et al. (2025) during interviews on bushfire adaptation in Greater Hobart.

The ALARP interventions are not quick-fixes, but practical steps that can be taken while navigating multi-faceted problems. Integrating practical support mechanisms with existing emergency management programs could strengthen overall community resilience (Daniel 2024). It is important to note that individual ALARP interventions may not directly reduce overall bushfire risk to houses, rather, they address critical bottlenecks in the adaptation pathway. For example, increased green waste collection does not itself reduce fire hazard, but it removes a barrier that prevents homeowners from clearing flammable vegetation and maintaining bushfire-adapted gardens.

Institutional support and resource management

Examples of 'institutional support and resource management' initiatives include interventions that reduce risk such as increasing the frequency and effectiveness of green waste services, for example increased green waste collection during fire season, additional green waste bins, special collection days for larger materials and community green waste drop-off points. Green waste management emerged as a critical need and participants consistently identified waste removal as a barrier to maintaining fire-safe gardens. Other interventions included tool-sharing programs, equipment lending libraries, funding for essential equipment purchases, grants for arborist services, subsidies for fire-resistant plants, assistance for elderly or disabled residents and incentives for collective neighbourhood initiatives.

In some cases, the solution may be obvious. In others, complex bureaucratic and legal processes can overwhelm ordinary infrastructure support that can affect residents' abilities to maintain fire-safe practices. This is evident in the case of legal and administrative restrictions on installation of fire bunkers in most Australian states and territories (Bowman and McCormack 2023). Prompting fire-wise gardening resource investment as well as the

evaluation and adjustment of regulations and policy ensures they are effective and sensitive to community needs (Kurtz and Snowden 2003).

The limited capacity of some residents to maintain community cooperation points to a fundamental need for institutional support and structured programs that provide consistent, long-term assistance while building community capacity (Ascoli et al. 2023). To be effective, bushfire adaptation requires coordinated support across individual, community and institutional levels (Frandsen et al. 2011). Participants in this study highlighted the benefit of institutional support to remove cognitive, time-based and financial barriers to community collaboration.

Individual garden bushfire adaptation

Examples of 'individual garden bushfire adaptation' initiatives include adding flexibility into garden bushfire adaptation programs to avoid competing values derailing the initiatives. The delivery of personalised, flexible and non-judgemental garden assessment reports proved effective in motivating fire-safe garden practices. Rather than prescribing rigid changes, assessments acknowledged existing garden values while suggesting practical modifications. Other interventions included integrating multiple objectives in garden bushfire adoption plans (e.g. gardening for wildlife and improve and maintain aesthetic levels) and account for emotional dimensions of garden adaptation.

Open-ended questions, reflective listening and empathic engagement provide a foundation for community-centred communication with garden owners (Rosenberg 2015). Open-ended questions allow participants to share their experiences and perspectives on their own terms. This sets a tone of respect and collaboration. Using open-ended questions encourage participants to explore and articulate their thoughts and feelings in-depth. This approach helps to gain a deeper understanding of perspectives. Active listening allows researchers to check if there is mutual understanding and validates participant experiences and feelings. Empathetic engagement acknowledges the emotions and values expressed by participants. In discussing sensitive topics like bushfire risks, showing empathy is crucial to build trust and openness.

Garden bushfire adaptation offers landowners an opportunity to reduce bushfire risk. By implementing risk-reduction measures in their gardens, owners can contribute to increased safety measures. Every mitigation of risk helps because it removes potential pathways for destruction. Understanding bottlenecks that influence residents to adapt fire-wise gardening has challenged scientists and bushfire practitioners given the complexity of processes involved. For example, the most nuanced finding of this study concerned the role of emotional attachment in garden adaptation decisions while balancing

competing obligations of everyday life (Koksall et al. 2019). Participants reported struggling to balance fire safety with deeply held values around environmental stewardship and aesthetic preferences – in addition to the element of cost. The emotional dimension of garden management has been largely overlooked in traditional fire safety approaches but proves crucial to understand implementation barriers as highlighted by other studies (Bradstock et al. 2014; Edwards and Gill 2016; Eriksen and Gill 2010; Eriksen and Prior 2011; Lohm and Davis 2015; Paton et al. 2008). Research shows that adaptation measures are likely to be implemented when they accommodate rather than override existing values (Eriksen and Ballard 2020; Lohm and Davis 2015). Therefore, an effective way to improve adaptation is to increase the self-esteem and motivation of residents by highlighting existing aspects in the garden space that function well regarding bushfire-wise gardening.

Facilitation of initiatives that enforce individual garden bushfire adaptation are complex, tangled up in multiple and sometimes contradictory values. Thus, these relationships may be readily described but not easily predicted. This stands in contrast to assumptions of traditional notions of behavioural theory, particularly the assumption of order, rational choice and intentional capability. Inspired by Kurtz and Snowden's (2003) Cynefin framework, this study suggests forging a sense of collective direction and not subscribe to rigid objectives that create perverse incentives.

Personalised technical guidance

Personal technical guidance is information provided to garden owners based on scientific evidence on measures that reduce bushfire hazard in gardens. Examples of personalised technical guidance initiatives include property-specific assessment and recommendations. These assessments present recommendations in a structured format (bullet point overview) that participants valued for simplifying decision-making and supporting evidence-based garden bushfire mitigation. Clear visual guides for garden zoning and educational programs about a fuel-free zone, based on Ondeï et al. (2024), help make mitigation tasks less overwhelming and provide clear priorities. This is particularly valuable for owners of larger properties where comprehensive modifications could seem daunting. The lack of awareness among garden owners regarding the importance of the fuel-free zone (0–1.5m from houses) (Gjedrem et al. 2025) is an important area for public education as the immediate house surroundings play a fundamental role in property protection during bushfires.

The research revealed complex interactions between knowledge barriers and implementation challenges. Participants frequently reported difficulties, accessing and applying context-specific information. Providing technical recommendations can increase individual and community

agency and capacity where individuals can work as change-makers.

Regular garden assessment programs allow for regular feedback and monitoring tools that help residents track their progress and adjust their approaches as needed. Other interventions include locally specific plant guides with photos, seasonal maintenance checklists, expert consultation for complex decisions, staged implementation plans, clear and accessible guidelines and standards as well as local bushfire-adapted garden demonstrations.

It must be acknowledged that personal technical guidance initiatives are complicated and rely on specialised knowledge of parameters such as the landscape topography, fire weather warnings, landscape models, plant and object flammability, spacing and cover of plants and flammable objects (Gibbons et al. 2018; Ondeï et al. 2024). The process to increase knowledge about garden bushfire adaptation is complicated by the inclusion of many stakeholders (CSIRO n.d.) that may deliver expert advice and regulations across sectors. Nevertheless, over time, technical and expert knowledge may become 'common sense' and intuitive practises through learning-and-doing processes. To bridge the gap between professional assessment and everyday practice requires complex expert guidance on garden fire adaptation being accessible to residents. To achieve this requires repeated cycles of assessment, action, learning and confidence building that move conscious effort to intuitive understandings of bushfire adaptation. In the future, people might learn more about bushfire-wise gardening through mobile applications. Smartphone apps for self-assessment and advice could enable reductions in the cost of personalised garden bushfire mitigation advice. This would allow for self-assessment.

Community support networks

Examples of 'community support networks' initiatives include shared labour pools for physical work, peer learning programs, community skills exchange networks, mentoring systems between experienced and new residents and neighbourhood working bees expose practical resource constraints, from physical labour requirements to equipment access. These networks can create mutual accountability and encourage sustained engagement with fire adaptation practices. This can be established through communal working bees (informal groups of residents who come together to do manual work for a shared benefit).

Community support networks are clusters of community members that aid and support each other either through physical work or knowledge exchange. Such networks may be informally or formally organised. This research revealed complex dynamics around community-level support mechanisms for garden adaptation. While participants frequently expressed desire for coordinated neighbourhood actions, particularly in high-risk landscape

areas, the reality of establishing and maintaining such networks is challenging. This reveals a crucial gap between desired support and current capabilities.

Community support network initiatives are complex and are affected by a broad set of factors that include social, individual and biophysical. The community networks might depend on resourceful individuals (e.g. local champions) who can lead such initiatives. However, relying on volunteer-driven initiatives raises important sustainability concerns. As McLennan (2022) noted, delegating responsibility for bushfire mitigation to volunteers and overburdening them can strain community resources and potentially decrease long-term engagement. The informal nature of volunteer networks makes them exposed to burnout, changing personal circumstances and uneven participation across communities. Facilitating community collaboration is an iterative process and success in one area does not predict success of similar projects elsewhere. The methodologies of such initiatives need to be relevant and sensitive to their context. Research indicates that supporting ongoing initiatives may be efficient due to their pre-established roots in the community (Ascoli et al. 2023).

Conclusion, recommendations and future directions

This study analysed fire risk scores of 21 gardens in the Greater Hobart area of Tasmania. The findings demonstrated that garden fire adaptation is not only a technical challenge but also a complex socio-ecological process that benefits from coordinated efforts across garden, community and landscape scales that interact in complex ways. This was captured using the Cynefin framework. The ALARP framework identified practical pathways to implement actionable responses that are targeted, cost-effective and address the technical and social aspects of garden adaptation.

Using these frameworks, findings suggest that personalised garden assessments can effectively motivate fire-safe practices, although their success depends on delivery that acknowledges existing garden values and emotional attachments. While community networks show promise for knowledge sharing and resource pooling, the widespread implementation and long-term effectiveness of fire-wise design practices requires structured institutional regulation such as alignment with existing standards (e.g. AS3959-2018) and support. This research suggests that future initiatives will be most effective when they combine technical expertise with enhanced support systems that address practical implementation challenges and the pre-existing values of residents while promoting fire safety. Findings suggest that government agencies, as well as non-government organisations with a stake in bushfire adaptation (e.g. local councils, fire agencies and insurance

companies) continue to develop their community engagement iteratively.

Translating these potential pathways and enabling conditions into effective intervention programs remains challenging. Future research could examine adaptation pathways across diverse geographic and socio-economic contexts through longitudinal studies, explore practical implementation challenges through action research or investigate multiple-objective approaches that balance bushfire safety with other values and aspirations (e.g. biodiversity and aesthetic).

As bushfire risks intensify at the wildland-urban interface, developing effective support systems for garden-level adaptation becomes increasingly important. By better understanding the dynamics and implementing targeted interventions, communities can create fire-resilient environments that maintain the multiple values that gardens provide.

Acknowledgements

The authors thank the study participants for their time and for allowing access to their gardens. They also acknowledge Natural Hazards Research Australia stakeholders for their input into the survey design. Thanks are extended to Dr Sharon Campbell (University of Tasmania) for reviewing the questionnaire and facilitating pilot interviews. This research was funded by Natural Hazards Research Australia project T2-A5: Bushfire risk at the rural-urban interface, with additional support from the Australian Research Council Laureate Fellowship (FL220100099) and the Healthy Environments and Lives National Research Network under the Special Initiative in Human Health and Environmental Change program (2008937).

References

- Ascoli D, Plana E, Oggioni SD, Tomao A, Colonico M, Corona P, Giannino F, Moreno M, Xanthopoulos G and Kaoukis K (2023) 'Fire-smart solutions for sustainable wildfire risk prevention: Bottom-up initiatives meet top-down policies under EU green deal', *International Journal of Disaster Risk Reduction*, 92:103715. <https://doi.org/10.1016/j.ijdrr.2023.103715>
- Bénichou N, Adelzadeh M, Singh J, Gomaa I, Elsagan N, Kinateter MT, Ma C, Gaur A, Bwalya AC and Sultan MA (2021) *National Guide for Wildland-urban interface fires: guidance on hazard and exposure assessment, property protection, community resilience and emergency planning to minimize the impact of wildland-urban interface fires*. National Research Council Canada. <https://doi.org/10.4224/40002647>
- Bowman DMJS (2024) 'Pathways for sustainable coexistence with wildfires', *Nature Sustainability*, 7:1547–

1549. <https://doi.org/10.1038/s41893-024-01460-1>

Bowman DMJS and McCormack PC (2023) 'Arrested policy development of private fire shelters (fire bunkers) is a barrier to adaptation to the Australian bushfire crisis', *Fire*, 6(8):298. <https://doi.org/10.3390/fire6080298>

Bradstock R, Price O, Penman T, Penman S, Gill N, Eriksen C, Dun O, Brennan-Horley C and Wilkinson C (2014) *Social construct of fuels in the interface*. Bushfire CRC, Australia.

Campbell SL, Williamson GJ, Johnston FH and Bowman DMJS (2024) 'Social and health factors influence self-reported evacuation intentions in the wildfire-prone island of Tasmania, Australia', *International Journal of Disaster Risk Reduction*, 111:104712. <https://doi.org/10.1016/j.ijdr.2024.104712>

Colvin AO APM (2024) Final Report. Independent Review of Commonwealth Disaster Funding. National Emergency Management Agency, Australian Government website <https://www.nema.gov.au/about-us/governance-and-reporting/reviews/independent-review-of-commonwealth-disaster-funding>, accessed 8 April 2026

Cunningham CX, Abatzoglou JT, Kolden CA, Williamson GJ, Steuer M and Bowman DM (2025) 'Climate-linked escalation of societally disastrous wildfires', *Science*, 390(6768):53–58. <https://doi.org/10.1126/science.adr5127>

City of Hobart (2022) Bushfire Management Strategy. City of Hobart website www.hobartcity.com.au/Council/Strategies-and-plans/Bushfire-Management-Strategy, accessed 8 April 2026.

CSIRO (Commonwealth Scientific and Industrial Research Organisation) (n.d.) Stakeholder map. CSIRO website <https://research.csiro.au/nbic/home/stakeholder-map/>, accessed 15 January 2025.

Daniel P (2024) 'New tactics for a new era: how emergency management needs to change', *Australian Journal of Emergency Management*, 39(4):8–9. <https://search.informit.org/doi/10.3316/informit.T2024120900018501334709203>

Dilworth TL and Price O (2024) 'Understanding Experiences of Resident Defence During Bushfires in New South Wales, Australia', *International Journal of Disaster Risk Reduction*, 117:2212–4209. <https://doi.org/10.1016/j.ijdr.2024.105150>

Edwards A and Gill N (2016) 'Living with landscape fire: Landholder understandings of agency, scale and control within fiery entanglements', *Environment and Planning D: Society and Space*, 34(6):1080–1097. <https://doi.org/10.1177/0263775816645588>

Eriksen C and Ballard S (2020) *Alliances in the Anthropocene: Fire, plants, and people*. Springer Nature.

Eriksen C and Gill N (2010) 'Bushfire and everyday life: Examining the awareness-action 'gap' in changing rural

landscapes', *Geoforum*, 41(5):814–825. <https://doi.org/10.1016/j.geoforum.2010.05.004>

Eriksen C and Prior T (2011) 'The art of learning: wildfire, amenity migration and local environmental knowledge', *International Journal of Wildland Fire*, 20(4):612–624. <https://doi.org/10.1071/WF10018>

Fox-Hughes P, Harris R, Lee G, Grose M and Bindoff N (2014) 'Future fire danger climatology for Tasmania, Australia, using a dynamically downscaled regional climate model', *International Journal of Wildland Fire*, 23(3):309–321. <https://doi.org/10.1071/WF13126>

Frandsen M, Paton D and Sakariassen K (2011) 'Fostering community bushfire preparedness through engagement and empowerment', *Australian Journal of Emergency Management*, 26(2):23–30. <https://search.informit.org/doi/10.3316/ielapa.140692861394554>

Gibbons P, Gill AM, Shore N, Moritz MA, Dovers S and Cary GJ (2018) 'Options for reducing house-losses during wildfires without clearing trees and shrubs', *Landscape and Urban Planning*, 174:10–17. <https://doi.org/10.1016/j.landurbplan.2018.02.010>

Gjedrem AM, Onde S, Price OF, Williamson GJ, Bowman DMJS (2025) 'Where the landscape meets the garden gate: fire risk perception and garden adaptation in Tasmania's wildland–urban interface. *International Journal of Wildland Fire*, 34(9):WF24213. <https://doi.org/10.1071/WF24213>

Haynes K, Tibbits A, Coates L, Ganewatta G, Handmer JW and McAneney J (2008) 100 years of Australian civilian bushfire fatalities: Exploring the trends in relation to the 'stay or go policy. Bushfire Cooperative Research Centre. <https://nswrfs.intersearch.com.au/shows3item.php?file=%252ficmi+reports%252f6715%252epdf>

Johnston FH, Williamson G, Borchers-Arriagada N, Henderson SB and Bowman DMJS (2024) 'Climate Change, Landscape Fires, and Human Health: A Global Perspective', *Annual Review of Public Health*, 45:295–314. <https://doi.org/10.1146/annurev-publhealth-060222-034131>

Jones-Lee M and Aven T (2011) 'ALARP—What does it really mean?', *Reliability Engineering & System Safety*, 96(8):877–882. <https://doi.org/10.1016/j.ress.2011.02.006>

Kurtz CF and Snowden DJ (2003) 'The new dynamics of strategy: Sense-making in a complex and complicated world', *IBM Systems Journal*, 42(3):462–483. [10.1147/sj.423.0462](https://doi.org/10.1147/sj.423.0462)

Koksall K, McLennan J, Every D and Bearman C (2019) 'Australian wildland-urban interface householders' wildfire safety preparations: 'Everyday life' project priorities and perceptions of wildfire risk', *International Journal of Disaster Risk Reduction*, 33:142–154. <https://doi.org/10.1016/j.ijdr.2018.09.017>

Log T, Vandvik V, Velle LG and Metallinou MM (2020)

'Reducing wooden structure and wildland-urban interface fire disaster risk through dynamic risk assessment and management', *Applied System Innovation*, 3(1):16. <https://doi.org/10.3390/asi3010016>

Lohm D and Davis M (2015) 'Between bushfire risk and love of environment: preparedness, precariousness and survival in the narratives of urban fringe dwellers in Australia', *Health, Risk & Society*, 17(5-6):404–419. <https://doi.org/10.1080/13698575.2015.1109614>

Lucas CH, Williamson GJ and Bowman DM (2022) 'Neighbourhood bushfire hazard, community risk perception and preparedness in peri-urban Hobart, Australia', *International Journal of Wildland Fire*, 31(12), 1129–1143. <https://doi.org/10.1071/WF22099>

March A and Rijal Y (2015) 'Reducing bushfire risk by planning and design: A professional focus', *Planning Practice and Research*, 30(1):33–53. <https://doi.org/10.1080/02697459.2014.937138>

McLennan B (2022) *Planning for an uncertain future: future scenarios for emergency volunteering in Australia*. Volunteering Australia. https://volunteeringstrategy.org.au/wp-content/uploads/2023/05/VRP_Planning-for-an-uncertain-future-future-scenarios-for-emergency-volunteering-in-Australia.pdf

Nolan RH, Bowman DMJS, Clarke H, Haynes K, Ooi MK, Price OF, Williamson GJ, Whittaker J, Bedward M, Boer MM, Cavanagh VI, Collins L, Gibson RK, Griebel A, Jenkins ME, Keith DA, McIlwee AP, Penman TD, Samson SA, Tozer MG and Bradstock RA (2021) 'What do the Australian black summer fires signify for the global fire crisis?', *Fire*, 4(4):97. <https://doi.org/10.3390/fire4040097>

Ondei S, Price OF and Bowman DMJS (2024) 'Garden design can reduce wildfire risk and drive more sustainable co-existence with wildfire', *npj Natural Hazards*, 1(18). <https://doi.org/10.1038/s44304-024-00012-z>

Ondei S, Williamson GJ, Foyster S and Bowman DMJS (2025) 'An expert system to quantify wildfire hazards in gardens and create effective defensible space', *International Journal of Disaster Risk Reduction*, 105424. <https://doi.org/10.1016/j.ijdrr.2025.105424>

Paton D, Burgelt PT and Prior T (2008) 'Living with bushfire risk: Social and environmental influences on preparedness', *Australian Journal of Emergency Management*, 23(3):41–48. <https://search.informit.org/doi/10.3316/informit.439787741630325>

Power J and Wettenhall R (1970) 'Bureaucracy and disaster: II: Response to the 1967 Tasmanian Bushfires', *Australian Journal of Public Administration*, 29(2):165–188. <https://doi.org/10.1111/j.1467-8500.1970.tb00180.x>

Richards R, Ferguson S, Cornish K, Whight S and Williamson G (2014) Bushfire in Tasmania: a new approach to reducing

our statewide relative risk. University of Tasmania. <https://hdl.handle.net/102.100.100/502107>

Rosenberg MB (2015) *Nonviolent communication: A language of life: Life-changing tools for healthy relationships*. PuddleDancer Press.

Sturzenegger L and Hayes T (2011) 'Post Black Saturday: Development of a bushfire safety system', *Australian Journal of Emergency Management*, 26(2):54–59. <https://search.informit.org/doi/10.3316/ielapa.142295296922760>

Tasmanian Fire Service (n.d.) Protect What You Value - Bushfire-Prone Areas. Tasmania Fire Service website www.fire.tas.gov.au/Show?pagelid=colBushfireProneAreas, accessed 8 April 2026.

Wise RM, Fazey I, Smith MS, Park SE, Eakin HC, Van Garderen EA and Campbell B (2014) 'Reconceptualising adaptation to climate change as part of pathways of change and response', *Global Environmental Change*, 28:325–336. <https://doi.org/10.1016/j.gloenvcha.2013.12.002>

About the authors

Dr Anna Marie Gjedrem is a Postdoctoral Research Fellow at the University of Tasmania. She leads research on the human dimensions of bushfire adaptation, community resilience and residential garden fire risk reduction. She completed her PhD in Wildland-Urban Interface Fire Risk Management through the European University of Cyprus and Western Norway University of Applied Sciences, where her interdisciplinary background in social innovation, sustainable development and safety sciences informed innovative qualitative approaches for wildfire adaptation.

Dr Stefania Ondei is a Postdoctoral Research Fellow at the University of Tasmania. She leads research on plant flammability, the design and assessment of fire-adapted gardens and optimal fire management strategies for natural landscapes to support multi-scale adaptation to current and future fire regimes.

Associate Professor Owen F Price is at the Fire Centre at the University of Tasmania and is director of the Centre for Environmental Risk Management of Bushfire at the University of Wollongong. He researches the effects of bushfires on biodiversity and buildings and the effectiveness of strategies to reduce bushfire risk.

Dr Grant J Williamson is a Senior Research Fellow in Fire Ecology at the Fire Centre at the University of Tasmania. His research includes the climatic and human drivers of bushfires and fire danger and the dynamics and human health effects of smoke from bushfires and prescribed fires on human health.

Professor David M J S Bowman is an Australian Research Council Laureate Fellow and the Director of the transdisciplinary Fire Centre at the University of Tasmania. He holds a research chair in Pyrogeography and Fire Science.

Abstract

In the aftermath of a disaster event, there is an increased need for public participation in recovery-related decision-making, exceeding the typical scope of public participation in non-disaster settings. Community-led approaches to recovery are generally considered advantageous to ‘top down’ approaches, not only based on principles of democratic local governance, but also for sustainability, suitability to local context and the implementation benefits that local buy-in and participation can provide. Community recovery committees are a frequently used mechanism in Australia to enact community-led approaches to recovery. This paper outlines the development of a new self-assessment tool for community recovery committees to support these groups identify areas of agreement and disagreement in relation to governance, formation and scope and stakeholder engagement, based on learnings from past groups. This paper outlines the development and testing of the tool and subsequent insights for future community recovery committees and for government and other agencies supporting them.

Community-led disaster recovery: a new tool to support community recovery committees

Peer reviewed

Dr Kate Brady^{1,2} 

ORCID: 0000-0002-5665-3989

Dr H Colin Gallagher² 

ORCID: 0000-0003-0029-7943

Hannah Morrice² 

ORCID: 0000-0003-0029-7943

Professor Lisa Gibbs² 

ORCID: 0000-0001-9702-6896

1. University of New South Wales, Sydney, New South Wales.

2. University of Melbourne, Melbourne, Victoria.

SUBMITTED
16 October 2025

ACCEPTED
30 January 2026

KEYWORDS
disaster recovery, community-led recovery, emergency recovery

DOI
[www.doi.org/10.47389/41.4.26](https://doi.org/10.47389/41.4.26)



© 2026 by the authors.
License Australian Institute for Disaster Resilience, Melbourne, Australia. This is an open source article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) licence (<https://creativecommons.org/licenses/by/4.0>). Information and links to references in this paper are current at the time of publication.

Introduction

Australia is experiencing increased risk and exposure to disaster events (CSIRO 2020). The frequency, intensity and complexity of disasters globally is anticipated to increase (AIDR 2025), with an expectation that growing numbers of individuals and communities will experience multiple, compounding and cascading disasters (Pörtner et al. 2022).

In the aftermath of a disaster event, there is an increased need for public participation in recovery-related decision-making, exceeding the typical scope of public participation in non-disaster settings (Cretney 2018). However, this need often intersects with heightened tensions resulting from the time and deliberation required to collaborate on community priorities clashing with the need for urgent action and certainty in post-disaster settings (Cretney 2016; 2018; Olshansky et al. 2012; Vallance 2011).

Disaster recovery is highly multifaceted, often lacking clear definitions or solutions. It also involves many stakeholders from across community, government, the not-for-profit and private sectors. Recovery efforts are often beset by conflicting values, incomplete information and constantly shifting dynamics. This level of social and technical complexity demands strong collaboration among stakeholders. Collaboration enables shared ownership of both the problems facing disaster-affected communities and their solutions, promotes resource sharing, supports trial-and-error learning and helps navigate and resolve conflicts (Head and Alford 2015). Community-led approaches to disaster recovery are generally considered advantageous to ‘top down’ approaches, not only based on principles of democratic local governance, but also for sustainability, suitability to local context and the implementation benefits that local buy-in and

participation can provide (Cretney 2016, 2018; Dibley et al. 2019; Easthope 2018; Olshansky et al. 2012; Sanderson et al. 2025).

In Australia, 'using community-led approaches' has been enshrined as one of the 6 national recovery principles and has been endorsed by all state and territory jurisdictions and the Australian Government (AIDR 2018; Owen 2018). Despite the importance of community-led recovery approaches being recognised in Australian policy and doctrine (AIDR 2018; Australia-New Zealand Emergency Management Committee 2022), there is little agreement regarding what this means or how these approaches should be enacted to best support disaster-affected communities (Inspector-General Emergency Management 2021; Owen 2018; Vallance 2011). This is evidenced by the different ways community-led recovery approaches are reflected in recovery plans across jurisdictions (Australia-New Zealand Emergency Management Committee 2022) and enacted within jurisdictions (Inspector-General Emergency Management 2021). Additionally, there are recognised challenges to using community-led approaches, including the demands on community members leading recovery efforts at a time of significant disruption and pressure (Inspector-General Emergency Management 2021; Pope and Harms 2022; Taylor and Goodman 2015; Vallance 2011), governments' abilities to genuinely engage in community-led approaches (Owen 2018; Sanderson et al. 2025; Taylor and Goodman 2015) and concerns of potential burden shifting of government responsibility to unpaid community members or under-resourced community groups (Cretney 2016; Inspector-General Emergency Management 2021; Taylor and Goodman 2015; Vallance 2011). Understanding the wide variation in what decisions are made and how they are made when agencies engage with communities after disasters is crucial (Cretney 2018). There is broad agreement that despite community-led approaches being beneficial and desired in disaster recovery, they are rarely executed (Cretney 2016, 2018; Love and Vallance 2013; Owen 2018; Sanderson et al. 2025).

There are a multitude of mechanisms community-led approaches to recovery can take (Cretney 2016, 2018). Community recovery committees (CRCs) are one mechanism through which community-led approaches can be enacted in post-disaster settings. CRCs have existed for decades in Australia, for example, the Area-Coordinating Committees following the Ash Wednesday bushfires in 1983 (Hill et al. 1987), the Wye River and Separation Creek 2015 Christmas bushfires recovery committee (2009 Victorian Bushfire Community Recovery Committees 2011; Leadbeater 2013). While most CRCs are based around geographic communities, there have been examples of CRCs formed based on communities of impact (e.g. Bushfire Bereaved Advisory Group following the 2009 Victorian bushfires) (2009 Victorian Bushfire Community

Recovery Committees 2011; Abotomy and Savage Kooroonya 2014; Emergency Management Victoria 2014). Committees or groups comprised of community members may engage with formal recovery actors in different ways and be referred to by terms including community recovery groups, renewal groups and resilience groups. The term CRC is mostly used in Victoria, where these groups are recognised in the State Emergency Management Plan (Emergency Management Victoria 2024).

While there is no formally agreed definition of CRC in the Australian Community Recovery Handbook (AIDR 2018) or jurisdictional doctrine, the term is used here to refer to 'groups comprised of community members who are involved in recovery processes after a disaster'. While the term 'involvement' has been left intentionally abstract, this definition does not refer to committees comprised of people representing government or other organisations, despite the term being used in some jurisdictions to refer to committees comprised of agency representatives.

CRCs work together towards a shared goal or goals, formally or informally. In the absence of any instruction manual, formal guidelines or central authority articulating a shared framing of what CRCs ought to be, CRCs are necessarily shaped, in part, by the individuals who comprise them. These individuals bring different experiences, values and inherent biases. There is limited research focusing on these groups, but there is ample anecdotal evidence and grey literature to indicate that the way these groups form and operate in different locations is likely to vary widely, including their perceived role, goals, capacities and needs (2009 Victorian Bushfire Community Recovery Committees 2011; Bloor et al. 2023; Clifton Creek Community Recovery Team 2023; Emergency Recovery Victoria 2023; Lloyd and Hopkins 2022; SIERRACON 2024; Taylor and Goodman 2015). Examples of the documented types of work that CRCs have undertaken in Australian communities include developing communication channels and information resources to provide recovery-specific information to community members; coordinating external services; engaging in significant advocacy activities with emergency management organisations and government bodies for procedural change; facilitating events, workshops, support groups and memorials; coordinating public works; applying for and managing grants and donations; allocating funds for community run services and events; coordinating services such as tool libraries and plant nurseries; undertaking community preparedness programs and undertaking surveys and consultations to identify community priorities for local infrastructure (Abotomy and Savage Kooroonya 2014; East Gippsland Shire Council, n.d.; Emergency Management Victoria 2014; Mallacoota and District Recovery Association n.d.; Bloor et al. 2023; Sierracon 2024; Strathewen Community Renewal Association 2010).

For people engaging with CRCs, such as local or state government representatives, it can be challenging to respond constructively to the idiosyncratic needs of different community groups while maintaining the bureaucratic efficiency of scalable, preplanned solutions, especially when supporting multiple communities across a region or state (Bloor et al. 2023; Taylor and Goodman 2015). This is further complicated by the short-term nature of the locally based disaster recovery workforce, which is characterised by short-term roles, often with constrained resources, limited training, competing demands and high rates of attrition (Leppold et al. 2025; Sanderson et al. 2025).

Both the community members forming CRCs and the people supporting them face significant informational challenges in post-disaster settings. While some resources for CRC members exist in Australia, including [Disaster Recovery Mentors Australia](#) (a volunteer led mentor program), [DisasterWise](#) (a learning network for community leaders), case studies, reports and documented advice to help inform these groups (2009 Victorian Bushfire Community Recovery Committees 2011; Mitchell 2019; Quinn, Gibbs et al. 2021; Sierracon 2024), it can be an overwhelming challenge for people to access and absorb this information at the early stages of recovery. This can make it difficult for CRCs to identify the scope of their groups and their support needs, increasing the challenges for government and other recovery organisations to tailor the support they provide to communities (Bloor et al. 2023).

Overall, effective collaboration requires significant time and resources to develop and sustain. However, in a disaster-recovery context, such time is often scarce and residents need urgent assistance and timely decisions but government-funded supports are tied to budget cycles. The need for broad system reform notwithstanding, it is imperative that CRCs are offered timely support to identify the complexities of their group formation, governance, scope and the support they need.

This paper outlines the development of a self-assessment tool for CRCs that has been piloted as part of a multi-phase research project.

Method

Study design

Phase 1 of the study (Gibbs, Gallagher et al. 2021) identified evidence from literature relating to how governments can support community-led deliberative decision-making processes in post-disaster recovery settings and how governments can best leverage existing and emerging community organisations, structures and networks after disasters. In addition to summarising the existing research, a range of common challenges for CRCs and agencies

supporting them were identified (Gibbs, Gallagher et al. 2021). From this, a preliminary self-assessment tool was developed to identify predictable challenges and to determine how CRCs wanted to approach issues likely to arise over the lifetime of their group. This preliminary tool identified areas of importance and predictable conflict within CRCs, drawing on stakeholder interviews, meetings with Bushfire Recovery Victoria team members, case studies, grey literature, academic research and tacit knowledge from a member of the research team with considerable experience working with a range of CRCs (Brady et al. 2023).

Phase 2 of the study (referred to as ReGroup) identified what CRC members considered the role of a CRC to be in terms of the group's mission, objectives, make-up, social position and relationships. This phase tested 2 new tools (a self-assessment tool and a social network mapping tool) for their relevance to CRCs (Brady et al. 2023). A project reference group was formed comprised of 18 members who had experience of either being a CRC member or a recovery worker implementing community-led activities during recovery (including supporting CRCs). This reference group contributed to the research team's refinement of the self-assessment tool by providing feedback through regular online meetings. The initial tool comprised 29 elements arranged under 3 headings of:

- formation and scope
- governance and decision-making
- stakeholder engagement.

These elements were presented on Likert scales in a self-assessment tool survey that individual members of CRCs could position themselves on.

Using the results from Phase 1 of the study, coupled with the tacit knowledge from the project reference group, Phase 2 was approached with a guiding assumption that there was no single 'right' way for CRCs to form, be governed, to choose the scope or goals of the group or be supported.

The intention of developing and testing a tool was to use experiences of people from past CRCs to help current CRCs consider issues that might be sticking points and to use this information to make better-informed choices. Despite differences between groups, the tools were designed to identify similarities in the types of issues that would be relevant, even if the desired approaches and outcomes of the groups were different.

This paper reports on the development and pilot of the self-assessment tool for relevance, usability and usefulness. Reporting on the other components of the ReGroup study, including a social network mapping tool can be found in Brady et al. (2023).

Ethics statement

Ethics approval for this study was obtained from the University of Melbourne Human Research Ethics Committee, project identification #24698.

Recruitment

Six CRCs were identified by project reference group members as potential Phase 2 ReGroup study participants. Groups were recruited for diversity related to stages of establishment (e.g. well-established or new), hazard exposure (e.g. fire, flood) and geographic locations within Australia. The CRCs were contacted by email or telephone and provided with information about the project for consideration. CRC members were asked to participate in a one-day in-person workshop during late 2022 to early 2023. Five of the invited groups agreed to participate. One group withdrew before the workshop was undertaken. A sixth group expressed interest but the timing of the workshops was not suited to them.

Consideration for the workload of CRCs was a point of discussion within the project reference group. Thus, potential participant groups were instructed that a criterion to take part in the research was a genuine belief from the group members that they considered their participation would be beneficial.

Workshops

The workshops comprised 3 different activities relating to the study aims of Phase 2. These were piloting the self-assessment tool, piloting a social network mapping tool and using an exercise to explore the role of CRCs. This paper reports only on the trial of the self-assessment tool pilot.

The Self-Assessment Tool (see Figure 1 sample) was loaded onto a survey form using Qualtrics software. Participants were given iPads to use to individually complete the self-assessment tool in the workshop. This activity took most participants approximately 15 minutes to complete.

In the workshops, the individual responses were processed using statistical software program R¹ to generate the results within 10 minutes of all participants completing the activity. As a simple and practical measure, the standard deviation for the spread of responses to gauge levels of agreement among group members was used. Participants were presented the results on a large screen so they could be viewed as a group, focusing on the elements of highest agreement and disagreement in the individual responses from group members.

After the results were presented, a group discussion was facilitated about the responses. Group members were asked to reflect on the things they found surprising or unexpected and to explore points of disagreement in more detail.

Following the workshop with the first group, minor adjustments were made to the phrasing of some statements in the self-assessment tool to reflect participant feedback. The tool was not altered after this.

Results

The Self-Assessment Tool was piloted with 4 CRCs from different locations in Australia that had experienced different disaster events. Table 1 lists the participant groups, their origin state and the total number of participants.

All of the groups identified that they had discussed at least some of the issues in the Self-Assessment Tool at some point but had not previously approached discussions in a structured or guided way. The group discussions were rich, thoughtful and nuanced. Participants asked each other to clarify their position and challenged some statements made by others in their group. In one site, the workshop discussions led members to agree on foundational changes in the proposed legal structure and governance arrangements of their group. While some of the groups had already addressed some of the points covered in the

1. A commonly used statistical software program called R, used for quantitative research, see www.r-project.org.

Table 1: Participant groups and numbers of participants.

Group	State	Setting	Number of workshop participants
A	NSW	Regional community. Community had experienced multiple flooding events in recent years, most recently in 2022. The group was formally established (with identified volunteer committee roles) approximately 6 months prior to participating in the workshop but had been running in a different form for nearly 8 years at that time.	7
B	Qld	Urban community. Community had experienced recent flooding event in 2022. Suburb had historic flooding. This group had been meeting for less than 6 months before the workshop and were in the stages of deciding how their group should be structured.	6
C	WA	Regional interface community. Community had experienced significant fire event in 2021 and historic fires. This group had formed approximately one year prior to their participation in the workshop.	12
D	Vic	Remote community. Community had experienced significant bushfire event in 2019-2020. This group had been formally established (with identified volunteer committee roles) for nearly 3 years at the time of workshop participation.	8

The below questions are about what you would like your Community Recovery Committee to look like.

Please select a position on the scale that reflects your views.

FORMATION AND SCOPE

One well defined location	☐ ☐ ☐ ☐ ☐ ☐ ☐	District level, multiple locations
Single issue focus	☐ ☐ ☐ ☐ ☐ ☐ ☐	Whole of recovery focus
Pre-existing group	☐ ☐ ☐ ☐ ☐ ☐ ☐	Completely new group
Self-appointed group	☐ ☐ ☐ ☐ ☐ ☐ ☐	Formal election process
No clear objectives for the group	☐ ☐ ☐ ☐ ☐ ☐ ☐	Clear, deliberate goals and parameters of the group
Do not manage projects	☐ ☐ ☐ ☐ ☐ ☐ ☐	Manage all projects
Group formed / adapted very soon after the disaster event	☐ ☐ ☐ ☐ ☐ ☐ ☐	Group formed / adapted some time after the disaster event
No financial responsibility	☐ ☐ ☐ ☐ ☐ ☐ ☐	Complex financial responsibility
No legal status of group	☐ ☐ ☐ ☐ ☐ ☐ ☐	Clear legal status of group
Our group does not represent the communities views and priorities to any external bodies (e.g. government and NGOs) on all issues relating to resilience and recovery	☐ ☐ ☐ ☐ ☐ ☐ ☐	Our group represents the communities views and priorities to external bodies (e.g. government and NGOs) on all issues relating to resilience and recovery

Figure 1: Extract from the self-assessment tool survey form.

A full copy of the tool survey is available at the NHRA website (Brady et al. 2023).

tool, they noted that discussions were still helpful as ways to think about future changes and what they could do differently.

Heterogeneity of groups

The discussions in each group had a different focus as a result of workshop participants and individual responses. This emphasised the heterogeneity of the groups and their contexts. Individuals brought different experiences, values and biases to the discussions and the groups had experienced a range of interactions with government and other agencies, which explains the substantial heterogeneity observed across groups. Of note, there was variation between and within groups. In workshop discussions,

participants drew heavily on community history, context and dynamic changes since the disaster event. Tables 2 and 3 outline the highest areas of agreement and disagreement for each of the groups in the surveys.

In addition to a wide range of perspectives of formation, governance, scope and stakeholder engagement between groups, there was no single agreed view between the groups regarding the role of CRCs as representatives of communities. Two of the CRCs regarded their main function as being a voice on behalf of their community:

We've been put in a position of trust by people who don't have capacity... they've said 'I don't have capacity, can you be my voice? I trust you, can you say this'.
(Member, Group B)

[CRCs] must be representative but avoid 'doing' representation... It must represent diversity, but once you're doing the job [as a committee member] you have to leave your passion project at the door... you have to implement what your community has asked for. If you have people 'doing' representation, you get divisions and factions.

(Member from Group D at a later presentation about the work of their CRC)

While the other groups didn't see themselves as fulfilling this role:

We are anarchists who want to get things done and are open to listening.

(Speaker A, Group A)

Yeah, but I don't want people to say 'where were you?' I don't want people to sue us, hold us accountable to things they thought would happen.

(Speaker B, Group A)

I think the word that is missing here is power or authority. I would like others to have power, not us to have all of the power.

(Speaker C, Group A)

This is a representation of community strength – what are the strengths of having different groups or people on a group. Everyone has different things they can do or take care of.

(Member, Group C)

Usefulness of tool

Participants in the 4 case study sites overwhelmingly reported that they considered the self-assessment tool to be both relevant and useful for their groups. They

identified that it was helpful to be able to access a flexible tool that covered a range of relevant domains. Additionally, participants reported that having a structured format to follow was useful to guide group discussions and decision-making, saying:

I like that you're not telling us the 'right way'. There's food for thought and options... I'd always prefer to be given the question than the answer, so this fits.

(Member, Group A)

Some participants noted that it was surprising to see areas of disagreement highlighted within the group that they hadn't been aware of before the workshop, noting they felt the discussions this prompted were constructive and useful. Participants identified that it was easier to talk about areas of disagreement using this approach before they became problems.

In 2 of the workshops, the discussion prompted clarification and resolution regarding issues the group had been grappling with for some time.

Role of government as an influence

Both government action and inaction in disaster-affected communities affected how groups formed and how they defined their scope, goals, governance and approaches to stakeholder engagement. There was a wide variance in the relationships that the 4 case site CRCs had with local and state government. One group felt the absence of government in their community had been a motivator for their group to form:

We're not anti-government per se, they're just not here.

(Member, Group A)

Another group saw their work as being closely aligned and integrated with government and considered that

Table 2: Highest areas of agreement per group.

Group	Formation and scope	Self-Assessment tool element	
		Governance and decision-making	Stakeholder engagement
A	Project management.	Group will exist beyond government involvement.	Active engagement with the community beyond the committee.
B	Group represents community externally.	Group will exist beyond government involvement.	Active engagement with the community beyond the committee.
C	Group needs clear, deliberate goals.	Defined decision-making role of the group.	Connection to elected officials.
D	Group legal status.	Formal roles needed within group.	Planned, active engagement with community by the committee.

Table 3: Highest areas of disagreement per group.

Group	Formation and scope	Self-Assessment tool element	
		Governance and decision-making	Stakeholder engagement
A	Group legal status.	Planning for representation for all sectors of the community.	Community members outside the committee are involved in the committee decision-making.
B	Group will take on financial responsibility.	Members should receive payment for committee involvement.	Media engagement.
C	Geographic location the group covers.	Planning for representation for all sectors of the community.	Media engagement.
D	When the group should form.	Term length of roles.	Level of engagement with elected officials.

the division of work between community members, government employees and elected officials should be based on how results could most efficiently be achieved:

[You have to ask] What strengths are represented here? Who can get stuff done?
(Member, Group C)

One group had reservations about having a close relationship with government based on an agreed perspective between group members that neither local nor state government understood what communities needed. Group members made several comments about the inability of governments to be flexible or community-oriented and had concerns about government action after disasters being politicised. Based on these concerns, they saw the importance of their group informing government:

We should be a conduit that helps government prioritise intelligence and ongoing resource allocation.
(Member, Group B)

One group saw their role as being independent from government and had mixed experiences with government interaction. While they had some scepticism, they still noted overall benefits to working with government:

It needs to be based on trust... we haven't always welcomed local government people [but] Shire staff as a liaison point is a helpful pathway back to council. It stops us barking up the wrong tree.
(Member, Group D)

Irrespective of how active, passive, collegiate or hostile participants felt government bodies were, all groups discussed the role of and purpose of their CRC in relation to government. This included being motivated to push against government agendas, filling a perceived gap left by government, addressing concerns they had about government process, providing advice or direction to government or improving information flow between government and community.

Timing of the tool

When workshop participants were asked if there was a 'best' or a 'right' time to access the self-assessment tool, there was very little agreement within or between groups, highlighting the need for flexibility. While some participants suggested that before a disaster would be the best time, others in their groups refuted this, saying they wouldn't have engaged with it or even understood the magnitude and complexity of the post-disaster setting before they had experienced it:

Every community in the country should do this stuff before an event, like an evacuation plan. But we probably wouldn't have done it.
(Member, Group D)

When some participants nominated 'soon after the disaster event' as being the best time, others in their groups rejected this, saying that the overwhelming nature of the immediate effects of the disaster would have prevented their ability to read, absorb or use the tool, even if they agreed that it would have helped. Pragmatically, one participant suggested that the best time would be:

... after one event, but before the next one.
(Member, Group A)

This reinforces the need for the recovery workforce to be trained in tools and resources available so that groups can be pointed to the right supports at the right time for them, noting that these tools may need to be introduced multiple times considering the post-disaster context of disruption and demand.

Discussion

This paper reports on the results of the pilot of the Self-Assessment Tool for CRCs in 4 disaster-affected communities in Australia. This study highlighted the heterogeneity between CRC perspectives on formation, scope, governance and stakeholder engagement of these groups. This variation reinforces the importance of understanding context when helping communities and the value of flexibility in tools and support available in such dynamic settings (Bloor et al. 2023; Love and Vallance 2013; Mitchell 2019). Mechanisms that support CRCs to navigate the difficulties of post-disaster settings and help negotiate the tensions between speed and deliberation are essential to community-led approaches to recovery (Olshansky et al. 2012). This tool may offer one such mechanism to CRCs and the agencies working with them.

This study also highlighted the inherent individualised nature of CRCs. Given the absence of a central authority articulating a shared framing of what CRCs ought to be and do, the membership of CRCs is shaped by individuals who bring distinct values and inherent biases and by their experience interacting with government and other agencies. Heterogeneity is not a limitation but an expected and defining feature of CRCs. This tool provides an opportunity to discuss differences and agreement in a structured way, offering utility to CRC members and government officials to potentially function more effectively.

The results of the pilot and workshop discussions drew out points of differences and disagreement between CRC members, reflecting the existing knowledge that priorities preferred approaches in post-disaster settings (Cretney 2018; Vallance 2011). The heterogeneity of CRCs highlighted in these results points to the challenges facing government and other recovery agencies to provide appropriate, tailored support to different groups (Bloor et al. 2023; Owen 2018) and reinforces the need for tools that

can help CRCs and governments identify the formation, scope, governance and needs of CRCs. It also emphasises why rigid predetermined approaches to interactions with communities, such as requiring specific committee structures, are unlikely to work well in post-disaster settings (Dibley et al. 2019; Owen 2018).

There was no single agreed view between groups regarding the role of the CRCs as representatives of their communities, with some groups seeing themselves as representatives and others not. This is crucial for governments and emergency management agencies to understand as there is often an assumption that CRCs are and see themselves as community representatives in recovery planning. This tool may assist governments and emergency management agencies to understand the perspectives of the groups with which they are working.

The self-assessment tool was a helpful device for CRCs as a flexible, methodical and relevant way for groups to identify areas of disagreement and potential conflict and to give thought to issues that the groups may not have previously considered. The wide variation on when participants considered the right or best time to use the tool highlights the importance of flexibility for support available to communities after disasters. Additionally, it reinforces the importance of ensuring the disaster recovery workforce has experience and training in community engagement and clear and flexible approaches to how governments plan to work with communities after disasters.

These findings highlight the importance of how groups see themselves in relation to government. It is notable that, irrespective of how group members considered government (e.g. helpful, unhelpful, active, passive), all groups considered their formation, role, scope and approach to stakeholder engagement in relation to their perception of government. This is important for government agencies to understand. Government actions, inactions and approaches directly influence the shape and role of CRCs. This points to the importance of government agencies having a clear articulation of how they interpret the principle ‘using community-led approaches to recovery’ (AIDR 2018; Inspector-General Emergency Management 2021) as it will influence how their teams subsequently interact with disaster-affected communities.

These results suggest the great difficulty for those seeking a ‘silver bullet’ for predetermined models for CRCs, as the contexts of communities both before and after disasters varies so widely. There are valid reasons that organisations would prefer ‘off the shelf’ models for CRCs, including the need to provide scalable, equitable support across multiple locations simultaneously, often in a constrained environment (Bloor et al. 2023; Taylor and Goodman 2015) and navigating the realities of a short-term, transitory recovery workforce. However, these findings add to the

body of research and grey literature confirming that this approach is overly simplistic and reduces the vital need for consideration of flexibility and community context (Cretney 2018; Love and Vallance 2013; Taylor and Goodman 2015; Vallance, 2011). Rather than continuing to ask ‘what is the best model for a CRC to engage with government processes?’ we suggest government and agencies instead ask ‘what do we need to better understand about the context of this disaster-affected community for a CRC to have the best chance of success?’. This change in assumptions requires governments and other support agencies to use flexible approaches, often simultaneously across different locations, in how they work with CRCs. The Self-Assessment Tool piloted in this study may support CRCs to improve clarity about their expectations, intentions and needs and for supporting agencies to clarify the support needs and approaches required.

Strengths and limitations of the study

The Self-Assessment Tool was designed with the intention of it being further developed as a digital resource, freely available to disaster-affected communities through the Australian Institute for Disaster Resilience website. Users would be able to access the tool at a time that best suits their needs, supported by guidance on its use. The digital versions would also generate real-time results, enabling CRCs to better identify community needs, inform planning and target support where it is most needed.

These promising findings support wide dissemination of the tool and further testing in diverse disaster and community contexts. However, to date, funding has not been secured to develop a scalable digital version. In its current form, the tools consist of static documents containing questions for consideration by CRCs but lacks the functionality to capture and display collective group responses or sentiment (Brady et al. 2023). This substantially limits its scalability and broader application.

Conclusion

This study piloted the use of a previously developed self-assessment tool with 4 CRCs in disaster-affected communities in Australia. Participants were positive about the relevance and benefits of the tool. The pilot study demonstrated proof of concept that the tool can support community-led approaches to recovery by assisting CRCs identify suitable governance structures, formation and scope and stakeholder engagement plans.

The wide range in views from the workshops about the preferred scope, formation, governance and stakeholder engagement approaches of CRCs demonstrates there is no ‘silver bullet’ model of how these groups are formed or governed, what their scope should be or how they should operate for individuals and agencies. This highlights

the complexity of enacting community-led approaches as a central tenet of the National Principles for Disaster Recovery (NEMA 2026). These findings reinforce the importance of understanding the context of different communities and point to a strong need for flexible approaches as to how CRCs are supported. This tool has the potential to help CRCs learn from past operations and make decisions about formation, scope, governance and engagement approaches that are suited to their context.

This study shows the importance of government and other agencies developing a clear understanding of how community-led approaches to recovery are interpreted and operationalised across different organisations and jurisdictions. The findings support further rollout and trialling of the tool and underscore the need for government bodies and other agencies to remain cognisant of how their actions—or inactions—can influence and shape the role, function and scope of CRCs.

Acknowledgement

This work was supported by Natural Hazards Research Australia.

References

- 2009 Victorian Bushfire Community Recovery Committees (2011) *Lessons Learned by Community Recovery Committees of the 2009 Victorian Bushfires*. Victorian Government website, accessed 16 October 2025.
- Abotomy R and Savage Kooroonya E (2014) *Victorian Government Black Saturday Bushfire Bereaved Advisory Group Legacy document December 2009– December 2013* [PDF]. Victorian Government website, accessed 16 October 2025.
- AIDR (Australian Institute for Disaster Resilience) (2018) *Community Recovery Handbook* [PDF]. AIDR website.
- AIDR (Australian Institute for Disaster Resilience) (2025) *Major Incidents Report 2024–25* [PDF]. AIDR website.
- Australia-New Zealand Emergency Management Committee (2022) *Australian Disaster Recovery Framework* [PDF]. ANZEMC website.
- Bloor M, Wernick N and Taylor M (2023) 'Anarchy in the Uki! How a hybrid of structure and autonomy can exist in community self-organisation' [PDF], *Australian Journal of Emergency Management*, 38(4):40–46.
- Brady K, Gallagher HC, Morrice H and Gibbs L (2023) *Community-Led Recovery: Evidence, Dimensions and Supports. Report to Natural Hazards Research Australia for Regroup project Phase 2* [PDF]. NHRA website.
- Clifton Creek Community Recovery Team (2023) *Clifton Creek Recovery: Looking to the Future—Summary Report* [PDF].
- Cretney RM (2016) 'Local responses to disaster: The value of community led post disaster response action in a resilience framework', *Disaster Prevention and Management*, 25(1):27–40, <https://doi.org/10.1108/DPM-02-2015-0043>
- Cretney RM (2018) 'Beyond public meetings: Diverse forms of community led recovery following disaster', *International Journal of Disaster Risk Reduction*, 28:122–130. <https://doi.org/10.1016/j.ijdr.2018.02.035>
- CSIRO (2020) *Climate and Disaster: Technical Reports* [Online]. CSIRO website, accessed 16 October 2025.
- Dibley G, Mitchell L, Ireton G, Gordon R and Gordon M (2019) *Government's role in supporting community-led approaches to recovery* [PDF]. Department of Health and Human Services website.
- Easthope L (2018) *The Recovery Myth: Plans and Situated Realities of Post-Disaster Response*, Springer. <https://doi.org/10.1007/978-3-319-74555-8>
- Emergency Management Victoria (2014) *Disaster Recovery Toolkit for Local Government* [Online]. EMV website, accessed 16 October 2025.
- Emergency Management Victoria (2024) *State Emergency Management Plan* [Online]. EMV website, accessed 16 October 2025.
- Emergency Recovery Victoria (2023) *Community Recovery Toolkit* [PDF]. Victorian Government website.
- Gibbs L, Gallagher C, Brady K, Leppold C, Ireton G, Haywood A, Clarke Y, Davies S, Norton F and Brandenburg V (2021) *Community-led Recovery—Black Summer Final Report: Evidence, dimensions and supports for Community* [PDF]. NHRA website. https://naturalhazards.com.au/sites/default/files/2022-03/community-led_recovery_black_summer_final_report_1.pdf
- Head BW and Alford J (2015) 'Wicked Problems: Implications for Public Policy and Management', *Administration and Society*, 47(6):711–739. <https://doi.org/10.1177/0095399713481601>
- Hill J, Hill H and Gray S (1987) 'Community Recovery following the Ash Wednesday Bushfires', *Children Australia*, 12(3):11–12. <https://doi.org/10.1017/S031289700001417X>
- Inspector-General for Emergency Management (2021) *Inquiry into the 2019–20 Victorian fire season: Phase 2 Progress and effectiveness of Victoria's immediate relief and recovery arrangements* [Online]. IGEW website, accessed 16 October 2025.
- Leadbeater A (2013) 'Community leadership in disaster recovery: A case study' [PDF], *Australian Journal of Emergency Management*, 28(3):41–45.

- Leppold C, Morrice H, Brady K, Reifels L, Abeysinghe S, Quinn P and Gibbs L (2025) 'Recovery work in cascading and compounding disasters: A qualitative study of community recovery workers in Australia', *International Journal of Disaster Risk Reduction*, <https://doi.org/10.1016/j.ijdr.2024.105152>
- Lloyd J and Hopkins C (2022) 'Community-led disaster recovery—Mallacoota, Victoria' [PDF], *Australian Journal of Emergency Management*, 37(4):8–9.
- Love R and Vallance S (2013) 'The role of communities in post-disaster recovery planning: A Diamond Harbour case study', *Lincoln Planning Review*, 5(1):3–9. <https://doi.org/10.34900/lpr.v5i1-2.765>
- Mitchell L (2019) *Case studies exploring community-led recovery and coordination* [PDF]. Social Recovery Reference Group Australia website.
- NEMA (National Emergency Management Agency) (2026) National Principles for Disaster Recovery [Online]. AIDR website, accessed 16 October 2025. <https://www.nema.gov.au/about-us/media-centre/updated-national-principles-disaster-recovery-have-been-released#Relatedarticles>
- Olshansky RB, Hopkins LD and Johnson LA (2012) 'Disaster and Recovery: Processes Compressed in Time', *Natural Hazards Review*, 13(3):173–178. [https://doi.org/10.1061/\(ASCE\)NH.1527-6996.0000077](https://doi.org/10.1061/(ASCE)NH.1527-6996.0000077)
- Owen C (2018) 'How can governments enable and support community-led disaster recovery?' [PDF], *Australian Journal of Emergency Management*, 33(1):66–69.
- Pope D and Harms L (2022) 'Insider community participation in recovery from natural disaster, 2009 to 2021: Scoping the evidence', *Australian Journal of Emergency Management*, 37(4):95–103. [www.doi.org/10.47389/37.4.95](https://doi.org/10.47389/37.4.95)
- Pörtner HO, Roberts DC, Tignor M, Poloczanska ES, Mintenbeck A, Alegría A, Craig M, Langsdorf S, Löschke S, Möller V, Okem A and Rama B (2022) 'IPCC, 2022: Summary for Policymakers', in Pörtner HO, Roberts DC, Tignor M, Poloczanska ES, Mintenbeck A, Alegría A, Craig M, Langsdorf S, Löschke S, Möller V, Okem A and Rama B (eds) *Climate Change 2022: Impacts, Adaptation, and Vulnerability. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change*, Cambridge University Press. <https://doi.org/10.1017/9781009325844.001>
- Quinn P, Gibbs L, Blake D, Campbell E, Johnston D and Ireton G (2021) *Guide to Disaster Recovery Capitals (ReCap)* [PDF]. Phoenix Australia website.
- Quinn P, Leppold C, Wright W, Reeves J and Baumgartl T (2021) *Nature and Community Recovery Factsheet for Bushfire Recovery Victoria*, University of Melbourne.
- Sanderson D, Heffernan T, DeSisto M and Shearing C (2025) 'Community-centred disaster recovery: A call to change the narrative', *Disasters*, 49(1):e12655. <https://doi.org/10.1111/disa.12655>
- SIERRACON (2024) *Reflections and lessons learned by the Community Recovery Committees (CRCs) of the 2019–20 East Gippsland bushfires* [PDF]. East Gippsland Shire Council website.
- Taylor D and Goodman H (2015) *Place-Based and Community-Led: Specific Disaster Preparedness and Generalisable Community Resilience* [Online]. CatholicCare Bushfire Community Recovery Service website, accessed 16 October 2025.
- Vallance SA (2011) 'Early Disaster Recovery: A Guide for Communities' [PDF], *Australasian Journal of Disaster and Trauma Studies*, 2011(2):19–25.

About the authors

Dr Kate Brady is the Senior Research Fellow for the HowWeSurvive initiative at the University of New South Wales, an Honorary Senior Research Fellow at the University of Melbourne and the Technical Adviser to Australian Red Cross. Her work focuses on what people find helpful and unhelpful after disasters.

Dr Colin Gallagher is a Senior Research Fellow in Social Networks with the Disaster, Climate and Adversity Unit at the University of Melbourne. His research interests are the role of social networks in disaster recovery processes, including mental health, community-led recovery and services delivery.

Hannah Morrice works as a Research Fellow at the Melbourne School of Population and Global Health, University of Melbourne. With a background in law, policy and public health, she focuses on translating research into practice across climate, disaster and health resilience, strengthening partnerships and evidence-based approaches to complex public health challenges.

Professor Lisa Gibbs is Director of the Disaster, Climate and Adversity Unit within Melbourne School of Population and Global Health, University of Melbourne. She leads an extensive applied research program investigating the health and wellbeing effects of disasters and the complex social influences on outcomes.

Abstract

Land-based search and rescue training in Aotearoa New Zealand has undergone substantial change, yet there has been limited examination of how these changes have affected the analytical foundations of search management. This review was undertaken to identify what concepts, tools and competencies have been retained, modified or lost in the Managing Land Search Operations course that evolved into Manage the Initial Response and Extended Search Planning. Using 8 analytical domains and a continuity scoring approach, this longitudinal review examined the evolution of 3 core courses. Findings indicate improvements in operational rhythm, interoperability, safety and alignment with the country's Coordinated Incident Management System. However, these gains are accompanied by a reduction in analytical depth, probability-based reasoning and decision traceability. Key frameworks, including the Probability of Success equation and the Bike Wheel model, have been simplified without clear justification. This review concludes with recommendations to restore analytical foundations and strengthen evidence-based decision-making within the search and rescue training system.

Land-based search and rescue training: evolution and simplification

Peer reviewed

Aly Curd¹ 

ORCID: 0009-0001-0609-623X

Dr Lauren Vinnell¹ 

ORCID: 0000-0003-3053-0152

Associate Professor Raj Prasanna¹ 

ORCID: 0000-0002-5608-6558

1. Massey University,
Wellington, New Zealand.

SUBMITTED
23 March 2026

ACCEPTED
15 April 2026

KEYWORDS
training, doctrine, evidence-based, search and rescue, emergency management, volunteerism

DOI
www.doi.org/10.47389/41.4.36



© 2026 by the authors.
License Australian Institute for Disaster Resilience, Melbourne, Australia. This is an open source article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) licence (<https://creativecommons.org/licenses/by/4.0>). Information and links to references in this paper are current at the time of publication.

Introduction

Aotearoa New Zealand's land-based search and rescue system relies heavily on well-trained volunteers (LandSAR 2022). Recent search and rescue evaluation reports, and their analysis in prior research, demonstrated that several themes appear consistently across operations, suggesting systemic challenges and recurring opportunities for refinement (NZSAR 2020a; NZSAR 2025; Curd et al. 2026). In response, this study examined the search and rescue training doctrine to assess whether the issues observed in practice were reflected in the instructional materials.

This analysis reviewed 3 cornerstone documents: the legacy Managing Land Search Operation courses of 2007–2011 (SARINZ 2007; 2008; 2011) and its successors, the contemporary Manage the Initial Response (NZSAR 2024) and the extended planning pathway delivered through the Extended Search Planning course (NZSAR 2021). Together, these represent 20 years of doctrinal evolution that shapes how land-based search and rescue volunteers learn to plan, assess evidence, manage risk and operate within the Coordinated Incident Management (CIMS)-aligned structures during Category 1 (Police-led) land-based operations (New Zealand Government 2019; NZSAR 2021).

This review builds on the systematic literature on search and rescue non-government organisations in emergency management (Curd et al. 2025), which highlighted the increasing centrality of volunteer organisations in emergency responses. This highlights persistent challenges such as variable training, limited resourcing and inconsistent integration with statutory agencies. By analysing the training documents, this study explored how instructional design either mitigates or perpetuates those sector-wide issues.

Background

Curd et al. (2026) revealed recurring systemic themes across multiple operations, including training and capability development, planning and preparedness, information management and situational awareness, inter-agency coordination, communications, safety and risk management, logistics and resource management as well as continuous improvement. These patterns appeared across different operational contexts, suggesting enduring sector-wide issues rather than isolated events.

Among these themes, training and capability development alongside continuous improvement emerged most prominently. This observation prompted a closer examination of the training domain itself. By analysing the core doctrinal training materials, the study explored what type of training was being delivered, how doctrine frames operational decision-making and whether these materials address the capability gaps identified in operational evaluations.

Findings from a systematic literature review of search and rescue non-government organisations in emergency management events by Curd et al. (2025) reinforced the importance of this focus. The review highlighted search and rescue non-government organisations as critical contributors to emergency response, while often operating with limited resources and outside formal legislative integration. Within this context, training plays a central role to enable volunteer responders to function as 'unpaid professionals', supporting safe and effective operational outcomes. However, inconsistent funding and fragmented planning arrangements can weaken training continuity and risk long-term capability erosion.

The evaluation themes and training analysis align with academic evidence on search theory, incident management and organisational learning. Research emphasises the importance of analytical search planning, probability-based decision-making and clear evidence-to-decision pathways in improving search effectiveness and resource efficiency (Koester 2008; Stoffel and Stoffel 2017; Young 2022). Similarly, studies of incident management highlight that while procedural simplification and inter-operability can improve early operational rhythm, they may also reduce analytical depth and decision transparency if not supported by comprehensive learning systems and doctrinal feedback loops (Comfort 2007).

Examining the evolution of Managing Land Search Operations (MLSO) development into Managing the Initial Response (MTIR) and Extended Search Planning (ESP) training documents provides a bridge between operational evaluation findings and the wider research literature. By analysing how training doctrine has developed over time,

this study clarified how training content, doctrinal framing and system integration collectively shape search and rescue capability and performance.

Method

Data source and scope

All materials analysed were drawn from search and rescue course resources and the Search and Rescue Institute of New Zealand Trust (SARINZ) archives as the authoritative documents. The review focused on land-based search and rescue training because Category 1 (CAT 1) searches, coordinated by NZ Police, form the operational interface with the emergency management sector (NZSAR 2021; *Policing Act 2008*¹). Maritime and aviation contexts were excluded to maintain jurisdictional clarity as these domains fall under Maritime New Zealand and RCCNZ pursuant to the *Maritime Transport Act 1994*² and *Maritime Transport Amendment Act 2013*.³ This allowed findings to apply directly to Police-led land search and rescue operations where inter-agency coordination and volunteer non-government organisation readiness are most critical.

No human participants nor personal data were involved and ethical principles of responsible representation were followed.

Inclusion and exclusion criteria

Documents were included if they were core instructional or doctrinal materials used to guide search and rescue practice including course workbooks, student reference texts and guideline documents covering initial response, Lost Person Behaviour (LPB) (Twardy and Koester 2005; Koester 2008) and search planning (Stoffel and Stoffel 2017). To capture doctrinal evolution, materials spanning 2007–2024 were selected, covering the transition from early MLSO workbooks to the ESP and MTIR streams. Only complete and substantive documents were retained.

Materials were excluded if they did not contribute directly to instructional content. This included assessment-only documents, refresher workbooks, duplicate editions and ancillary supplements. Marine Response materials were excluded due to their separate maritime jurisdiction.

The final number comprised 5 documents analysed in their original PDF form without pre-processing or reformatting:

- Managing Land Search Operations workbook – student text, Aug 2007, 67 pages (SARINZ 2007).

1. *Policing Act 2008* at www.legislation.govt.nz/act/public/2008/0072/latest/DLM1102187.html

2. *Maritime Transport Act 1994* at <https://legislation.govt.nz/act/public/1994/0104/latest/DLM334660.html>

3. *Maritime Transport Amendment Act 2013* at www.legislation.govt.nz/act/public/2013/0084/latest/DLM4698452.html

- Managing Land Search Operations MLSO - workbook Aug 2008, 70 pages (SARINZ 2008).
- Managing Land Search Operations - Initial Response course workbook, May 2011, 76 pages (SARINZ 2011).
- Extended Search Planning - Student Reference and SAR Guidelines, 73 pages (NZSAR 2021a).
- Manage the Initial Response - Student Reference with NZSAR Guidelines, 24 pages (NZSAR 2024).

Comparison procedure

The analysis used comparative content analysis combined with manual page-to-page comparison to identify wording changes and structural or doctrinal shifts (Bowen 2009). Original pagination and language were retained to maintain a transparent audit trail and ensure differences reflected substantive change rather than formatting variation.

A comparison grid was constructed with one row per page. Columns recorded page notes, likely matches in later editions and thematic tags. Anchor terms (e.g. GSMEAC SEE/LoD Bike Wheel) were used to assist navigation across documents.

Successive editions were reviewed in parallel using page-to-page comparison (page i to page i) following established approaches for tracing continuity in longitudinal document analysis (Krippendorff 2018; Mahoney and Rueschemeyer 2003). Additions, deletions, relocations and wording changes were recorded in the grid. Where structures closely aligned (e.g. MLSO 2007–2008; MLSO 2008–2011), continuity was prioritised.

Each page was assigned a preliminary similarity judgement based on content overlap and emphasis (Braun and Clarke 2006):

- High: Same concept taught with the same intent; wording may differ, but definitions, steps or tools remain effectively unchanged.
- Medium: Core idea still present but meaningfully rephrased, reordered or partially expanded/trimmed.
- Low: Topic loosely related but scope or mechanism materially changed.
- No match: Content added removed or relocated with no clear link to earlier doctrine.

Mapping the 2011 split into ESP and MTIR

For the transition from MLSO 2011 to ESP and MTIR, each page was matched to the closest destination page using headings, repeated phrases and key terms. Destination pages and brief rationales (e.g. ‘moved to ESP—SEE/LoD—POA workflow’) were recorded. Where no successor existed, content was logged as removed or new (Fereday and Muir-Cochrane 2006).

Representative pages indicating doctrinal shifts were redlined by hand with deletions struck through, insertions underlined and definition changes noted in the margins. Where meaning was conveyed through tables or diagrams, annotations referenced surrounding text and identified diagram-led changes (Braun and Clarke 2006; Fereday and Muir-Cochrane 2006).

A classification table logged occurrences of key concepts (e.g. LPB Bike Wheel IAPs POA/POD/POS SEE/LoD suspension/demobilisation CIS) with page references and change notes. Each entry was coded by change type (e.g. moved to ESP, moved to MTIR, removed, new wording, changed) to distinguish editorial edits from doctrinal shifts (Mahoney and Rueschemeyer 2003).

Unclear mappings were revisited after a delay to reduce cognitive bias and cross-checked against table-of-contents and anchor-term scans (Prior 2003). Pages dominated by diagrams or non-extractable tables were interpreted using surrounding explanatory text (Bowen 2009).

Analytical approach

The study used a framework-based deductive-inductive thematic analysis combined with comparative content analysis and diachronic comparison (Braun and Clarke 2006; Fereday and Muir-Cochrane 2006; Gale et al. 2013; Mahoney and Rueschemeyer 2003). This approach enabled the analysis to identify patterns of continuity and change across successive editions while distinguishing substantive doctrinal shifts from changes in wording, structure or presentation.

The coding framework brought together the 8 thematic domains and the similarity judgements described above, with each coded unit accompanied by a brief note documenting the relevant change. This provided a consistent basis for tracing how instructional concepts were retained, modified, relocated, introduced or removed across the training materials.

Thematic domains and their derivations

The thematic domains were derived from a prior document analysis of NZSAR SAREx evaluation reports (NZSAR 2025; Curd et al. 2026). In that study, inductive coding identified recurring strengths, gaps and recommendations, which were consolidated into higher-order categories through axial coding (Fereday and Muir-Cochrane 2006). Eight cross-cutting domains consistently accounted for the findings (New Zealand Government 2019; NZSAR 2020b), being:

- training and capability development
- planning and preparedness
- information management and situational awareness
- inter-agency coordination

- communications
- safety and risk management
- logistics and resources
- continuous improvement.

These domains captured the majority of issues observed in search and rescue exercise evaluations while remaining concise enough to avoid excessive fragmentation (Bowen 2009; Krippendorff 2018). They also aligned directly with Coordinated Incident Management System (CIMS) and Incident Management Team (IMT) functions (New Zealand Government 2019).

Application and validity

The domains were applied as deductive tags at the page level and assigned only where content materially influenced operational practice. Multi-tagging was permitted when pages spanned multiple IMT functions. Boundary decisions followed the test: Would this content change what an IMT function does in practice?

Construct validity was strengthened by cross-checking domains against national doctrine (CIMS functions) and common IMT products, such as Initial Action Plans (IAP), Situation Reports (SITREPs), operational briefing templates (GSMEAC) and debrief forms (New Zealand Government 2019; NZSAR 2020b). Similarity judgements were applied consistently, with ambiguous cases conservatively coded as 'Low' and revisited during reconciliation. Notes documenting how content changed or moved supported aggregation and the construction of a longitudinal account of doctrinal evolution.

Findings

Training and capability development

The progression from MLSO to MTIR and ESP strengthens early confidence and standardises core search and rescue

planning practices including briefings, IAP structure and Lost Person Behaviour-informed tasking (see Table 1). MLSO provides the foundation in probability and search theory, MTIR focuses on first-period execution and rapid evidence capture. ESP formalises multi-period planning through SITREP/IAP rhythm, Search Effort Evaluation/Level of Detection (SEE/LoD) use and Probability of Area (POA) re-apportionment. This sequencing aligns with CIMS functions, supporting transfer into broader emergency management environments.

However, long-term competency depends on structured progression and assessment consistency. Learners may pass MTIR with form completion rather than demonstrated decision quality, such as applying SEE/LoD evidence to adjust POA or conducting basic sensitivity checks (e.g. 'If LoD varies $\pm 10\%$ does POA change?'). This matters because practice increasingly relies on SEE/LoD and emergency services agencies caution against uncontextualised Probability of Detection (POD) assumptions (Frost and Stone 2001; Hill 2012; SARINZ 2013; Stoffel and Stoffel 2017). Competence therefore needs to be demonstrated across the evidence→reasoning→decision chain (NZSAR 2021; Mahoney and Rueschemeyer 2003).

Two training design implications follow. First, a clear learning pathway (MLSO→MTIR→ESP→advanced/function-specific training) should emphasise ongoing practice and mentoring rather than treating ESP as a terminal qualification, supporting sustained capability development (Nurmiati et al. 2024). Second, assessments should include short, scored analytical tasks, such as POA recalculation from SEE/LoD or brief sensitivity note, consistent with search theory's emphasis on combining LPB heuristics with evidence-based re-planning (Koester 2008; Perkins 2013; Stoffel and Stoffel 2017).

Assessment should also align closely with the CIMS by requiring scenarios and logs that demonstrate traceable POA adjustments supported by SEE/LoD forms or field

Table 1: Training and capability development across the training documents.

Course	Core focus	Key competencies and practices	Assessment gaps/issues	Recommendation and implications
MLSO	Introduced foundational probability and planning literacy.	Core Search Theory (POA×POD=Probability of Success (POS)); Lost Person Behaviour (LPB)-based reflex tasking; initial analytical reasoning.	Heavy reliance on narrative over analytical reasoning.	Retain as conceptual foundation, used to explain uncertainty and evidence logic, anchor volunteer understanding of probability frameworks for later CIMS-aligned courses.
MTIR	Rapid first-period execution and evidence capture.	Initial Planning Point (IPP) establishment, direction of travel, LPB cue collection, task reporting.	Assessment favours form completion over reasoning, no POA re-weighting or sensitivity checks.	Add scored analytical tasks computing POA changes from SEE/LoD, require $\pm 10\%$ sensitivity testing, reinforces decision competence and readiness for ESP.
ESP	Structured planning cycle intelligence integration and iterative re-tasking.	SITREP/IAP cadence, SEE/LoD integration, POA re-apportionment, evidence-driven planning.	Documentation outweighs analytical quality, POD→SEE/LoD shift lacks validation, weak evidence traceability.	Require 'assumptions and tests' section linking decisions to evidence, include traceable POA changes, align outputs with CIMS planning intelligence and operations functions for defensibility and interoperability.

debriefs. A simple ‘assumptions and tests’ note within IAPs could improve transparency and allow partner agencies to follow search logic and uncertainty (Hill 2012).

Prioritising decision quality, evidence handling and analytical clarity would strengthen transferable planning skills and reinforce disciplined, auditable practice. Over time, this would support stronger interoperability between volunteer and statutory responders and enhance sector readiness (Yazdani and Haghani 2024).

Planning and preparedness

Across MLSO, MTIR and ESP, planning cadence becomes clearer and faster, yet traceability is inconsistent. ESP expects planners to show how new evidence changes plans between operational periods (see Table 2) but many exemplars do not record explicit POA changes with supporting evidence (e.g. Region B: 0.25→0.15 based on Team 3 SEE/LoD + clue X). MTIR performed well in first-period tasking using LPB, Bike Wheel and GSMEAC, but often lacked a concise ‘assumptions and tests’ note linking debrief insights to subsequent decisions. Without this bridge, planners must reconstruct reasoning from fragments rather than documented logic.

Earlier MLSO editions (SARINZ 2007, 2008) provided the clearest probability framework explicitly teaching $POA \times POD = \text{Probability of Success (POS)}$ and demonstrating how segmentation, evidence and detection effort reshape POA. ESP relies on SEE/LoD and scenario re-weighting, yet the shift from POD to SEE/LoD is not clearly justified nor aligned with international search planning practice (Frost and Stone 2001; Stoffel and Stoffel 2017). Records showing POA before and after adjustments, critical for analytical continuity and inter-agency understanding, were also inconsistently documented in IAPs.

Escalation cues signalling when planners should move from heuristic tasking to more analytical planning cycles are rarely recorded. Tools, such as the Bike Wheel, LPB zones and the speed–efficiency–thoroughness model effectively guide initial deployment, but without clear triggers, planners may remain in investigative mode too long. As a result, re-segmentation, scenario re-weighting and SEE-based POA reassessment may be delayed.

The consequences are significant. Plans may appear structured but without visible evidence→POA→tasking logic and prioritisation can appear qualitative rather than analytical. This reduces decision transparency and confidence among emergency management agencies and incoming IMT personnel. Failure to record escalation triggers and POA changes ultimately limits auditability, slows coordination and weakens trust. These are challenges that are also identified in broader emergency management interoperability research (Yazdani and Haghani 2024).

Information management and situational awareness

Across MLSO, MTIR and ESP, information management and situational awareness have become more structured. ESP provides the clearest intelligence cycle, using SITREPs and debriefs intended to feed into POA updates (see Table 3). MTIR captures critical first-period information efficiently although handover processes are often implicit rather than formalised. MLSO established the conceptual foundations of information discipline, distinguishing coverage from detection and emphasising assumptions but relied more on narrative reporting than structured intelligence products.

Each course contributes distinct strengths. MLSO built foundational literacy in probability and information quality. MTIR supported rapid capture of IPP, direction of travel,

Table 2: Planning and preparedness across the training documents.

Course	Core focus	Key competencies and practices	Assessment gaps/issues	Recommendations and implications
MSLO	Introduced the full probability narrative and analytical framework for search planning.	$POA \times POD = POS$, segmentation and re-weighting, evidence-based POA recalculation.	Analytical rigour diluted in later courses, evidence→POA→tasking chain rarely reinforced.	Retain MSLO analytical narrative as foundational doctrine, embed POS formula and segmentation logic in all later modules, emphasise POA traceability to evidence and detection effort.
MTIR	Rapid first-period tasking and deployment planning.	Integrates LPB with Bike Wheel, GSMEAC briefs, initial deployment structure.	Post-task bridge missing, no ‘assumptions and tests’ footer, escalation triggers undocumented.	Add ‘assumptions and tests’ section in IAPs, record what is known/contested, formalise escalation criteria (e.g. stale clues, high-risk terrain) to trigger analytical reassessment.
ESP	Evidence-led multi-period planning and scenario re-weighting.	SEE/LoD integration, POA re-apportionment, scenario re-segmentation.	POA deltas not consistently shown, SEE/LoD substitution lacks validation, missing POS framework, weak evidence-to-decision linkage.	Require explicit POA-delta documentation with evidence sources (e.g. ‘Region B: 0.25 → 0.15 due to Team 3 SEE/LoD + clue X’), standardise trigger documentation, reinstate $POA \times POD = POS$ or justify SEE/LoD equivalence to align with international best practice.

Table 3: Information management and situational awareness across the training documents.

Course	Core focus	Key competencies and practices	Assessment gaps/issues	Recommendation and implications
MLSO	Builds conceptual literacy in probability documentation and information quality.	Distinguishes coverage vs detection, narrative debriefs, early CIMS-style intelligence thinking.	No formal intelligence cycle, inconsistent traceability, limited standardisation of outputs.	Retain conceptual grounding, reinstate coverage-detection distinctions, uses MLSO narratives to teach the rationale for structured intelligence practice and reliability awareness.
MTIR	Rapid capture and relay of first-period information.	Identifies IPP direction of travel LPB cues hazards and clues, updates IMT rapidly.	Informal handovers, no standardised intel card, missing provenance/confidence ratings, visuals disconnected from reasoning.	Introduces a standard Intel Card (IPP scenarios clues with confidence LoD notes hazards), requires confidence grading, link maps/visuals to interpretive notes.
ESP	Establishes a full intelligence cycle and evidence-driven updates.	Structured collection–analysis–dissemination rhythm, SEE/LoD-based debriefs, POA re-apportionment, bias awareness.	Weak evidence linkage for POA changes, missing provenance, inconsistent bias/confidence grading, visuals unexplained.	Include POA-delta tables with evidence citations, adds credibility/confidence grading, embed 'decision test' lines, provide worked SEE/LoD→POA→POS examples, tag doctrine with provenance sources.

LPB cues, hazards and task status and formed the basis for extended planning. ESP linked debrief evidence to scenario re-weighting and POA reallocation using SITREPs to maintain a Common Operating Picture (COP) while recognising analytical bias risks.

This progression reflects broader changes in emergency management intelligence practice. When MLSO was introduced in 2007, national intelligence doctrine was still developing and drew heavily on military models (NZFC 1998). ESP reflects a mature understanding of intelligence requirements, though it rarely cites provenance or contemporary intelligence standards (NZSIS 2025), which weakens methodological transparency.

The most consistent weakness across all courses was traceability. IAPs and SITREPs rarely show explicit evidence→POA→tasking logic. SEE/LoD thresholds lack citation, confidence/bias grading is inconsistently applied and visual products often lack interpretive notes explaining

why priorities changed. These gaps limit internal decision rigour and limit inter-agency confidence.

Several practical improvements could address this. Planning products could include POA-delta tables with supporting evidence and confidence grading. MTIR would benefit from a standardised intelligence card summarising IPP scenarios, key clues, coverage notes and hazards. ESP could include worked examples demonstrating SEE/LoD→POA→POS reasoning and doctrinal updates should clearly identify evidence sources.

These refinements would better link evidence capture, analytical reasoning and doctrinal learning, combining MLSO's conceptual depth, MTIR's operational speed and ESP's emerging evidence-led planning framework.

Inter-agency coordination

The progression from MLSO to MTIR to ESP reflects a steady strengthening of inter-agency coordination in

Table 4: Inter-agency coordination across the training documents.

Course	Core focus	Key competencies and practices	Assessment gaps/issues	Recommendation and implications
MLSO	Establishes whole-of-operation governance and partner integration framework.	Explains activation→demobilisation lifecycle governance structures and partner interfaces.	Narrative emphasis, few shared products, unclear data flows and partner requirements.	Retain governance framing, embed standardised coordination outputs (distribution lists contact logs), clarify evolving partner roles across phases.
MTIR	Rapid operational clarity and initial coordination in first period.	GSMEAC briefings IPP LPB and Bike Wheel outputs establish shared picture.	External partner needs often implicit, handovers inconsistently defined, template divergence reduces traceability.	Add Coordination Checklist to GSMEAC, standardise distribution logs, include partner-specific tasking hooks to improve readiness and auditability.
ESP	Sustained multi-agency coordination aligned with CIMS.	IAPs/SITREPs structured by CIMS functions; maintains COP across IMTs/EOCs/ECCs.	Still references CIMS 2nd Ed (2014), limited interoperability, missing POA justifications and partner triggers.	Update to CIMS 3rd Ed (2019), include Concordance Header (period version distribution), require POA justification notes with SEE/LoD sources, add emergency service organisation support requirement boxes in IAPs to improve cross-agency confidence.

search and rescue training, though consistency and traceability remain uneven. ESP aligns most closely with CIMS by embedding recognised roles and functions, multi-period planning and products, such as SITREPs and IAPs designed to interface with IMTs, Emergency Operation Centres (EOCs) and Emergency Coordination Centres (ECCs) (see Table 4). However, the reference imagery is still drawn from the CIMS 2nd Edition (New Zealand Government 2014) rather than the 3rd Edition (New Zealand Government 2019). MTIR delivers rapid clarity in the first operational period through structured briefings and tasking outputs yet often leaves inter-agency handover details, such as what information is required, by whom and in which format, implicit. MLSO, by contrast, provides an end-to-end governance framework but relies more on narrative than on transferable, standardised products.

Each framework contributes meaningfully to coordination. ESP's strength lies in its alignment with the CIMS, providing emergency services organisations with familiar structures supported by SITREPs that sustain a COP. MTIR adds early-phase operational clarity through GSMEAC briefings, LPB analysis and Bike Wheel outputs, which provide rapid context for response action. MLSO remains foundational, defining how operations progress from activation through demobilisation and situating coordination within broader governance structures.

Despite these advances, several weaknesses persist. MTIR products rarely specify which agencies should receive key outputs or when. Template divergence across SITREP and IAP formats continues to slow interoperability and decision traceability is inconsistent, with few IAPs recording POA deltas or source evidence. Such exclusions undermine auditability and make it difficult for responding agencies to reconstruct planning logic.

Several low-friction changes could strengthen coordination. To reduce template divergence, IAPs and SITREPs

should include a shared concordance header, such as a standardised top strip with period, version, author distribution list and contacts to add interoperability even if layouts differ. Decision traceability can be improved by requiring a short justification of each POA change per region or segment referencing SEE/LoD and clue logs. Notifications and requests for additional support from emergency service organisations should also be made explicit within IAPs, with boxes that specify which agencies must be notified under what conditions, and by what method.

Communications

Communication practices have improved progressively across MLSO, MTIR and ESP but timeliness, interoperability and auditability remain uneven. MLSO contributes by situating communication within the whole-of-operation narrative emphasising documentation and handover discipline. However, it relies heavily on narrative logs rather than standardised items that can be readily shared across agencies. MTIR excels in the first operational period by delivering fast, structured GSMEAC briefings, early communication checks, frequency and channel assignments and clear sked timings. ESP extends this by embedding SITREP rhythm and multi-period distribution, providing mechanisms to sustain the COP. However, gaps persist and many ESP packs still lack clear version control, distribution logs and explicit hooks for public information coordination (see Table 5).

Each of the 3 streams offer strengths that are critical for effective operations. MLSO plays a foundational role by reinforcing why communication results must survive staff turnover and withstand external scrutiny, situating communications within governance and accountability frameworks. MTIR's crisp GSMEAC briefs and simple message discipline means tasking in the first operation period is rapid and coherent, supported by early checks

Table 5: Communications across the training documents.

Course	Core focus	Key competencies and practices	Assessment gaps/issues	Recommendation and implications
MLSO	Embeds communication within governance and accountability frameworks.	Emphasises documentation discipline and communication continuity across shifts.	Narrative logs dominate, poor interoperability, plans not easily shared.	Retain governance framing, introduce structured comms templates (versioned logs distribution records), reinforce auditability and cross-agency shareability.
MTIR	Tactical communication discipline and speed in first operational period.	GSMEAC briefings comms checks clear skeds rapid tasking clarity.	Incomplete tasking traceability, inconsistent SITREP/IAP radio logs, weak redundancy planning.	Standardise task trace log,; ensure key transmissions recorded in SITREPs/IAPs, include redundancy plans and partner-aligned communications templates.
ESP	Sustained multi-period communication supporting a COP	Structured SITREPs multi-period distribution integration with Public Information.	Missing version/timestamp controls, interoperability gaps, ad hoc public communications, weak message-to-decision traceability.	Enforce version control and distribution logs, align comms plans with partner agencies, formalise public information role, embed evidence transmission records in SITREPs.

and channel assignments. ESP introduces greater structure with regular SITREPs designed to maintain a COP and integrate updates for public information and partners within the planning cycle. These strengths establish a foundation for effective communication, but uneven adoption undermines consistency.

Several weaknesses compromise the strength of communications. Across all streams, IAPs and SITREPs are sometimes distributed without unique version identifiers, timestamps or distribution logs. This leaves supporting emergency service organisations uncertain about which document to act upon. Interoperability also appeared problematic. While communication plans, channel plans and call signs exist, they do not always align with supporting emergency service organisations formats, requiring translation at critical moments. Tasking traceability is another gap. Evidence and information shared by radio are not consistently captured in SITREPs or IAPs, limiting the audit trail between field evidence, search clues, and planning decisions. Redundancy is inconsistently addressed with backup channels, relay points and loss-of-communications procedures rarely standardised or rehearsed.

Safety and risk management

Safety and risk management appear consistently across MLSO, MTIR and ESP, although integration and auditability vary. MTIR is strongest in the first operational period, emphasising rapid hazard identification, concise safety briefs and immediate controls that enable decisive action. ESP extends this into multi-period planning, embedding risk sections in IAPs, medical and rescue contingencies and integrating fatigue, demobilisation and CIS considerations. MLSO provides a broader conceptual framework linking safety to activation operations and demobilisation, although its guidance remains largely narrative and inconsistently templated (see Table 6).

Each framework contributes strengths. MLSO situates safety within governance and lifecycle management, MTIR provides tactical clarity through GSMEAC briefings and stop-work authority and ESP embeds safety within the IAP cycle reinforcing risk as a continuous process. However, gaps persist that reduce traceability and accountability. IAPs rarely document why risk ratings change, such as river rise, treefall or reduced LoD/POD in hazardous terrain, and field evidence is seldom linked to later control measures. Fatigue and supervision exceptions for night or technical operations often lack written justification and CIS protocols vary in clarity and timing. Dynamic hazards, like weather or flooding, are noted in SITREPs but rarely include explicit thresholds for halting or adapting tactics.

Overall, while MTIR and ESP demonstrate progress towards structured safety integration, inconsistent documentation and weak evidence linkage limit auditability and organisational learning.

Logistics and resources

Logistics and resource management are evident across the MLSO, MTIR and ESP although visibility and auditability remain uneven. MLSO provides an end-to-end administrative framework, situating logistics within governance and demobilisation processes but relies heavily on narrative guidance rather than standardised, data-rich templates for inter-agency accountability. MTIR is strongest in the first operational period, enabling rapid mobilisation, team tracking and equipment checks. ESP extends logistics into multi-period planning, addressing personnel rotations, staging supply and facility management although links between tasking outputs coverage verification and re-task readiness remain inconsistent (see Table 7).

Each framework contributes strengths. MLSO establishes whole-of-operation traceability, MTIR enables rapid early resourcing through clear team identification and call-out

Table 6: Safety and risk management across the training documents.

Course	Core focus	Key competencies and practices	Assessment gaps/issues	Recommendation and implications
MLSO	Conceptual framework linking safety to activation operations and demobilisation.	Embeds safety through full lifecycle, links risk to governance and documentation.	Narrative style, lacks structured operational guidance for dynamic risk decisions.	Retain lifecycle framing, convert to structured templates linking hazard identification controls and verification, emphasise governance accountability and risk traceability.
MTIR	Tactical safety: rapid hazard identification and immediate controls in first period.	GSMEAC safety briefs, stop-work/re-task authority, rapid control implementation.	Weak risk traceability, rationale for changing risk levels seldom recorded, fatigue and supervision exceptions not justified.	Add risk change log in IAPs showing cause-and-effect, tie SEE/LoD data to evolving controls, require written justification for deviations from standard protocols.
ESP	Institutionalised risk management across multi-period operations.	Safety embedded in IAPs, includes medical fatigue demobilisation and CIS elements.	Risk changes lack rationale or evidence, thresholds for action rarely stated, CIS triggers unclear.	Include explicit evidence-based action thresholds in IAPs (e.g. 'Cease ops if river > 1.2 m or forecast wind > 60 km/h'), link hazard evolution to field intel, formalise CIS escalation criteria and risk-justification statements for transparency.

Table 7: Logistics and resources across the training documents.

Course	Core focus	Key competencies and practices	Assessment gaps/issues	Recommendation and implications
MLSO	End-to-end governance and administrative logistics from activation to demobilisation.	Links logistics to governance cost recovery and documentation.	Narrative-heavy guidance, low visibility of real-time status, lacks structured multi-agency tools.	Retain lifecycle framing but adopt standardised templates (asset registers cost logs demobilisation records), emphasise traceability auditability and financial accountability.
MTIR	Rapid mobilisation and operational support in the first period.	Fast call-outs safety checks team tracking scheduling.	Weak linkage between deployment and coverage evidence, limited turnaround monitoring, reactive posture.	Standardise post-task reports with GPS/SEE/LoD data, use readiness dashboards for teams/equipment, anticipate POA shifts for proactive staging.
ESP	Multi-period logistics and team welfare integration.	Manages rotation medical transport and facility support, embeds demobilisation planning.	Resource tables lag behind POA priorities, bottlenecks untracked, ad hoc procurement.	Synchronise logistics planning with POA updates, visualise readiness and turnaround, standardise demobilisation and welfare logs, add lightweight procurement tracking actions and CIS follow-ups.

tracking and ESP integrates logistics into the IAP cycle, aligning personnel relief, transport and medical support with operational phases. Together, they form a layered logistics system though not yet a fully auditable one.

Significant gaps persist. Task debriefs often lack GPS tracks, photographs or LoD/POD data. This limits how planning can verify coverage or determine re-task readiness. Resource tables within IAPs frequently lag changing POA priorities, creating mismatches between search focus and available assets. Turnaround times between team recovery, equipment servicing and redeployment are rarely monitored, obscuring operational bottlenecks. Demobilisation tracking and procurement for extended operations also remain inconsistent.

Overall MLSO, MTIR and ESP demonstrate improved logistics discipline but further refinement is required to achieve reliable traceability, real-time visibility and proactive resource management across multi-agency search and rescue operations.

Continuous improvement

Debriefing is a consistent feature across MLSO, MTIR and ESP although its depth and influence on planning vary (see Table 8). At its most effective, debriefs capture objective

evidence, such as SEE/LoD feedback, GPS tracks and photographs and translate these into clear rationale for POA changes in subsequent IAPs. This creates a learning loop where evidence informs planning (Somerville and Chatzipanagiotou 2015). When treated as optional or purely narrative, however, lessons remain anecdotal and rarely influence doctrine (Kikkawa and Mavin 2017).

Each framework contributes differently. MLSO provides the strongest theoretical foundation, embedding the POA×POD=POS framework and legitimising structured debriefing although its application often depended on local practice. MTIR prioritises rapid evidence capture but does not require formal LoD or coverage verification fields. ESP introduces a multi-period learning cycle, such as tasking debrief, SEE/LoD input, POA update and IAP revision. However, sources of change are frequently implicit and POA adjustments inconsistently documented. This limits planning transparency and inter-agency confidence.

A recurring weakness in MTIR and ESP is the absence of a documented evidence base explaining why changes occur. Without cited sources, doctrinal updates appear qualitative complicating inter-agency interpretation and limiting course refinement (Neelen and Kirschner 2020). Training therefore risks reinforcing routine practice rather than

Table 8: Continuous improvement across the training documents.

Course	Core focus	Key competencies and practices	Assessment gaps/issues	Recommendation and implications
MLSO	Establishes the theoretical foundation linking probability to search effectiveness.	Embeds POA×POD=POS, legitimises debriefing, promotes lessons learned.	Debriefs inconsistently applied, limited structured evidence use, lessons not integrated.	Retain MLSO's conceptual base, make debriefs mandatory, link findings directly to planning and doctrinal updates.
MTIR	Rapid evidence captured in first operational period.	Collects clues coverage and task outcomes, supports quick tactical learning.	Missing POD/SEE/LoD fields, weak POA rationale, narrative over evidence.	Standardise debrief forms, include POD/SEE/LoD and POA deltas, require documented rationale for planning changes.
ESP	Embeds iterative learning across operational periods.	Links task–debrief–POA update–IAP revision, integrates SEE/LoD data.	Evidence sources often implicit, POA inconsistently recorded, weak doctrinal traceability.	Mandate evidence citation for POA shifts, embed before/after POA tables, train planners in evidence-to-decision logic.

measurable improvement, leaving practitioners vulnerable to cognitive biases such as the Dunning–Kruger effect (Dunning 2011; Peake et al. 2020).

While MLSO, MTIR and ESP advance debriefing practice, they do not consistently close the loop between evidence capture, planning adjustment and doctrinal learning. Embedding explicit evidence trails in debriefs and IAPs, supported by stronger analytical training, would help convert continuous improvement from aspiration into demonstrable system performance (Cooper et al. 2003; Slavin 2020).

Discussion

This study analysed how land-based search and rescue training doctrine in New Zealand has evolved by comparing MLSO, MTIR and ESP. Using 8 domains drawn from SAR exercise evaluation findings, the study examined how training content, tools and decision-making approaches have changed over time. Overall, the results show stronger structure and interoperability, but weaker analytical depth, evidence traceability and use of probability in decision-making.

Competencies analysis

The IMT competency framework outlines requirements across personal attributes, planning processes, operational knowledge and continuous improvement. When assessed against MLSO, MTIR and ESP, there was strong alignment in many technical competencies. MLSO introduces deeper application of search theory, probability calculations and decision-making. MTIR builds competence in early incident management, including scenario development, tasking and the use of LPB. ESP extends these competencies into multi-operational period planning, incorporating scenario ranking, SEE and structured handovers. Together, these courses address most of the technical and planning skills expected.

A notable shortfall related to continuous improvement and organisational learning, which are explicit requirements within the IMT competency framework (New Zealand Government 2019; NZSAR 2020a 2020b). While the courses acknowledge debriefing and evaluation, guidance is conceptual. There is limited practical instruction on capturing, analysing and translating debrief findings into changes in plans training or doctrine. As a result, post-operation learning is often treated as an informal or local responsibility rather than a structured IMT function. This limits the ability of IMT members to demonstrate competency in closing the learning loop between response and preparedness and weakens evidence of compliance with competencies relating to lessons identified and continuous improvement (Neelen and Kirschner 2020).

The competency framework also expects capability in urban and suburban search contexts, including passive

search techniques and the application of LPB beyond wilderness environments. However, current training materials remain strongly wilderness-focused. Without additional learning, IMT members may not fully meet competencies relating to suburban search operations (Young and Wehbring 2007; Koester 2008).

Overall, MLSO, MTIR and ESP provide a strong technical foundation, but additional training is required in areas such as suburban search organisational learning, personal wellbeing, volunteer conduct, media awareness and function-specific development to fully meet the competency framework.

International best practice and traceability

Contemporary search management doctrine emphasises traceability from evidence to decision. International frameworks, such as the United States National Search and Rescue Supplement (United States National Search and Rescue Committee 2020), the United Kingdom's SAR strategy (JESIP 2024; UKSARC 2025) and Australia's *National Search and Rescue Manual* (AMSA 2025), all expect analytical judgements, particularly POA adjustments and POD decisions, to be explicitly recorded, sourced and reproducible. This documentation discipline supports accountability and allows planners to reconstruct the reasoning behind operational decisions during multi-agency reviews.

Several common practices define international best practice. Version-controlled planning products, including IAPs, SITREPs and probability logs are treated as analytical records rather than administrative outputs. Evidence sources are embedded within tasking documentation with POD or coverage data linked to region identifiers and timestamped debriefs allowing residual POA to be independently verified (JIBC 2018; USCGRDC 2025). Bias control and confidence grading are also incorporated into analytic processes, helping decision-makers assess the strength of evidence across operational periods (JESIP 2024).

These practices provide a useful benchmark for New Zealand search and rescue training materials. MLSO introduced documentation discipline and the POA×POD=POS framework but relied largely on narrative reasoning. MTIR improved operational clarity but provided limited mechanisms for linking field evidence to revised planning assumptions. ESP integrated intelligence products, such as SITREPs and intelligence cycles, yet lacks the explicit provenance statements and POA or SEE/LoD records common in international systems. As a result, the logic of decision-making is often implicit rather than auditable.

This gap matters because traceability supports learning, evaluation and operational defensibility. Aligning this doctrine with international practice would require modest adjustments, including embedding evidence references

within planning products, adopting confidence or bias grading and recording POA changes alongside their supporting evidence. These measures would strengthen transparency, improve analytical continuity and bring search and rescue documentation closer to international standards (New Zealand Government 2014).

SEE/LoD versus POD: incomplete equation and evidence deficit

A recurring weakness within contemporary search and rescue doctrine is the partial replacement of POD with the SEE and LoD frameworks without clear evidential or mathematical justification. In classical search theory, POS is derived from the complete relationship $POA \times POD = POS$, where each variable is empirically or probabilistically estimated (Koopman 1946; Frost and Stone 2001; Cooper 2003; Koester 2008; Perkins 2013; Stoffel and Stoffel 2017). Current materials substitute SEE/LoD as proxies for search performance but do not quantify how these measures relate to detection probability or success outcomes. As a result, the relationship between search effort, likelihood of detection and probability of success becomes implied rather than demonstrable.

International search and rescue systems in the United States, Canada, the United Kingdom and Australia treat POD as an estimable and auditable parameter, often calculated using coverage factors derived from sweep width, effort and search area (JIBC 2018; USCGRDC 2025; AMSA 2025; UKSARC 2025). Where empirical data is limited, assumptions are documented and traceable through calculation logs or planning tools.

By contrast, the SEE/LoD framework used in ESP and MTIR offers operational simplicity but reduces analytical transparency and limits third-party verification. Without validation studies linking SEE/LoD categories to measurable detection outcomes, the framework remains evidentially unsupported. Re-establishing a quantified link between SEE/LoD and detection probability through field trials, retrospective analysis or retention of POD within the $POA \times POD = POS$ framework would restore methodological completeness and align New Zealand's doctrine with internationally validated practice.

The Bike Wheel Model: current state and required fixes

The Bike Wheel model was one of the most effective teaching tools introduced in the MLSO courses (SARINZ 2007). At its core, the model provided a structured yet flexible framework for reflex tasking, a cognitive map that connects LPB, terrain analysis and operational sequencing (see Figure 1). The outer rim represented the search environment, sectors, regions and terrain features, while each spoke represented a decision pathway or hypothesis

to be tested. The hub symbolised information flow and coordination, ensuring that clues, information and team feedback were continuously centralised.

What made the original version sophisticated was its balance between simplicity of presentation and conceptual depth. It integrated behavioural probability, operational tempo and evidence feedback within a single visual metaphor. MLSO taught it not merely as a mnemonic, but as a dynamic model of search reasoning, a way to visualise hypotheses, prioritise sectors and control information loops under uncertainty.

In MTIR version 2024, the model was modernised but faithfully preserved in intent (see Figure 2). The adaptation correctly linked the Bike Wheel to CIMS functions and to the speed→efficiency→thoroughness progression showing how planners could cycle through rapid hypotheses in the first operational period before shifting to evidence-driven refinement. MTIR's depiction of wilderness versus urban variants added valuable context clarifying how the model scales across different environments while retaining its cognitive architecture. In this respect MTIR successfully upheld the original sophistication within an operationally accessible framework.

By contrast ESP (NZSAR 2021) simplified the Bike Wheel (see Figure 3). The diagram was retained as a generic reference to 'reflex tasking' but its underlying logic was stripped of the analytical dimensions that once linked clues, evidence and scenario weighting. The hub no longer represented information centralisation, the spokes no longer corresponded to testable hypotheses and the visual grammar that once conveyed iterative statistical reasoning was reduced to a static reminder of 'where to look first'.

This simplification reflects a limited appreciation of the model's theoretical intent, treating it as a static diagram rather than as an evolving reasoning process. The result is a version that is easier to teach but detached from the decision science that gave it meaning. Learners can reproduce the image, but they are less equipped to apply the underlying logic of hypothesis testing, evidence review and iterative re-planning (see Figure 4). This trend mirrors a broader pattern of conceptual dilution across recent training materials, where simplification has come at the expense of analytical literacy.

Re-establishing this level of sophistication would not only restore the Bike Wheel's original analytical intent (see Figure 4) but would also align New Zealand's search and rescue doctrine with international best practice. Other international frameworks (e.g. USNSARC 2000; AMSA 2025) emphasise traceable reasoning and transparent documentation as hallmarks of professional search planning. Reconnecting the Bike Wheel model to its evidence-driven foundation would contribute to New Zealand's reputation for innovative yet disciplined practice

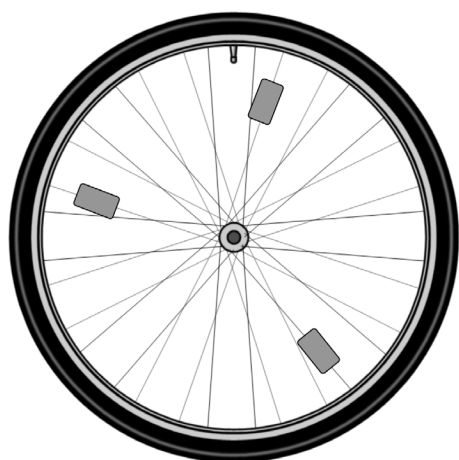


Figure 1: MLSO's Bike Wheel Model (SARINZ Trust 2007).
Printed with permission.

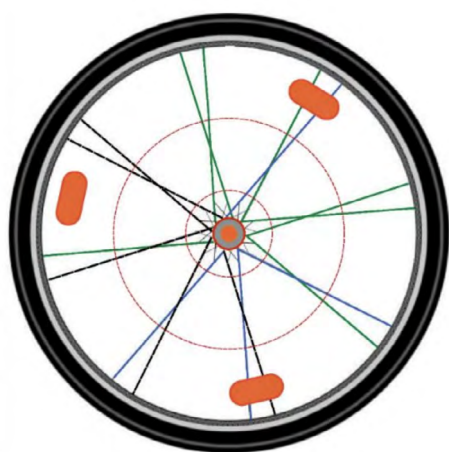


Figure 2: MTIR Bike Wheel Model (NZSAR 2014).
Printed with permission.

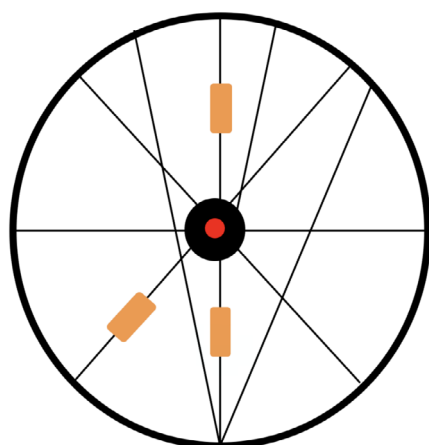


Figure 3: ESP Bike Wheel Model (NZSAR 2021).
Printed with permission.

and allow the model to function as it was conceived: as a bridge between behavioural insight and operational planning and a living representation of structured reasoning under uncertainty.

Conclusion

The longitudinal analysis of Aotearoa New Zealand's land-based search and rescue training materials spanning MLSO, ESP and MTIR reveals a clear progression towards professionalisation, accessibility and stronger alignment with the CIMS. Over 20 years, training doctrine has evolved from a single comprehensive course into 2 specialised streams of MTIR, which builds rapid competence for the first 24–36 hours and ESP, which formalises multi-period planning. This shift has improved role clarity operational tempo and inter-agency consistency.

This study showed that, across 8 analytical domains, training structure has strengthened but analytical depth has declined. In particular, the probabilistic framework linking probabilities of area, detection and success ($POA \times POD = POS$) has largely been replaced by the SEE/LoD approach without clear validation or demonstrated equivalence to international search standards. Without a verifiable detection metric, decision-making and after-action evaluation become less transparent and harder to defend.

A similar simplification is visible in the evolution of the Bike Wheel model. The original MLSO version integrated behavioural hypotheses, search strategy development and feedback loops. MTIR maintained this reasoning, but ESP reduced it to a static reflex-tasking diagram. While accessible, this shift risks producing practitioners confident in procedure but less prepared for adaptive analytical reasoning, a pattern noted elsewhere in emergency management training literature.

Despite these concerns, several strengths remain. MTIR's emphasis on immediate action, safety and structured briefings has strengthened first-period discipline, while ESP reinforces intelligence cycles, multi-period incident action planning and structured debriefing processes that enhance interoperability. Safety and responder welfare considerations are more systematic and post-operation learning has improved. However, some doctrinal visuals still reference CIMS 2nd Edition (2014) rather than the 3rd Edition (2019), suggesting incomplete integration.

Persistent weaknesses include lack of evidence provenance, uncalibrated SEE/LoD measures and limited learning-progression pathways, producing a system that is efficient but analytically shallow. Learners gain confidence rapidly but risk the Dunning–Kruger effect. Assessments emphasise form completion over reasoning and doctrinal updates often lack citation or benchmarking.

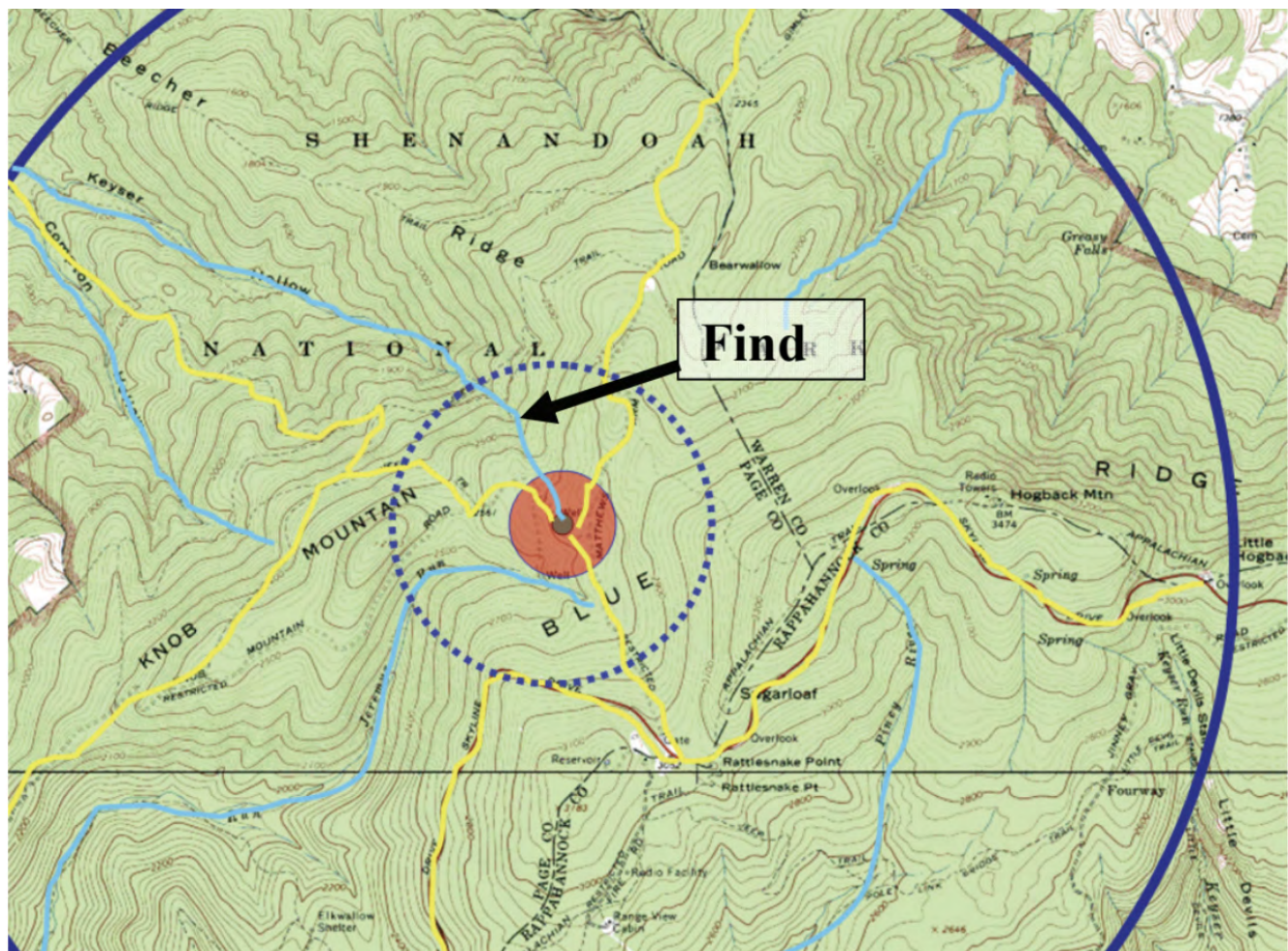


Figure 4: Simplified sophistication of Koester's Bike Wheel applied to SAR scenario (Koester 2014). Printed with permission.

Future reform should retain MTIR and ESP's accessibility while restoring analytical rigour. This includes validating or reinstating the POA×POD=POS framework, restoring analytical reasoning within the Bike Wheel model and entrenching evidence attribution, worked examples and micro-credentials in probability and intelligence analysis.

Overall, Aotearoa New Zealand's search and rescue training architecture has improved operational structure and interoperability but its analytical foundation requires reinforcement. Reconnecting evidence with decision-making would ensure that search strategies and probability adjustments remain traceable and defensible, strengthening alignment with international best practice and supporting an evidence-based volunteer search and rescue system.

Acknowledgement

This paper is part of a PhD study at Massey University. The project was supported by Te Hiranga Rū QuakeCoRE, an Aotearoa New Zealand Tertiary Education Commission-funded Centre.

References

- AMSA (Australian Maritime Safety Authority) (2025) *National Search and Rescue manual (February 2025 final v2)*. Australian National Search and Rescue Council.
- Bowen GA (2009) 'Document analysis as a qualitative research method', *Qualitative Research Journal*, 9(2):27–40. <https://doi.org/10.3316/QRJ0902027>
- Braun V and Clarke V (2006) 'Using thematic analysis in psychology', *Qualitative Research in Psychology*, 3(2):77–101. <https://doi.org/10.1191/1478088706qp063oa>

- Comfort LK (2007) 'Crisis management in hindsight: Cognition, communication, coordination and control', *Public Administration Review*, 67:189–197. <https://doi.org/10.1111/j.1540-6210.2007.00827.x>
- Cooper DC, Frost JR and Robe RQ (2003) *Compatibility of Land SAR Procedures with Search Theory* [PDF]. Potomac Management Group prepared for US Department of Homeland Security United States Coast Guard. US Coast guard website.
- Curd A, Vinnell L and Johnston DM (2025) 'Exploring the role of search and rescue organisations in emergency events: A systematic review in Aotearoa New Zealand', *Australian Journal of Emergency Management*, 40(1):22–32. <https://doi.org/10.47389/40.1.23>
- Curd A, Vinnell L and Prasanna R (2026) 'From lessons identified to lessons learned: Systemic patterns in Aotearoa New Zealand's search and rescue exercise evaluations', *Disaster Prevention and Management*, 35(6):97–112. <https://doi.org/10.1108/DPM-02-2026-0058>
- Dunning D (2011) 'The Dunning–Kruger effect: On being ignorant of one's own ignorance', in: Olson JM and Zanna MP (Eds.) *Advances in experimental social psychology*, 44:247–296. Academic Press. <https://doi.org/10.1016/B978-0-12-385522-0.00005-6>
- Fereday J and Muir-Cochrane E (2006) 'Demonstrating rigor using thematic analysis: A hybrid approach of inductive and deductive coding and theme development', *International Journal of Qualitative Methods*, 5(1):80–92. <https://doi.org/10.1177/160940690600500107>
- Frost JR and Stone LD (2001) *Review of search theory: Advances and applications to search and rescue decision support* [PDF]. Defence Technical Information Centre.
- Gale NK, Heath G, Cameron E, Rashid S and Redwood S (2013) 'Using the framework method for the analysis of qualitative data in multi-disciplinary health research'. *BMC Medical Research Methodology*, 13:117. <https://doi.org/10.1186/1471-2288-13-117>
- Hill KA (2012) 'Cognition in the woods: Biases in probability judgments by search and rescue planners', *Judgment and Decision Making*, 7(4):488–498. <https://psycnet.apa.org/doi/10.1017/S1930297500002825>
- JESIP (Joint Emergency Services Interoperability Programme) (2024) *Joint Doctrine: The Interoperability Framework* Version 3.1 (April 2024) [PDF]. JESIP website.
- JIBC (Justice Institute of British Columbia) (2018) *Search and rescue fundamentals* [PDF]. JIBC website.
- Kikkawa Y and Mavin TJ (2017) 'A review of debriefing practices', *Aviation Psychology and Applied Human Factors*, 7(1):42–54. <https://psycnet.apa.org/doi/10.1027/2192-0923/a000114>
- Koopman BO (1946) *Search and screening (Operations Evaluations Group Report No. 56)*. Center for Naval Analyses.
- Koester RJ (2008) *Lost Person Behavior: A Search and Rescue Guide on Where to Look – for Land, Air and Water*. dbS Productions, Charlottesville, VA.
- Koester RJ (2014) *Lost Person Behavior: Instructor Activity Guide 2014*. dbS Productions, Charlottesville, VA.
- Koester RJ (2018) *Determining Probabilistic Spatial Patterns of Lost Persons and their Detection Characteristics in Land Search & Rescue* [PDF]. Doctoral thesis, University of Portsmouth.
- Krippendorff K (2018) *Content Analysis: An Introduction to its Methodology*. 4th edn. SAGE.
- Land Search and Rescue (2022) *Code of Practice Strategic Plan* [PDF]. LandSAR website.
- Mahoney J and Rueschemeyer D (2003) *Comparative Historical Analysis in the Social Sciences*. Cambridge University Press.
- Neelen M and Kirschner PA (2020) *Evidence-informed Learning Design: Creating Training to Improve Performance*. Kogan Page.
- NZFC (New Zealand Fire Commission) (1998) *The New Zealand Coordinated Incident Management System (CIMS): teamwork in emergency management*. NZFC.
- New Zealand Government (2014) *The New Zealand Coordinated Incident Management System (CIMS)* 2nd edn. [PDF]. NZ Government website.
- New Zealand Government (2019) *Coordinated Incident Management System (CIMS)* 3rd ed. [PDF]. NZ Government website.
- Nurmia E, Wahyono SB and Rhomadan MR (2024) 'Implementation of problem-based learning in SAR education and training: A narrative study at Basarnas', *Edunity: Social and Educational Studies*, 3(8):790–795. <https://doi.org/10.57096/edunity.v3i8.298>
- NZSIS (New Zealand Security Intelligence Service) (2025) *New Zealand's Security Threat Environment. An assessment by the New Zealand Security Intelligence Service* [PDF]. NZSIS website.
- NZSAR (New Zealand Search and Rescue) (2020a) *A summary of SAREX Common Themes* [PDF]. NSAR website.
- NZSAR (New Zealand Search and Rescue) (2020b) *Land Search and Rescue Response Guidelines* [PDF]. NSAR website.
- NZSAR (New Zealand Search and Rescue) (2021a) *Extended Search Planning student reference and SAR Guidelines* [PDF]. NZSAR website.
- NZSAR (New Zealand Search and Rescue) (2021b) *Operational Framework for the NZSAR Region* [PDF]. NZSAR website.

NZSAR (New Zealand Search and Rescue) (2024) Manage the Initial Response (MTIR) student reference.

NZSAR (New Zealand Search and Rescue) (2025) SAREX reports [Online]. NZSAR website, accessed DATE. <https://nzsar.govt.nz/training-resources/collective-training/sarex-reports>

Peake A, McCalmon J, Raiford B, Liu T and Alqahtani S (2020) 'Wilderness search and rescue missions using deep reinforcement learning', in *IEEE International Symposium on Safety Security and Rescue Robotics*, pp.102–107. IEEE.

Perkins D (2013) [Probability of Detection for the Search Manager](#) [PDF]. Conference presentation, Arizona State SAR Conference.

Prior L (2003) *Using Documents in Social Research*. SAGE.

SARINZ (Search and Rescue Institute of New Zealand Trust) (2007) *Managing Land Search Operations (MLSO) Course Workbook*.

SARINZ (Search and Rescue Institute of New Zealand Trust) (2008) *Managing Land Search Operations (MLSO) Course Workbook*.

SARINZ (Search and Rescue Institute of New Zealand Trust) (2011) *Managing Land Search Operations (MLSO) 3-day initial response course workbook*.

SARINZ (Search and Rescue Institute of New Zealand Trust) (2013) 'POD: Fact or fiction', *Heads Up*, 19(1):5–6.

Slavin RE (2020) 'How evidence-based reform will transform research and practice in education', *Educational Psychologist*, 55(1):21–31. <https://doi.org/10.1080/00461520.2019.1611432>

Somerville M and Chatzipanagiotou N (2015) 'Informed systems: Enabling collaborative evidence-based organisational learning', *Evidence Based Library and Information Practice*, 10(4):24–39. <https://doi.org/10.18438/B8VP4X>

Stoffel R and Stoffel B (2017) *Textbook for Managing Land Search Operations*. ERI Publications.

Twardy CR Koester R and Gatt R (2006) [Missing Person Behaviour: An Australian Study](#) [PDF]. Report to the Australian National SAR Council. ESF website.

UKSARC (United Kingdom Search and Rescue Committee) (2025) [Strategic Overview of Search and Rescue in the United Kingdom of Great Britain and Northern Ireland](#) [Online]. UK Government website, accessed 3 May 2025.

USNSARC (United States National Search and Rescue Committee) (2000) [National Search and Rescue Supplement to the International Aeronautical and Maritime Search and Rescue Manual](#) [PDF]. US Covil Air Patrol website, accessed date 25 July 2025.

USCGRDC (US Coast Guard Research and Development Center) (2025) [U.S. Coast Guard Research & Development Center FY26 Research Program Portfolio](#) [PDF]. US Coast Guard website.

Yazdani M and Haghani M (2024) 'A conceptual framework for integrating volunteers in emergency response planning and optimisation assisted by decision support systems', *Progress in Disaster Science*, 24:100361. <https://doi.org/10.1016/j.pdisas.2024.100361>

Young CS and Wehbring J (2007) *Urban Search: Managing Missing Person Searches in the Urban Environment*. dbS Productions, LLC.

Young CS (2022) *Intelligent Search: Managing the Intelligence Process in the Search for Missing Persons*. dbS Productions, LLC.

About the authors

Aly Curd is a PhD candidate at the Joint Centre for Disaster Research, Massey University and an emergency management practitioner based in Aotearoa New Zealand. Her work focuses the search and rescue sector and the role and integration of volunteer organisations within emergency management systems.

Dr Lauren Vinnell is a senior lecturer in Emergency management at the Joint Centre for Disaster Research, Massey University. Her background is in applied social psychology and she uses quantitative and experimental survey methods. Her research focuses on risk perception and communication, predictors of natural hazard preparation and improving human behaviour during earthquake shaking through drills and warnings.

Associate Professor Raj Prasanna is a researcher at the Joint Centre for Disaster Research, Massey University. He focuses on the design and deployment of technology-enabled solutions that enhance situational awareness, decision-making and performance across all phases of disasters. He leads the Crisis Response and Integrated Simulation Science Laboratory advancing work on low-cost earthquake early warning systems, structural health monitoring, LoRa-based communication networks and edge-AI analytics.

How Australian fire and rescue service personnel would like to improve their decision-making learning and training programs

Peer reviewed

Adjunct Professor Jim McLennan^{1,2} 

ORCID: 0000-0002-5846-1323

Dr Peter Hayes^{1,3} 

ORCID: 0000-0003-3874-012X

Dr Chris Bearman^{1,3,4} 

ORCID: 0000-0001-9892-9878

Dr Greg Drummond^{1,5,6} 

ORCID: 0000-0002-2560-3700

Dr Rhona Flin^{1,7} 

ORCID: 0000-0003-4044-5699

Dr Philip Butler^{1,8,9} 

ORCID: 0000-0003-0564-7105

1. Natural Hazards Research Australia, Melbourne, Victoria.
2. La Trobe University, Melbourne, Victoria.
3. Central Queensland University, Adelaide, South Australia.
4. University of Central Lancashire, Preston, United Kingdom.
5. Department of Fire and Emergency Services, Perth, Western Australia.
6. University of New South Wales, Kensington, New South Wales.
7. Robert Gordon University, Aberdeen, United Kingdom.
8. Liverpool University, Liverpool, United Kingdom.
9. Berkdiff Human Factors, London, United Kingdom.

SUBMITTED
25 November 2025

ACCEPTED
31 March 2026

KEYWORDS
emergency services, decision-making, training needs

DOI
[www.doi.org/10.47389/41.4.51](https://doi.org/10.47389/41.4.51)

Introduction

In Australian states and territories, fire and rescue services agencies (urban fire services, rural fire services and State Emergency Services (SES)) respond to the threats posed to individuals, communities, infrastructure and environments by hazardous events such as structure fires and collapses, transport accidents, hazardous materials exposures, bushfires, storms and floods.¹ Agency personnel with responsibilities for responding to emergencies must make decisions about how to manage the response as they assess the nature of the threats posed and the resources available.

In a series of workshops conducted in 2022 by Natural Hazards Research Australia, a number of priorities were identified for future needs in the practice and training of IEM decision-making. These priorities were:

- updating and reinforcing knowledge about decision-making skills and how to develop them
- increasing understanding of decision-making contexts and consequences
- building capacity for making strategic decisions and dealing with uncertainty
- improving cross-agency and cross-jurisdictional coordination and planning
- reviewing and learning from existing research and tools
- developing practitioner decision-making skills quickly.

1. Depending on the nature of the incident other emergency response agencies are likely to be involved, notably police and ambulance services.



© 2026 by the authors. License Australian Institute for Disaster Resilience, Melbourne, Australia. This is an open source article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) licence (<https://creativecommons.org/licenses/by/4.0>). Information and links to references in this paper are current at the time of publication.

Abstract

Effective management of the response to an incident or emergency event is critically dependent on the decision-making skills of incident and emergency management (IEM) personnel. In a series of workshops conducted in 2022 by Natural Hazards Research Australia, priorities were identified that specified future needs for the practice and training of IEM decision-making. The research in this paper contributes to the understanding of how to address these priorities by considering the views of a sample of fire and rescue service personnel about their agency's current decision-making training program and aspects to improve. This paper provides findings from 34 semi-structured interviews with fire and rescue services personnel in Australia. The sample comprised 29 men and 5 women. Participants worked in rural fire services ($n=17$), urban fire services ($n=9$) and State Emergency Services ($n=8$). The findings suggest that there is need for greater training focus on emergency management decision-making, greater use of exercise-based training activities, a formal approach to mentoring and coaching staff development programs and mandatory refresher courses and review exercises to maintain incident management skills. Australian fire and rescue services agencies need to ensure they are taking a strategic and holistic approach to emergency management learning and development programs.

To address these priorities, it is important to understand how people make decisions in IEM, what the challenges for IEM decision-making are, how decision-making is currently trained and the opportunities to improve training. This paper contributes to this broad understanding of decision-making by considering the views of a sample of fire and rescue service personnel about their agency's current decision-making training program and the aspects to improve.

How people make decisions in IEM

There is a good understanding of the cognitive processes that underlie IEM decision-making. Over the last 25 years, the cognitive science literature has increasingly recognised the central role of 2 main types (or systems) of decision-making: analytical (deliberative) and intuitive (recognition) approaches. Together, these approaches form the dual pathway model² of decision-making (e.g. Evans and Stanovich 2013; Evans 2019; Stanovich and West 2000). As the name suggests, analytical approaches follow a structured, deliberative process to weigh up options and decide on the best choice. This approach assumes adequate time, information and resources and is thus less practical in more dynamic, opaque and time-constrained situations (Steigenberger et al. 2017). In contrast, intuitive (or recognition) approaches have developed from observing how experts make decisions in the real world. A well-known example of this approach is recognition primed decision-making (RPD), which outlines how skilled practitioners use pattern matching to make decisions by comparing the current situation with their past experiences (Klein 1993). If the situation is recognised as similar to a decision maker's previous experience, then a similar solution may be applied to resolve the situation. Approaches such as RPD are generally swift and largely based on the decision maker's recognition (intuitive) cognitive processes (Klein 1999). When working under low-time, high workload and high-risk situations, intuitive approaches have the advantage of using less cognitive resources than analytical approaches. Of course, the safe and effective use of RPD requires that the practitioner has suitable relevant experience to use this approach (Klein et al. 2010).

Consistent with the dual pathway model, recent literature reviews of the emergency management, military, police, medicine and other high-reliability organisational domains have found that most decision-making relies largely on both analytical and intuitive approaches (Reale et al. 2023; Penney et al. 2022; Perona et al. 2019). Emergency management practitioners use a combination of analytical and intuitive approaches, but the emphasis varies depending on contextual factors such as uncertainty, task complexity, time available, novelty and resourcing (McLennan et al. 2001, 2003; Penney et al. 2022; Steigenberger et al. 2017). As much as 80% of IEM decision-making is largely intuitive (Cohen-Hatton et al. 2015;

McLennan et al. 2001, 2003; Taynor et al. 1990). Some contemporary decision frameworks used in the emergency management sector incorporate aspects of the analytical and intuitive decision processes discussed. For example, both the SPAR(CD) framework (Lauder and Penney 2023a, b) and the UK Decision Control Process³ describe analytical and intuitive processes in the context of the formation and implementation of goals, plans, actions and review.

An important point to note is that there is often a high degree of sophistication required by decision makers to interweave intuitive and analytical approaches to make sense of incidents and to swiftly develop satisfactory solutions. A qualitative study of police first-response highlights the challenging nature of this work noting the role of 'a complex and situated mix of intuition and analysis' in guiding effective decision-making (Akinci and Sadler-Smith 2020, p.78). This observation highlights the challenge for training IEM practitioners to become effective decision makers.

Penney et al. (2022) and Drummond et al. (2026) note that some organisations overly focus on one decision process at the expense of another in their doctrine and training. Typically, there is an over-emphasis on analytical processes while neglecting the importance of intuitive processes. This tends to make the decision-making process appear more deliberate, rational and reportable than it is and may cause decision inertia when a swift decision is required. The appropriate balance of intuitive and analytical processes with an understanding of the limitations of each has been a focus of the Australian National Operational Guidelines on Decision Making (Bearman et al. 2026; Drummond et al. 2026) and needs to underpin high-quality decision-making training.

Challenges for IEM decision-making

IEM decision-making is a challenging endeavour because of the intrinsic nature of the overall response task situation, typically characterised by one or more situational factors (Bearman et al. 2024; Brehmer 1992; Brunacini 2002; Dörner 1980; Flin and Arbutnot 2002; McLennan et al. 2017; Penney et al. 2022; Tislington and Watt 2019; Zsombok 1997):

1. A complex, sometimes opaque, hazardous situation.
2. An uncertain and dynamic threat environment.
3. Potentially uncertain and changing priorities.
4. Action and feedback loop processes rather than a single select-and-forget decision.
5. Time pressure.
6. High stakes, often involving immediate threat to life and/or costly damage to property, infrastructure, economies and environments.

2. This is similar to System 1 and System 2 thinking described by Kahneman (2012).

3. Version 3.1 (April 2024), available from <https://www.jesip.org.uk>

7. Multiple agencies engage so that decision-making is distributed and effective communication is critical.
8. Multiple stakeholders in outcomes whose goals may be in conflict.

In addition to these intrinsic challenges to the IEM decision-making endeavour, Butler et al. (2024) identified 3 challenges arising from the wider societal context in which decision-making may occur, which are:

- the negative effects of stress and fatigue on IEM decision makers in command roles at large scale incidents extending over long time periods
- inter-operability problems of communication, coordination and jurisdiction associated with multi-agency involvement in managing complex emergencies such as terrorist attacks
- ethical dilemmas about where assistance can be provided and where it cannot where the demands of the emergency exceed the available response resources.

Training needs and learning strategies

To be able to function effectively in such environments, emergency services personnel require high-quality specialised training so they can perform their varied response tasks effectively and safely (Bearman et al. 2025; Cohen-Hatton et al. 2015; Flin et al. 2026; Ward et al. 2019). Personnel need to have knowledge about a myriad of topics such as SOPs (Standard Operating Procedures), radio communications protocols, forest fire behaviour, building material performance, hazardous chemical safety. In addition, they need to have good technical skills such as use of breathing apparatus, fast-water flood rescue, ladder safety and non-technical skills such as leadership, decision-making and teamwork (Bearman et al. 2023; Hayes et al. 2021).

Organisations need to carefully curate the learning experiences of their workforce so that these experiences align with strategic goals and evolving needs (Ford 2021, McLennan et al. 2024). Ultimately, emergency management organisations need to develop and maintain the capability of their personnel to meet statutory responsibilities, respond to changing hazard environments (e.g. use of hydrogen as a fuel source) (AFAC 2021), respond to increases in the frequency and severity of climate-related incidents (Mach et al. 2016; Pescaroli et al. 2023), manage the effects of demographic changes in the workforce and community (Chong et al. 2022) and use new emergency response technologies (Khanal 2022; Pine 2018). Thus, developing and maintaining robust decision-making capability is central to an emergency management organisation's capacity to effectively and flexibly manage its statutory responsibilities. It is clear, however, that while

some emergency management organisations are delivering high-quality training in some areas, there are gaps in the provision of training that are not addressed adequately (Bearman et al. 2024; McLennan et al. 2024).

Four main types of learning approaches can be used to train and maintain the capabilities of practitioners. These are formal learning, guided learning, self-directed study and developmental job experiences (Ford 2021).

Formal training covers the learning programs that an organisation uses to train and develop its workforce to meet its needs (Ford 2021). These learning activities are delivered using face-to-face, online and virtual instructional environments. Some of these programs incorporate learning technologies such as computer-based simulation and augmented reality to create realistic scenarios for trainees to learn and practice skills safely. This type of training for emergency management decision-making was covered in McLennan et al. (2024), offering suggestions to strengthen the effectiveness of emergency management decision-making training. Many programs used by emergency management agencies currently lack robust non-technical skills training (Hayes and Bearman 2023). Hayes and Bearman (2023) provide guidance on how to embed non-technical skills in AFAC Public Safety Training Package units⁴ (and agency training delivery materials) commonly used in Australia to train emergency management personnel. Hayes and Bearman (2023) identified ways to strengthen the content and delivery of the situation awareness and decision-making topics described in those units.

Guided learning (Ford 2021) describes the individualised and facilitated on-the-job training practitioners can undertake. This occurs when someone new to the role is paired with an experienced practitioner to observe and learn practicalities of the job. Guided learning helps to address the gaps that inevitably occur in formal training programs and assists new personnel to learn about the informal aspects of organisational life (de Toni and Noninio 2010). Guided learning can be delivered via one-on-one coaching (especially for decision-making or leadership skills) and through supervisory or peer coaching and mentoring for less experienced colleagues. Coaching and mentoring are recognised as important to improve the performance of personnel (Ellinger 2014; Connor and Pokora 2017; Weinberg and Scandura 2024). Traditionally, they have tended to be viewed as somewhat peripheral to traditional training and development activities (Bruce-Foulds et al. 2016), although they are being increasingly introduced in workplaces (Ellinger 2014; Ghosh and Ellinger 2024; ICF 2025).

4. The 5 Public Safety Training units are Work in a team (PUATE001), Lead a crew (PUAOPE020), Control a Level 1 incident (PUAOPE012), Observe fire from an aircraft (PUAFIR005) and observe a non-fire emergency (PUAFIR006).

Self-directed or autonomous learning (Ford 2021) is learning that is voluntary in nature and is guided by a practitioner's own developmental needs and interests to build their skills and knowledge (Ellingson and Noe 2017). Organisations can support and encourage this type of learning by creating a culture supportive of continuous learning and development. Creating and sustaining a learning culture aligned to an organisation's strategic goals requires considerable investment (Ford 2021). This includes senior management commitment to creating and rewarding learning opportunities, modelling such learning, encouraging collaboration and team learning and having systems that capture and share learning across the organisation (Marsick and Watkins 2003). [The Emergency Management Professionalisation Scheme](#) is an example of a program that supports ongoing professional development for emergency management practitioners.

Developmental job experiences are created by providing practitioners with 'stretch' job assignments and on-the-job experiences to expand their knowledge base and skills range (Ford 2021). Developmental job experiences help practitioners recognise the gap between their current skills and knowledge and the requirements of a new or larger job (Cao and Haromi 2020). This can help motivate practitioners to acquire new skills and knowledge and challenge them to try new behaviours to address varied or novel job demands (Dragoni et al. 2009; McCauley et al. 1994). The new job demands can help practitioners develop new ways of thinking given they may be required to solve challenging problems and make decisions under conditions of novelty, risk and uncertainty (DeRue and Wellman 2009). This approach to developing practitioners has been shown to help practitioners speed up their learning of non-technical skills such as leadership (McCauley et al. 2006).

The 4 types of learning can be combined in various ways. This approach is used widely in emergency medicine to help less experienced practitioners develop their knowledge and skills in hospital trauma units (Sims et al. 2014). The blending of different types of learning has become a design feature in Australian public service training and development programs including various emergency management organisations. Since 2011, many of these organisations have adopted the Centre for Creative Leadership 70:20:10 framework to guide the design of these programs (McCall Jr et al. 1988; Johnson et al. 2018). The framework describes how training and development programs should be configured around 3 types of learning activities: experiential, social and formal. The framework specifies that the program should be made up of 70% challenging job experiences; 20% informal on-the-job learning such as peer support, managerial support,

mentoring and feedback and 10% formal training and learning activities (DeakinCo 2018). However, concerns have been expressed that Australian Public Service organisations that have implemented this approach have not achieved the desired learning outcomes in terms of transfer of training and managerial capability development (Johnson et al. 2018).

The technical and non-technical skills required for emergency management require ongoing maintenance training to ensure they do not atrophy (Woodman et al. 2021). Without periodic operational use, or exercising, of trained-for skills, practitioner performance will decay. Woodman et al. (2021) highlighted how organisations can use needs assessments and task analyses to identify aspects of:

- (1) when formal instruction may be the best option (or not) to remedy competency gaps
- (2) the profile of who needs to be trained
- (3) the content that needs to be taught.

A further issue related to emergency management decision-making skill maintenance is that not only do practitioner skills decay over time without use and systems, protocols, software and social networks change, thus increasing the importance of regular refresher training (Woodman et al. 2021).

Organisations need to provide high-quality, ongoing training and learning opportunities in policies and procedures, technical skills and non-technical skills that employ a variety of learning approaches. While many emergency management agencies provide high-quality training in policies, procedures and technical skills, training in non-technical skills (such as decision-making) appears neglected (Bearman et al. 2023, 2025; Hayes and Bearman 2023; Hayes et al. 2021). In a recent survey of emergency management personnel in Australia by Bearman et al. (2025), only a quarter (26%) of respondents said they had attended formal training on decision-making. Forty per cent of respondents said that the training they received from their organisation had either not improved their decision-making (12%) or they were unsure whether it had (28%). Nearly 60% of respondents felt that the approach to operational decision-making taught during any training was mostly ineffective (12%) or sometimes ineffective (48%). Nearly a third (29%) of respondents said that decision-making training rarely or never changed their on-the-job practice.

This study extends those findings by analysing semi-structured interview data to highlight the views of a sample of fire and rescue service personnel about their agency's decision-making training program and those aspects in need of improvement.

Method

Participants

A total of 34 fire and rescue services personnel participated in semi-structured interviews (29 men and 5 women). They worked in rural fire services ($n=17$), urban fire services ($n=9$) and SES ($n=8$). Rural fire services personnel respond to both bushfires and structure fires. They also carry out rescues, mostly relating to vehicle accidents. Urban fire and rescue services personnel respond to a wide range of emergency events including home, building and factory fires; transport accidents; hazardous chemical spills and discharges and rescues including building and trench collapses and rescues from heights. SES personnel respond to mostly weather-related emergencies including flood rescues, storm damage and fallen trees.

Participant agency role levels ranged from first responders (operational activities level) to executive role chief officers. The mean age was 52.9 years ($SD=8.40$; range 29–67 years) and they reported 23.1 mean years of experience in emergency response work ($SD=9.08$; range 5–40 years). The roles of the majority were Tactical Level ($n=19$) followed by those with roles at Strategic Level ($n=10$). Three participants had roles at Executive Level and 2 participants had roles that were mostly at Operational Response Level (Bearman et al. 2024; Drummond et al. 2025).

Procedure

The research was promoted nationally by Natural Hazards Research Australia and AFAC through publications and social media communications. Participants first completed an online Qualtrics® survey about their emergency management decision-making. The survey included an invitation to opt-in for possible participation in a follow-up interview. A total of 154 completed surveys were returned, including 102 agreements to participate in an interview. A target of 30 to 40 interviews was set to complete the task within the time limit of the project and participants were selected to include a representative sample of emergency management practitioners who were:

- from across Australian states and territories
- volunteer and career personnel
- represented in any of the 4 levels of emergency management decision-making (operational, tactical, strategic, executive)
- represented a range of emergency management response agencies (including urban fire and rescue, rural fire, SES).

Forty interviews were conducted, 34 with fire and emergency personnel and 6 with personnel from other

agencies of police ($n=3$), land management ($n=2$) and ambulance ($n=1$). The 6 interviews were not included in the analysis. Participants were invited to respond to 6 interview questions. This paper reports only on responses to question 6.

Interview protocol questions:

1. To start this interview, it would be helpful to understand a bit about your background working in emergency management and your experience in decision-making. In particular, it would be helpful to hear about your current role. Could you please tell us a bit about yourself and your emergency management work?
2. (a) Would you please provide a brief overview of how you were initially trained to make your emergency management operational decisions?

(b) What subsequent or ongoing training or development activities have you undertaken about operational decision-making?
3. Would you please outline your organisation's guidance and policy on operational decision-making?
4. Would you please describe your operational decision-making practice?
5. Based on your experiences, please outline what you consider are some of the most significant challenges to effective operational decision-making in today's operational environment?
6. How do you think we can improve the training and development of emergency management operational decision makers in roles like yours?

The interviews with fire and rescue service personnel were conducted by the second author ($n=21$) and the third author ($n=13$) using a video online platform and recording and transcribing facilities. The transcripts were analysed by the first author for thematic content following the procedures for Codebook Thematic Analysis using multiple coders to achieve accuracy as consensus discussed by Braun and Clarke (2021, 2022). The analysis was reviewed by the second and third authors independently and revised in discussion with the first author. All 3 authors have extensive experience in emergency incident response activities, undergoing and providing training in emergency management decision-making and using qualitative research investigating emergency management decision-making. The final consensus resulted in 4 overall training improvement needs themes being identified: policies, programs, curricula and activities (see Table 1). Specific training needs identified are detailed in Table 2.

Table 1: Agency training and development needs: themes and illustrative examples.

Training and development policies	Training programs	Training curricula	Training activities
The need for the framework developed by the organisation to ensure its overall training and development program meets its statutory goals and responsibilities. <i>I think we've got to formalise the mentoring.</i> <i>What we should have is at least every 2 year refresher IC program.</i> <i>What we can have is a nationalised approach to incident command training. Just work out what we're going to agree to and do it.</i>	A coherent schedule of training and development arrangements that are designed to achieve and maintain the policy-driven array of personnel capabilities. <i>Exercises are not given enough priority in our training regime.</i> <i>I think it would be good to have courses that are formal and some that are informal. Maybe some mandated.</i> <i>Without doing interoperability training there are problems when you get to large complex operations where you need people that actually understand the capabilities of other agencies.</i>	A specification of what topics will be covered across the spectrum of the training program. <i>There should be more organised study in regard to decision-making and leadership in general. A proper course needs to be made available.</i> <i>We need to start people on their incident management and decision-making training journey earlier than we do.</i> <i>There needs to be more training about cognitive flexibility and understanding of your working memory so you understand your own biases.</i>	How training and learning are delivered and facilitated in the various training courses. <i>Really, it's about training that puts people in realistic decision-making spaces to improve it.</i> <i>It's about putting people in a stressful situation and getting them to force themselves to go beyond their natural feelings.</i> <i>More frequent scenario-based training exercises, especially involving more complex types of incidents.</i> <i>Get somebody with street cred, somebody that crews can look up to and think, 'Yeah, that person's a good Incident Manager'. Get that person to model how they manage an incident.</i>

Ethics

Ethics approval for this research was received from Central Queensland University (#HREC 024362).

Results

The interviewees identified 48 ways agencies could improve training and development to enhance IEM decision-making (Mean=1.4, range 0–3). Table 2 summarises the initiatives interviewees would like agencies to implement grouped into the 4 training improvement needs themes as described in Table 1. The 'core businesses' of the 3 types of agencies differ. As the 3 types of emergency services organisations selected for this study respond to different types of emergency events, Table 2 groups interviewee responses separately for each.

The training and development improvements suggested by interviewees differed greatly in terms of scope and ranged from the most basic, '... we need more practical drills... Yeah, just get better at that basic firemanship' to the national, '...nationalise incident command and make it stick. Take the level of authority away from the agencies to determine the approach'. Overall, 3 of the areas recommended for improvement together accounted for 59% of the total number of proposals. These 3 were a greater training focus on emergency management decision-making (10 out of 48, 21%), greater use of exercise-based training activities (9 out of 48, 19%) and instituting and formalising mentoring and coaching staff

development programs (9 out of 48, 19%). Five participants (10%) advocated for mandatory refresher courses and review exercises for senior staff to maintain skills.

There was a degree of consistency across the 3 types of agencies in training needs identified by interviewees at the training and development policy level. For all 3, formally organised mentoring and coaching development programs were deemed necessary. For both rural and urban fire services, national approaches to training and credentialling were nominated by some interviewees. Some rural fire service and SES interviewees spoke of the need for mandatory refresher courses for senior managers to maintain emergency management skills. The most striking difference among the 3 kinds of agencies related to desired training activities. Only 2 rural fire service interviewees nominated particular activity needs. Only one SES interviewee spoke of a training activity need: (to have experts from outside the emergency management sector give presentations). In contrast, 8 (17%) urban fire service interviewees nominated desired changes in training activities; 7 about exercises. This reflects the greater range of incidents that urban fire services are required to respond to including house fires, factory fires, building collapses, transport accidents, hazardous chemical discharges as well as trench and high-angle rescues.

With only 3 interviewees from the executive and 2 from the operational activities, it can be noted that the former identified needs in the policy area, the latter in the training activities area. There were no noteworthy differences

Table 2: Australian fire and rescue services agencies training needs as perceived by interviewees.

Interviewee services type and Australian state or territory	Policy (n=17)	Program (n=6)	Curriculum (n=15)	Activities (n=10)
Rural fire services: WA 5 NSW 4 VIC 3 SA 2 NT 1	A formally organised approach to mentoring/coaching (6). Mandatory refresher courses and review exercises for skill maintenance (4). Greater emphasis on provision of exercise-based learning opportunities. A national approach to training and credentialling.	Higher priority to training exercises (2). Greater encouragement/recognition/reward for undertaking suitable external courses related to emergency management decision-making. Online courses to develop a range of skills, both technical/practical and non-technical, not necessarily linked to promotion.	Embed emergency management decision-making as a topic in training from initial induction (3). Increased content focused on decision-making and leadership. Increased content on psychological aspects of decision-making. Develop standards and training courses to develop competencies for the incident management team logistics function and the air observer function. Provision of a general model of emergency management decision-making. Greater emphasis on development of people management and leadership skills. Incorporate training modules covering all the required incident-related skills, not just those related to the most encountered incidents.	Greater use of scenario-based learning opportunities. Ensure training activities in non-technical skills are related directly to those required for incident management.
Urban fire and rescue services: NSW 7 Tasmania 3 Vic 1	A formally organised approach to mentoring/coaching. Mandatory refresher courses and review exercises for skill maintenance.	Nil	Embed emergency management decision-making as a topic in training from initial training. Provision of training in administrative skills and people management. Greater emphasis on practical fireground management knowledge. Greater emphasis on developing situation awareness, particularly information-elicitation skills.	Greater emphasis on scenario-based learning opportunities (3). Greater emphasis on exercise-based demonstrations/modelling of incident management by recognised experts. Greater emphasis on exercise-based learning opportunities and with follow-up in operational activities. Greater emphasis on TDG/tabletop-based learning opportunities with formally organised appraisal and critiquing. Need for opportunities/forums for discussion among peers about decision-making issues for personnel development and not linked to promotion. Greater use of drills necessary for good firemanship. Training exercises and scenarios need to be more realistic.
SES: NSW 6 WA 1 Qld 1	A formally organised approach to mentoring/coaching (2). A national approach to training and credentialling. National non-technical skills competency training standards with the addition of guidelines about modification to meet local hazard needs.	Need to evaluate the training program outputs in relation to operational needs. Need to provide adequate training to improve interoperability via appropriate multi-agency exercises.	Broaden the scope of training in incident management to consider impacts of operational decisions for post-incident recovery. Content specifically on decision-making. Content on relevant decision tools/cognitive aids.	Knowledge and awareness-expanding presentations by experts from outside the emergency management sector, such as the military and humanitarian aid.

Note: Figures in brackets indicate the number of interviewees who suggested the change.

in the patterns of responding by interviewees from the tactical and strategic incident management levels.

Discussion

The analysis of data was designed to highlight the views of fire and rescue service personnel about their agency's current training in decision-making and those aspects to improve. This builds on findings by Bearman et al. (2025) that more than 40% of participants said the training they had received from their organisation either had not improved their decision-making or they were unsure whether it had. In addition, nearly 60% of participants felt the approach to decision-making taught during any training was mostly or sometimes ineffective and nearly a third said that decision-making training rarely or never changed their on-the-job practice. Focusing on IEM personnel's opinions about their decision-making training provides important information that can help agencies meet industry identified priorities for decision-making practice and training, particularly in developing rapid practitioner decision-making skills and building capacity for making decisions and dealing with uncertainty.

The data showed a need for greater training focus on emergency management decision-making as a distinct skill. This is being addressed by the Natural Hazards Research Australia project on Enhancing Decision Making in Emergency Management (Bearman et al. 2024). The data also showed a desire by participants for agencies to make greater use of exercise-based training activities and for more formalisation of mentoring and coaching staff development programs.

A further topic of note is the proposal for mandatory refresher courses and review exercises to maintain incident management skills. Participants whose roles were in the Strategic Level commented about the challenge of maintaining incident management knowledge and skills because of infrequent opportunities to use them. This issue has been identified in other jurisdictions. For example, the United Kingdom Fire Service College provides a course to address this challenge.⁵ Woodman et al. (2021) cover the issue of skill decay and skill maintenance in a study of first responders. They outlined some analytical approaches that emergency management organisations can use to configure appropriate skills maintenance and refresher programs for practitioner decision-making and other non-technical skills based on likely skill decay and recurrency requirements.

McLennan et al. (2024) described the value to agencies taking a strategic (and holistic) approach to the learning and development of practitioners by framing learning as occurring through a 4 types of training strategies framework (see Ford 2021, p.9). That framework

suggests that effectively curating a range of practitioner learning activities and experiences can create stronger opportunities to develop decision-making skills. For example, at suitable incidents, placing a Leading Firefighter in a Station Officer Incident Controller role while supported (coached) by an experienced Station Officer combines guided learning with developmental job opportunities.

Hayes (2018) observed that while there has been a move towards an integrated approach to the development of emergency management practitioner skills within fire and rescue services, there has also been an increasing shift in responsibility for professional development from the organisation to the individual. To support self-directed or autonomous learning, organisations need to ensure they facilitate a culture and provide resources conducive to this (Ford 2021). Staff development systems that capture and enable the sharing of findings from post-operation reviews are invaluable (McLennan et al. 2024; Marsick and Watkins 2003). Further, developmental job experiences highlight the importance of fostering learning experiences for practitioner skills development. Rather than maximising the number of developmental job experiences, the focus should be on the fit between the experience and the practitioner's individual learning needs (Cao and Haromi 2020).

It is acknowledged that agencies face budgetary constraints and a balance must be struck between the costs of training programs and the need to adequately fund emergency response capability. One of our interviewees commented:

Our exercising and training regimes are probably not given enough priority because senior management is so busy with the business side of things. Not to put too fine a point on it, the world is run by accountants!

However, agency response capability is highly dependent on the skills of the responders and this should remain the focus for emergency management agencies.

Limitations

There are limitations of this study, notably the generalisability of the results to the wider fire and rescue services sector. While 34 interviewees came from agencies from all Australian states and the Northern Territory, agency annual reports indicate that there are more than 200,000 emergency services personnel involved in emergency management across the country. It would not be appropriate to conclude that the reported accounts of training improvement needs are necessarily characteristic of any agency nor of Australian fire and rescue service agencies in general. Rather, the findings should be viewed as suggestive of the likely value to agencies of reviewing

5. United Kingdom Fire Service College course [Revalidation for Advanced Incident Command in Fire and Rescue Services](#) (National Operational Guidance Level 3).

training and development programs to identify and address issues that would benefit from changes.

Of the participants, only 5 were female, 15% of the total. While this mirrors broadly the historical gender balance of the sector and there were no obvious overall differences between the responses of the male and female participants, it is expected that this study missed important IEM training needs specific to the needs of women.

Conclusion

A number of training needs recommended by interviewees were identified in the data relating to policies, programs, curricula and activities. The analysis highlights important topics that emergency management agencies need to address in their conceptualisation and delivery of training. In particular, the data showed there was need for a greater training focus on the decision-making aspects of emergency management, a desire for greater use of exercise-based training activities, a formal approach to mentoring and coaching staff development programs and mandatory refresher courses and review exercises to maintain incident management skills. It is important that emergency management agencies take a strategic (and holistic) approach to the learning and development of emergency management practitioners. As McLennan et al. (2024) noted, 'The most constructive action for emergency management organisations to improve decision-making effectiveness is to undertake critical reviews of current arrangements for decision-making training' (p.42).

References

- AFAC (Australasian Fire and Emergency Services Authorities Council) (2021) *AFAC Emergency responders training analysis: A report for the National Hydrogen Strategy* [PDF]. AFAC, Melbourne.
- Akinci C and Sadler-Smith E (2020) 'If something doesn't look right, go find out why': how intuitive decision making is accomplished in police first-response', *European Journal of Work and Organizational Psychology*, 29(1):78–92. <https://doi.org/10.1080/1359432X.2019.1681402>
- Bearman C, Drummond G, Hayes P, Gyles D, McLennan J, Butler P and Flin R (2026) *Australian National Operational Guidelines on Decision Making Part A: The Incident & Emergency Management Decision Making (IEM-DM) Model, Pitfalls and Safeguards*. Melbourne, Australasian Fire and Emergency Service Authorities Council Limited.
- Bearman C, Hayes P, Kuhn M, Drummond G, McLennan J, Butler P and Flin R (2025) *The current state and future needs of decision making: knowledge, practice, tools and training options*. Natural Hazards Research Australia. <https://doi.org/doi:10.13140/RG.2.2.32251.84001>
- Bearman C, Hayes P, McLennan J, Penney G, Butler PC and Flin R (2024) 'The challenges of decision-making in emergency management, the cognitive aids people use and the decision-making training they receive', *Australian Journal of Emergency Management*, 39(4):10–12. <https://doi.org/10.47389/39.4.23>
- Bearman C, Hayes P and Thomason M (2023) 'Facilitating teamwork in emergency management: The team process checklist', *International Journal of Disaster Risk Reduction*, 94:103775. <https://doi.org/10.1016/j.ijdrr.2023.103775>
- Braun V and Clarke V (2021) 'One size fits all? What counts as quality practice in (reflexive) thematic analysis?', *Qualitative Research in Psychology*, 18(3):328–352. <https://doi.org/10.1080/14780887.2020.1769238>
- Braun V and Clarke V (2022) 'Conceptual and design thinking for thematic analysis', *Qualitative Psychology*, 9(1):3–26. <https://doi.org/10.1037/qup0000196>
- Brehmer B (1992) 'Dynamic decision making: Human control of complex systems', *Acta Psychologica*, 81(3):211–241. [https://doi.org/10.1016/0001-6918\(92\)90019-A](https://doi.org/10.1016/0001-6918(92)90019-A)
- Bruce-Foulds CH, Clark GR and Ray KA (2016) 'Coaching and mentoring: What they are and how they are used in organisations', in E Parsloe and M Leadham (Eds.), *Coaching and mentoring, practical techniques for developing learning and performance* (3rd ed.), (pp.225–242). Kogan Page.
- Brunacini AV (2002) *Fire command* (2nd ed.). Jones & Bartlett Learning.
- Butler PC, Flin R, Bearman C, Hayes P, Penney G and McLennan J (2024) 'Emergency management decision making in a changing world: 3 key challenges', *Australian Journal of Emergency Management*, 39(4):23–31. <https://doi.org/10.47389/39.4.23>
- Cao J and Hamori M (2020) 'How can employers benefit most from developmental job experiences? The needs-supplies fit perspective', *Journal of Applied Psychology*, 105(4):422–432. <https://doi.org/10.1037/apl0000449>
- Chong JXY, McLennan BJ and Dunlop P (2022) *Emergency Services Workforce 2030 - Changing Workforce Literature Review* [PDF]. Bushfire and Natural Hazards Cooperative Research Centre.
- Cohen-Hatton SR, Butler PC and Honey RC (2015) 'An Investigation of Operational Decision Making in Situ: Incident Command in the UK Fire and Rescue Service', *Human Factors*, 57(5):793–804. <https://doi.org/10.1177/0018720815578266>
- Connor M and Pokora J (2017) *Coaching and mentoring at work: Developing effective practice*. McGraw-Hill Education (UK).

DeakinCo (13 August 2018) *The 70:20:10 model of learning and development* [Online]. Deakin University website, accessed 16 February 2026.

DeRue S and Wellman N (2009) 'Developing leaders via experience: The role of developmental challenge, learning orientation, and feedback availability', *Journal of Applied Psychology*, 94:859–875. <https://doi.org/10.1037/a0015317>

de Toni AF and Nonino F (2010) 'The key roles in the informal organization: a network analysis perspective', *The Learning Organization*, 17(1):86–103. <https://doi.org/10.1108/09696471011008260>

Dörner D (1980) 'On the difficulties people have in dealing with complexity', *Simulation and Games*, 11(1):87–106. <https://doi.org/10.1177/104687818001100108>

Dragoni L, Tesluk PE, Russell JEA and Oh IS (2009) 'Understanding Managerial Development: Integrating Developmental Assignments, Learning Orientation, and Access to Developmental Opportunities in Predicting Managerial Competencies', *Academy of Management Journal*, 52:731–743. <http://dx.doi.org/10.5465/amj.2009.43669936>

Drummond G, Bearman C, Hayes, P, Gyles D, McLennan J, Butler P and Flin R (2026) *Australian National Operational Guidelines on Decision Making Part B: The Handbook of Decision Making in Incident and Emergency Management – Guidance for Australian Fire and Emergency Services*. Melbourne, Australasian Fire and Emergency Service Authorities Council Limited.

Ellinger AD (2014) 'Coaching and mentoring', in RF Poell, TS Rocco and G Roth (Eds.), *The Routledge companion to human resource development*, (pp.389–407). Routledge.

Ellingson JE and Noe RA (Eds.) (2017) *Autonomous learning in the workplace*. Routledge.

Evans NJ (2019) 'A method, framework, and tutorial for efficiently simulating models of decision-making', *Behavior Research Methods*, 51(5):2390–2404. <https://doi.org/10.3758/s13428-019-01219-z>

Evans JSB and Stanovich KE (2013) 'Dual-Process Theories of Higher Cognition: Advancing the Debate', *Perspectives on Psychological Science*, 8(3):223–241. <https://doi.org/10.1177/1745691612460685>

Flin R and Arbuthnot K (2002) *Incident command: Tales from the hot seat*. Ashgate.

Flin R, Reader T and O'Connor P (2026) *Safety at the sharp end: A guide to non-technical skills* (2nd ed.). CRC Press.

Ford JK (2021) *Learning in organizations: An evidence-based approach*. Routledge.

Ghosh R and Ellinger AD (2024) 'Coaching and mentoring', in TS Rocco, ML Morris and RF Poell (Eds.), *The Sage Handbook of Human Resource Development*, (pp.277–293). Sage.

Hayes P (2019) *Coaching and Mentoring - Research Insights into Good Practice* [Online]. AFAC website, accessed 16 November 2025.

Hayes P and Bearman C (2023) *Embedding Non-Technical Skills in Emergency Management Training* [Online]. Australasian Fire and Emergency Services Authorities Council website, accessed 16 November 2025.

Hayes P, Bearman C, Butler P and Owen C (2021) 'Non-technical skills for emergency incident management teams: A literature review', *Journal of Contingencies and Crisis Management*, 29(2):185–203. <https://doi.org/10.1111/1468-5973.12341>

ICF (International Coaching Federation) (2025) *ICF global coaching study* [Online]. ICF website, accessed 16 November 2025.

Johnson SJ, Blackman DA and Buick F (2018) 'The 70: 20: 10 framework and the transfer of learning', *Human Resource Development Quarterly*, 29(4):383–402. <https://doi.org/10.1002/hrdq.21330>

Kahneman D (2012) *Thinking, fast and slow*. Penguin.

Khanal S, Medasetti US, Mashal M, Savage B and Khadka R (2022) 'Virtual and Augmented Reality in the Disaster Management Technology: A Literature Review of the Past 11 Years', *Frontiers in Virtual Reality*, 3:843195. <https://doi.org/10.3389/frvir.2022.843195>

Klein G (1993) 'A Recognition-Primed Decision (RPD) model of rapid decision making', in G. Klein, J. Orasanu, R. Calderwood, & C. E. Zsombok (Eds.), *Decision Making in Action: Models and Methods*, (pp.138–147). Ablex Publishing.

Klein G (1999) *Sources of power: How people make decisions*. The MIT Press.

Klein G, Calderwood R and Clinton-Cirocco A (2010) 'Rapid Decision Making on the Fire Ground: The Original Study Plus a Postscript', *Journal of Cognitive Engineering and Decision Making*, 4(3):186–209. <https://doi.org/10.1518/15534310X12844000801203>

Lauder D and Penney G (2023a) 'An operator's guide to SPAR(CD): a model to support decision-making', *Australian Journal of Emergency Management*, 38(4):59–66. <https://doi.org/10.47389.38.4.59>

Lauder D and Penney G (2023b) 'Towards a common framework to support decision-making in high-risk, low-time environments', *Journal of Contingencies and Crisis Management*, 31(4):862–876. <https://doi.org/10.1111/1468-5973.12487>

- Mach KJ, Mastrandrea MD, Bilir TE and Field CB (2016) 'Understanding and responding to danger from climate change: the role of key risks in the IPCC AR5', *Climatic Change*, 136:427–444. <https://doi.org/10.1007/s10584-016-1645-x>
- Marsick VA and Watkins KE (2003) 'Demonstrating the Value of an Organization's Learning Culture: The Dimensions of the Learning Organization Questionnaire', *Advances in Developing Human Resources*, 5(2):132–151. <https://doi.org/10.1177/1523422303005002002>
- McCall MW Jr, Lombardo MM and Morrison AM (1988) *The lessons of experience: How successful executives develop on the job*. The Free Press.
- McCauley CD, Drath WH, Palus CJ, O'Connor PMG and Baker BA (2006) 'The use of constructive-developmental theory to advance the understanding of leadership', *Leadership Quarterly*, 17(6):634–653. <https://doi.org/10.1016/j.leaqua.2006.10.006>
- McCauley CD, Ruderman MN, Ohlott PJ and Morrow JE (1994) 'Assessing the developmental components of managerial jobs', *Journal of Applied Psychology*, 79(4):544–560. <https://doi.org/10.1037/0021-9010.79.4.544>
- McLennan J, Hayes P, Bearman C, Penney G, Butler PC and Flin R (2024) 'Training to improve emergency management decision-making: what the research literature tells us', *Australian Journal of Emergency Management*, 39(4):33–45. <https://doi.org/10.47389/39.4.33>
- McLennan J, Omodei M, Holgate A and Wearing A (2017) 'Human information processing aspects of effective emergency incident management decision making', in M Cook, J Noyes and Y Masakowski (Eds.), *Decision Making in Complex Environments*, (pp.143–150). CRC Press.
- McLennan J, Omodei MM and Wearing AJ (2001/2003) 'Cognitive processes of first-on-scene fire officers in command at emergency incidents as an analogue of small-unit command in peace support operations', in P. Essens, A. Vogelaar, E. Tanerkan, & W. Winslow (Eds.), *The human in command: Peace support operations*, (pp.312–332). Mets & Schilt.
- Penney G, Launder D, Cuthbertson J and Thompson MB (2022) 'Threat assessment, sense making, and critical decision-making in police, military, ambulance, and fire services', *Cognition, Technology and Work*, 24(3):423–439. <https://doi.org/10.1007/s10111-022-00694-3>
- Perona M, Rahman MA and O'Meara P (2019) 'Paramedic Judgement, Decision-Making and Cognitive Processing: A Review of the Literature', *Australasian Journal of Paramedicine*, 16:1–12. <https://doi.org/10.33151/ajp.16.586>
- Pescaroli G, Guida K, Reynolds J, Pulwarty RS, Linkov I and Alexander DE (2023) 'Managing systemic risk in emergency management, organizational resilience and climate change adaptation', *Disaster Prevention and Management: An International Journal*, 32(1):234–251. <https://doi.org/10.1108/DPM-08-2022-0179>
- Pine JC (2018) *Technology and Emergency Management* (2nd ed.). Wiley.
- Reale C, Salwei ME, Militello LG, Weinger MB, Burden A, Sushereba C, Torsher LC, Andreae MH, Gaba DM, Mclvor WR, Banerjee A, Slagle J and Anders S (2023) 'Decision-Making During High-Risk Events: A Systematic Literature Review', *Journal of Cognitive Engineering and Decision Making*, 17(2):188–212. <https://doi.org/10.1177/1555343422114>
- Sims Jr HP, Faraj S, Yun S and Pearce CL (2014) 'University of Maryland Shock Trauma Center rotates shared leadership in crisis situations depending on skill level and crisis severity', in CL Pearce, CS Manz and HP Sims Jr (Eds.), *Share Don't Take the Lead: Leadership Lessons From 21 Vanguard Organizations*, (pp.15–27). Information Age Publishing.
- Stanovich KE and West RF (2000) 'Advancing the rationality debate', *Behavioral and Brain Sciences*, 23(5):701–717. <https://doi.org/10.1017/S0140525X00623439>
- Steigenberger N, Lübcke T, Fiala H and Riebschläger A (2017) *Decision modes in complex task environments*. CRC Press.
- Taynor J, Klein G and Thordsen M (1990) *Distributed Decision Making in Wildland Firefighting: ARI Research Note 90-42 [Online]*. United States Army Research Institute for the Behavioral and Social Sciences archive website, accessed 16 November 2025.
- Tissington P and Watt F (2019) 'Decision-making: Inside the mind of the incident commander', in T. R. Evans & G. Steptoe-Warren (Eds.), *Applying Occupational Psychology in the Fire Service*. Springer.
- Ward S, Steptoe-Warren G and Rhys Evan T (2019) 'Assessing operational preparedness in incident commanders', in T. Rhys Evans & G. Steptoe-Warren (Eds.), *Applying Occupational Psychology to the Fire Service*, (pp.261–296). Palgrave MacMillan.
- Weinberg FJ and Scandura T (2024) 'Advancing the future of workplace development: integrative approaches to mentoring and coaching', *Journal of Managerial Psychology*, 39(6):832–843. <https://doi.org/10.1108/JMP-08-2024-717>

Woodman S, Bearman C and Hayes P (2021) 'Understanding skill decay and skill maintenance in first responders', *Australian Journal of Emergency Management*, 36(4):44–49. <https://doi.org/10.47389/36.4.44>

Zsombok CE (1997) 'Naturalistic decision making: where are we now?', in CE Zsombok and G Klein (Eds.) *Naturalistic Decision Making*, (pp.3–16). Erlbaum.

About the authors

Adjunct Professor Jim McLennan is with the La Trobe University School of Psychology and Public Health. He researches emergency management decision-making and training with emergency services agencies.

Associate Professor Chris Bearman is an associate professor of Cognitive Psychology at Central Queensland University in Australia, a Visiting Fellow at University of Central Lancashire in the United Kingdom and a volunteer firefighter in the South Australian Country Fire Service. He conducts research into decision-making and non-technical skills in emergency management, rail, aviation and space missions.

Dr Peter Hayes is a Research Fellow at the Appleton Institute at Central Queensland University. He conducts research in human factors and organisational psychology in the emergency management sector.

Dr Greg Drummond is a superintendent with DFES WA and an Adjunct Professor with the University of New South Wales. He specialises in critical thinking, managing uncertainty, emergency management and wildfire engineering.

Professor Rhona Flin is Professor of Industrial Psychology at Aberdeen Business School Robert Gordon University and Emeritus Professor of Applied Psychology at the University of Aberdeen, Scotland. Her research interests are in safety and non-technical skills in higher risk work settings.

Dr Philip C. Butler is a research associate in the Department of Psychology at the University of Liverpool and an honorary research associate of Cardiff University in the United Kingdom. A former lecturer and firefighter, he conducts research into decision-making and non-technical skills in emergency management.

Professionalism: the Australian Emergency Management Uniform Minimum Dataset

Peer reviewed

Dr Russell Dippy¹

ORCID: 0000-0001-7023-2489

1. Charles Sturt University,
Bathurst, New South Wales.

SUBMITTED

4 January 2026

ACCEPTED

23 February 2026

KEYWORDS

*emergency management,
professionalisation, body of
knowledge*

DOI

www.doi.org/10.47389/41.4.63



© 2026 by the authors.
License Australian Institute for
Disaster Resilience, Melbourne,
Australia. This is an open
source article distributed
under the terms and conditions
of the Creative Commons
Attribution (CC BY) licence
(<https://creativecommons.org/licenses/by/4.0>). Information
and links to references in this
paper are current at the time of
publication.

Introduction

Emergency events are a part of life and affect communities on an ongoing basis. For example, the Major Incidents Report (AIDR 2017, p.3) recorded 9 major incidents in 2016–17 but in the 2024–25 report that number had risen to 40 (AIDR 2025, p.1). This increasing number of emergency events affects individuals, communities and the environment in diverse ways. Thus, emergency managers, response managers and recovery managers must have the knowledge, skills and abilities required to ameliorate the effects of these events.

Emergency management in Australia is undergoing a process of professionalisation (Dippy 2022, p.72). Professionalisation of emergency management requires a range of activities to be undertaken including the building of extensive theoretical knowledge and legitimate expertise, application of a code of ethics, possession of an altruistic commitment to service and application of a level of autonomy (Peterson 1976, p.573; Yam 2004, p.979). Certification, education and training previously explored by Dippy (2020 p.56; 2022 p.68) form part of this process of professionalisation in Australia. This paper brings together aspects of previous work on professionalisation and proposes development of the Australian Emergency Management Uniform Minimum Dataset. The dataset is a framework to capture and record emergency event data in a form that can be used in future research and builds the body of knowledge required for professionalisation of emergency management in Australia.

Background

The research undertaken for this dataset development aimed to determine the human capacities of the emergency manager in Australia. In obtaining data for this research, a list of emergency events was required. From this list, inquiry reports were retrieved

Abstract

The professionalisation of emergency management in Australia is ongoing. Supporting that process is the development of a body of knowledge to support the new profession. The body of knowledge for emergency management requires that emergency events are recorded in a manner and format that supports ongoing learning and research. There is currently no agreed format or standard for the recording of emergency events in Australia. Emerging from research into the human capacities of an emergency manager in Australia is the concept of a minimum dataset that supports building the body of knowledge and supports future research. The Australian Emergency Management Uniform Minimum Dataset is proposed as a means of standardising the collection of data related to emergency events that occur in Australia. A standardised collection of data will allow for practitioners and researchers to identify and learn from past events and will support the professionalisation of emergency management practice.

(where possible) to allow analysis and to identify human capacities. During this collation of research data, the issue of emergency management event data standards arose. In short, there was no standard for the collection, collation and reporting of emergency events across Australia. The lack of a standard for data has been noted in other sectors and emergency management is not considered unique in this gap.

Emergency event data were located in a broad range of sources including academic and industry websites and published research. The information located was collated and examined to determine which emergency events would form the initial dataset for the research. The databases selected include Australian and international sources as there was no recognised Australian authoritative dataset. Each dataset was found to be unique with data fields designed to meet the needs of the owner. There was not a dataset available that met the professionalisation needs of emergency management. The databases identified were:

- Asian Disaster Reduction Centre (Asian Disaster Reduction Centre 2018)
- Australian Institute for Disaster Resilience Knowledge Hub (AIDR 2018)
- Insurance Council of Australia (Insurance Council of Australia 2018)
- Major Post-event Inquiries and Reviews: Review of Recommendations (Cole et al. 2017)
- The International Disaster Database (Centre for Research on the Epidemiology of Disasters 2019).

During analysis of the data, it was found there was duplication of events across databases and details of each event collected were unique based on the original purpose of the source database.

This paper presents the Australian Emergency Management Uniform Minimum Dataset that emerged upon completion of the analysis. The Australian Emergency Management Uniform Minimum Dataset brings together the range of concepts and definitions that emerged from the analysis into a single dataset that can be captured and collated to support the future development of underpinning information that supports emergency management professionalisation and research.

Research methodology

The underpinning research question examined ‘What human capacity demands should inform the development and appointment of an emergency manager?’. A 20-year period of emergency event inquiry reports was examined. To undertake the research a list of emergency events was required from which to obtain judicial and semi-judicial inquiry reports. The reports were analysed as part of the research.

Any research undertaken in emergency management is likely to be based in the first instance on a list of events that had occurred in Australia. Professionalisation of emergency management requires information as to the nature, scope and number of emergency events with a level of authority to support consistent ongoing learning and research. The research and ongoing learning aspects are only achieved if common data are collected alongside copies of the lessons management or other post-event reports. For the research conducted for this study, details of the human capacities of the emergency manager were required, however, other research needs may need other information. For this research, a single database had to be constructed as there was no single authoritative Australian database.

The collection, collation and analysis of the emergency events was undertaken using Microsoft Excel and pivot tables. The emergency event inquiry reports analysed for this research were all judicial or semi-judicial in nature. Judicial inquiries occur in a legal environment such as criminal or coronial courts. Semi-judicial inquiries, including royal commissions and formal legislated inquiries, have a legally enforceable requirement to answer questions and provide information. Judicial and semi-judicial inquiries are conducted for emergency events that have significant impacts upon communities, based in part on their complexity or consequences.

To retrieve the lists of emergency events, search criteria were applied to the databases identified. Search criteria included the terms ‘Australia’, ‘disaster’ and ‘emergency’ to collect the broadest range of potential information.

The initial collection of information provided 802 entries. Data collected for each identified emergency event included the name, date, location, type, inquiry type, internet URL and source database. That list of data fields was expanded to include details of any inquiry identified and if the report was located and retrieved. The initial 802 entries were categorised by emergency type and summarised. The emergency type for each event was determined by examining the event description. In some instances, an emergency can lead to multiple effects, for example, a cyclone can lead to flooding. In this case the original emergency type (the cyclone) was listed as the category. Any subsequent effects of that emergency (the flooding) were not used in the collated tables. The results of the categorisation and examination of the data collected are shown in Table 1.

In collating Table 1, the issue of dates of events became apparent. Emergency event dates were identified in many forms and included the date of onset of the emergency or a nominated arbitrary date during the event period. This showed that there was no apparent standard applied to the recorded date for an event.

Table 1: Initially collected Australian emergency events collated from multiple data sources 1 January 1997 to 31 December 2017.

Emergency type	Count
All-hazard	11
Bushfire	138
Criminal	5
Cyclone	181
Earthquake	7
Environment	12
Fire	15
Flood	148
Health	21
Industrial	28
Insect infestation	3
Landslide	4
Marine	6
Storm	169
Tornado	26
Transport	25
Tsunami	2
Terrorist	1
Total	802

Each entry was re-examined with a view to determine, as closely as possible, the start date of the event. After establishing a start date, it was observed that further refining of the dataset was required. In refining the data, further clarification of key words applied in the search process was required.

The originally applied search terms of 'disaster' and 'Australia' returned several results containing events that affected Australians but did not occur in Australia. These events included the Bali Bombing in 2005, the Samoa tsunami in 2009 as well as cyclones that had been named when they formed at sea and at a significant distance from Australia but did not subsequently make landfall on Australian coastlines. As the research question had sought events that occurred 'in' Australia, these external events were excluded from the final dataset.

The consolidated list contained 11 entries that related to inquiries conducted in Australia between January 1997 and December 2017. These inquiries were broad-ranging and examined emergency management issues in general. However, they had been undertaken because of a series of emergencies, not a specific emergency. These 11 broad-ranging inquiries were considered and retained in the dataset for further review as the data analysis progressed because their broad nature added to the richness of the data. They were coded as 'all hazards' in recognition of the breadth of issues examined.

The 11 all-hazard coded events are an important source of data for the emergency management body of knowledge. They are retained in the data and included in the proposed

Australian Emergency Management Uniform Minimum Dataset in a manner that recognises and differentiates the data for future research and learning.

The initial result of 802 emergency events between January 1997 and December 2017 may seem a large number. The inclusion of insect infestation and criminal acts may be surprising. However, the number and content are symptomatic of the underlying issue of emergency management not being classified as a profession, evidenced by the lack of consistency of data-recording. Thus, the many processes applied to the data are a result of having no agreed data collection nor recording rules for emergency management. It is possible that any emergency event can be reported as an emergency or a disaster because the definitions of those terms are not agreed nor applied uniformly across Australia. Dates are also not accurately applied and databases do not apply consistent criteria.

As a result of this first refinement of the data, the total number of events for analysis reduced from the initial 802 to 706. Many of the data sources had duplicate events because of the way their dates were recorded (e.g. only recording events by month and year or using different dates) or because of different names used to describe the same event. Each entry was examined and a single date applied for each event.

The next review of the data considered the description of each event and more duplicate entries were identified. These duplicates were marked and subject to 2 rounds of checking before being removed from the data. As a result of the identification of duplicates, the number of event entries for consideration in the research further reduced from 706 to 457 events, summarised in Table 2.

A body of knowledge is identified as fundamental to the recognition of a profession (Green and Gates 2014, p.80; Jensen and Kirkpatrick 2022, p.427; Trofymowych 2007, p.430). For emergency management, part of the required body of knowledge is a definitive list of events that could be referred to by emergency managers. Tables 1 and 2 highlight the lack of a body of knowledge in emergency management as there is not a definitive list of emergency events available for use. A definitive list would include standard data fields, agreed inclusion criteria and definitions and other data such as copies of inquiry reports. As emergency management is not yet a profession, there is no central body to decide on criteria for how to classify an emergency or a disaster. While some work is underway and some groups and organisations are collating data, a definitive list has not been agreed. While some local and international databases were identified, there is no agreement about the data fields required or information collected. This research developed a list of data fields to collate and examine the data in support of the research question.

Table 2: Entries after duplicate events were removed from the initial dataset for the period 1 January 1997 to 31 December 2017.

Emergency type	Count
All-hazard	11
Bushfire	66
Criminal	2
Cyclone	79
Earthquake	4
Environment	11
Fire	8
Flood	100
Health	12
Industrial	19
Insect infestation	2
Landslide	2
Marine	4
Storm	98
Tornado	21
Transport	17
Terrorist	1
Total	457

The 457 events (see Table 2) did not include details of any emergency event inquiry reports produced. Further searches were conducted to identify and locate inquiries that had been conducted in relation to the event. The lists of data, inquiries and research papers used in the development of Table 1 formed the first potential source of inquiry information and locations. From these data sources some inquiries were retrieved; others were located from internet searches. Each inquiry located was downloaded for further examination.

For this process, no criteria were applied to the type of inquiry. The aim was to identify and locate any inquiry that had been conducted for each emergency event in the

data. As a result, 157 events were identified as having had an inquiry conducted that could be located and retrieved. Once located, the inquiry type was noted in the database. The results are shown in Table 3.

For this study, the focus was on judicial and semi-judicial emergency event inquiry reports. The 157 events (see Table 3) with inquiries located were reviewed to identify those that had been subject to a judicial or semi-judicial inquiry. Judicial or semi-judicial inquiry reports were required for this research due to their greater level of rigour. Judicial inquiries were clearly identifiable as they are led by judicial officers and were predominantly part of royal commissions, trials and coronial inquests. Semi-judicial inquiries are those where there is a requirement to answer questions or provide information, but these are not conducted within a court-type process. Semi-judicial inquiries are not always led by judicial officers; the range of inquirers is broader and the legislative support for the activity is varied.

Application of the semi-judicial inquiry definition removed internally conducted inquiries where a staff member or consultant conducted an internal review. The internally conducted inquiries and reviews may not have had the same level of rigour applied to the investigation as an externally conducted, independently led inquiry.

Examination of inquiries reduced the events from 157 to 63 events for inclusion in the research. The final 63 included 9 of the 11 previously identified non-incident-specific (all-hazards) inquiries. The remaining inquiry types spanned a range of inquiry types, thus giving a breadth of data to inform the research. The updated list with those 63 inquiries categorised is presented in Table 4.

The final 63 events were reviewed and grouped according to the state or territory jurisdiction in which they occurred. All states and territories were represented in the final

Table 3: Emergency events identified that had an inquiry conducted.

Emergency type	Agency	Independent	Parliamentary	Royal Commission	Trial	Coronial	Total
All-hazard		9	2				11
Bushfire	1	29	9	1		6	46
Criminal					2		2
Cyclone	1	38					39
Earthquake		1					1
Environment		1					1
Fire		1				4	5
Flood		30	2				32
Industrial		3	2	1		3	9
Landslide						1	1
Marine						1	1
Storm	1	5					6
Transport		1				1	2
Terrorist						1	1
Total	3	118	15	2	2	17	157

Table 4: Emergency events subject to judicial or semi-judicial inquiry.

Emergency type	Independent	Parliamentary	Royal Commission	Trial	Coronial	Total
All-hazard	7	2				9
Bushfire	11	9	1		6	27
Criminal				1		1
Cyclone	2					2
Environment	1					1
Fire	1				4	5
Flood	3	2				5
Industrial	2	2	1		3	8
Landslide					1	1
Marine					1	1
Storm	1					1
Transport					1	1
Terrorist					1	1
Total	28	15	2	1	17	63

dataset with only one event from each of the Northern Territory and the Australian Capital Territory. The largest number of inquiries were held in Victoria. The range of emergency events ensured a broad range of data to inform the research. The results of the jurisdiction-based analysis are shown in Table 5.

During data collection, total deaths were captured as this could trigger a judicial or semi-judicial review. A coronial review, for example, is usually only conducted where deaths occur. The 63 events included 485 deaths. As such, deaths could be considered for inclusion in the minimum dataset and included in the emergency management body of knowledge because deaths trigger inquiries.

Some events were subject to multiple inquiries. For example, the Melbourne thunderstorm asthma event in 2016 was subject to an Inspector-General inquiry and coronial inquests for each death. This resulted in 88 inquiries being captured for examination in the research.

The lack of consistent definitions, dates, incident or emergency event naming and an authoritative database of emergency event inquiries shows the lack of a consolidated body of emergency management knowledge.

Ethics

This research received approval from the Charles Sturt University Human Research Ethics Committee, approval #H19294.

Findings

The Australian Emergency Management Uniform Minimum Dataset has been developed to address the gap identified in collating and providing data to support this and future research into emergency events in Australia. The dataset is proposed to contain a standard set of data fields. The dataset will be able to be collated

Table 5: Emergency events for examination broken down by jurisdiction.

Emergency type	ACT	Aus Gov	NSW	NT	Qld	SA	TAS	Vic	WA	Total
All-hazard		1	1		2	1		2	2	9
Bushfire	1	3	3		3	1	3	7	6	27
Criminal								1		1
Cyclone					2					2
Environment									1	1
Fire					3		1	1		5
Flood					1			4		5
Industrial			2	1				3	2	8
Landslide			1							1
Marine			1							1
Storm								1		1
Transport					1					1
Terrorist			1							1
Total	1	4	9	1	12	2	4	19	11	63

Note: ACT (Australian Capital Territory), Aus Gov (Australian Government), NSW (New South Wales), NT (Northern Territory), Qld (Queensland), SA (South Australia), Vic (Victoria) and WA (Western Australia).

as a single page addendum to future emergency event inquiry reports to support the collection and collation of consistent data suitable for ongoing continual improvement and research functions.

The data fields recommended for inclusion in the dataset include those required to provide for consistency in event naming conventions, start dates (and finish dates where appropriate), location details, deaths and injuries, details of lead and recovery agencies, inquiries undertaken and the location of the inquiry reports. Table 6 shows the Australian Emergency Management Uniform Minimum Dataset fields and descriptions. A table format is used to allow collation of the required data by removing the description field and replacing it with the required data once collected.

Discussion

This study showed that the total content of the body of knowledge for emergency management is not yet agreed.

However, one aspect of that body of knowledge is the ability to determine the happenings that are being referred to when describing emergency events. The Australian Emergency Event Uniform Minimum Dataset provides an initial standard that can be discussed and agreed across the emerging profession that will support the standardised collection of data to support future lessons management and research.

The need for a uniform minimum dataset

Several reasons for the Australian Emergency Management Uniform Minimum Dataset arose during the research. Firstly, there is no agreed source of information for emergency events in Australia. This research identified multiple lists of emergency events. The multiple lists are held by different organisations with no agreed organisation or repository holding a 'master list'. There may be further lists in existence across various emergency management stakeholders and researchers that were not identified in this research. The lack of a consistent list of events

Table 6: Australian Emergency Management Uniform Minimum Dataset fields and descriptions.

Field	Description
Event type	Used to describe the event type. Where multiple event types arise, the primary causal event should be listed in line with the description used by the Control Agency naming convention. A single primary event type should be used. Event types should be selected from either Fire (Urban), Fire (Rural), Flood (Riverine), Flood (Dam Break), Storm (including severe wind, rain events and associated storm surges), Cyclone, Drought, Earthquake, Landslide/Landslip, Tsunami, Thunderstorm Asthma, Transport Accident (including Road, Rail, Air), Deliberate Events (including criminal acts and terrorism events), Cyber (including communications system failures), Technology or Infrastructure (including statewide blackouts, water system failures), Primary Industry (including animal and plant disease, marine events), Health (including all forms of human disease outbreak), Industrial Accident, Hazardous Materials. If the emergency is a multi-event or multi-hazard review then an event type should be chosen to reflect this or be listed as All-Hazards.
Secondary consequences	Used to describe the secondary consequences arising from the primary event. Secondary consequences could include Fire (Urban), Fire (Rural), Flood (Riverine), Flood (Dam Break), Storm (including severe wind and rain events), Cyclone, Earthquake, Landslide/Landslip, Tsunami, Thunderstorm Asthma, Transport Accident (including Road, Rail, Air), Deliberate Events (including criminal acts and terrorism events), Cyber (including communications system failures), Technology or Infrastructure (including statewide blackouts, water system failures) Primary Industry (including animal and plant disease, marine events), Health (including all forms of human disease outbreak), Industrial Accident, Hazardous Materials.
Event name	The name of the event as applied by the Control Agency.
Start date	The start date as nominated by the Control Agency.
Start time	The start time as nominated by the Control Agency (*where known).
Control agency	The agency or organisation that had the primary role to control the response to the event.
Location	The start location and extent of the event. This may be a street address and may include an area affected via size or description.
Deaths	Any known deaths as reported by the Jurisdictional Police agency.
Injuries	Injuries that required transport to a health facility/hospital (*details of subsequent admissions to hospitals or treatments are not required).
Property damage	A summary of the damage caused by the emergency event (e.g. the number of homes and business premises destroyed or affected).
Other losses	Describes the nature and value of other related losses (e.g. environmental, business operations, infrastructure and social capital assets with reported insured loss value).
Level of response	Describes if the event was managed at a local, regional or state level by the Control Agency.
Level of recovery	Describes if the event recovery was managed at a local, regional or state level.
Lessons process	Describes the type of lessons management process undertaken (internal debrief, internal lessons management process, external independent report, judicial or semi-judicial inquiry).
Lessons process location	Describes if the outcomes of the lessons process are available and the location (URL) or contact point.

constrains the ability to identify opportunities for learning from previous events. As stated by Santayana (2009), 'if you cannot remember the past, you are condemned to repeat it'.

Secondly, from the lists identified, there was no information consistency in the data held for each event. Where some data field names were consistent, the content of that field was not. The analysis noted many events with similar but inconsistent names for the emergency. The analysis noted that some events were listed in different databases with different start dates. Some events were listed in the databases even though they did not affect Australians. A database that included international emergency events affecting Australia would be considerably larger and harder to maintain.

Continual learning is supported by lessons management. A lessons management process is documented in the Lessons Management handbook (AIDR 2019). The handbook provides a standardised means of undertaking and documenting lessons management processes such that changes to policy, education, community resilience, response and recovery operations can be enacted. However, the existence of those lessons process outcomes is not listed nor recorded. The location of the reports is not shared. An Australian Emergency Management Uniform Minimum Dataset will provide a means of recording the lessons process (including internal reviews) and, more importantly, the location of the documented process. This study identified that the availability of reports of lessons processes was not uniformly available. Only 151 reports were able to be located for 457 events.

The uniform fields

The Australian Emergency Management Uniform Minimum Dataset (Table 6) proposes a set of uniform fields to be collected by agencies and organisations that report on emergency and disaster events. The data fields contain a description that should allow for uniform data capture to occur. The provision of a table allows the initial development of a uniform list of emergency events. The information required in the minimum dataset can be obtained at the time of the event; however, its recording and sharing as part of emergency event reports will allow for further information generated to be linked to the one defined event. Further event information that may arise over time includes insurance, environmental, social and other recovery information that is developed and collected after the event. This data may be collected into a supplementary set of data in future iterations of the dataset.

Implementation of the Australian Emergency Management Uniform Minimum Dataset requires a range of actions in practitioner, inquiry author and academic environments. Practitioner engagement is required to share the model and collaborate to develop understanding and acceptance.

Inquiry event authors, including Inspectors-General of emergency management, Natural Hazards Research Australia and Australian state and territory coroners and those undertaking inquiries such as royal commissioners will require separate engagement. Other bodies such as the National Emergency Management Agency, AIDR and AFAC (Australasian Fire and Emergency Services Authorities Council) are key organisations that must support implementation. Authors of the inquiry reports will require consultation to seek support for the regular publishing of the minimum dataset as an appendix to their work.

Academic involvement includes research, publishing of journal articles, national and international conference presentations and incorporating ongoing feedback. The academic community would be a large user of the information contained within the dataset. Engagement by academia with agencies, organisations and event inquiry authors will support the collation and publication of the information in the standardised table.

Foreseeable issues and roadblocks

The lack of profession status means there is no clear path or model to develop the underpinning knowledge required. The implementation of the Australian Emergency Management Uniform Minimum Dataset may face the same issues and roadblocks as other emerging changes to the sector. Issues such as inertia and the lack of understanding of the dataset or its need may arise. Some agencies or inquiry authors may not support the change in their reporting practices. Tertiary education models will need to support this work. These roadblocks and issues are not unique to this potential model and have been described by Dippy (2025a, 2025b).

Champions can support the pre-identification of potential road blocks and issues and identify options to address them. Champions can support the pre-identification of potential issues and identify options to address those issues. Champions can advocate for the dataset in their respective areas of work. The work of the champions is not separate from, but integral to the ongoing professionalisation of emergency management in Australia.

The Australian Emergency Management Uniform Minimum Dataset can be a catalyst to accelerate the work of professionalisation. The ability to 'sell' the dataset to practitioners, inquiry event authors and academics is key to both implementation of the dataset and the journey towards professionalisation that emergency management is undergoing.

Conclusion

This paper examined the issue of data consistency that arose during research into the human capacities of the Australian emergency manager. The broader research

identified that there was no central database of emergency events that is collated across Australia. The databases that did exist contained inconsistent data entries that did not allow for a single, consistent and coherent list of Australian emergency events to be collated and shared.

This paper proposes an Australian Emergency Management Uniform Minimum Dataset to allow the uniform collection and collation of emergency and disaster event information. A uniform dataset will provide consistent, contemporary data to support improvements in practice and the development of the emergency managers, response managers, recovery managers and practitioners in the emergency management sector.

Proposed development activities supporting the dataset require agreement of practitioners, authors and academics and possible changes to databases that hold this important information.

The Australian Emergency Management Uniform Minimum Dataset supports the passage to professionalisation and will require work for implementation across practitioners, inquiry authors, policy makers and academia. The implementation work required can be undertaken in parallel to other professionalisation actions underway.

Acknowledgements

The author acknowledges academic supervisors at Charles Sturt University, Associate Professor Valerie Ingham and Dr Ann Lazarsfeld-Jensen for their support. Also acknowledged are colleagues and anonymous peer reviewers who enhanced this paper with comments and feedback.

References

- Asian Disaster Reduction Centre (2018) *GLIDeNumber* [Online]. GLIDeNumber.
- AIDR (Australian Institute for Disaster Resilience) (2017) *Major Incidents of the Year 2016-2017* [PDF]. AIDR website.
- AIDR (Australian Institute for Disaster Resilience) (2018) *Australian disasters* [Online]. AIDR website, accessed 16 July 2018.
- AIDR (Australian Institute for Disaster Resilience) (2019) *Lessons Management* [PDF].
- AIDR (Australian Institute for Disaster Resilience) (2025) *Major Incidents Report 2024-25* [PDF]. AIDR website.
- Centre for Research on the Epidemiology of Disasters (2019) *The International Disaster Database* [Online]. University Catholique de Louvain website, accessed 6 April 2024.
- Cole L, Dovers S, Eburn M and Gough M (2017) *Major post-event inquiries and reviews: Review of recommendations* [Online]. UNDRR website, accessed 6 April 2024
- Dippy R (2020) 'Professionalism: Certification for emergency management leaders' [PDF]. *Australian Journal of Emergency Management*, 35(4):56–60.
- Dippy R (2022) 'Professionalism: Education and training for emergency management leaders', *Australian Journal of Emergency Management*, 37(2):68–73. <https://doi.org/10.47389/37.2.68>
- Dippy R (2025a) 'Professionalism: application of the concept of disciplinarity to emergency management', *Australian Journal of Emergency Management*, 40(3):6–16. <https://doi.org/www.doi.org/10.47389/40.3.06>
- Dippy R (2025b) 'Professionalism: defining the Emergency Manager, Response Manager and Recovery Manager', *Australian Journal of Emergency Management*, 40(1):66–74. <https://doi.org/doi.org/10.47389/40.1.66>
- Green T and Gates A (2014) Understanding the process of professionalisation in the police organisation', *The Police Journal: Theory, Practice & Principles*, 87(2):75–91. <https://doi.org/http://dx.doi.org/10.1350/pojo.2014.87.2.662>
- Insurance Council of Australia (2018) Data hub [Online]. ICA website, accessed 6 April 2024. <https://insurancecouncil.com.au/industry-members/data-hub>
- Jensen J and Kirkpatrick S (2022) 'Local emergency management and comprehensive emergency management (CEM): A discussion prompted by interviews with chief resilience officers', *International Journal of Disaster Risk Reduction*, 79:1–13. <https://doi.org/10.1016/j.ijdr.2022.103136>
- Peterson DR (1976) 'Is psychology a profession?', *American Psychologist*, 31(8):572–581. <https://doi.org/10.1037/0003-066X.31.8.572>
- Santayana G (2009) *The Life of Reason; Or, the Phases of Human Progress*. BiblioBazaar, LLC.
- Trofymowych D (2007) 'Police education past and present: Perceptions of Australian police managers and academics' [Online], *The Flinders Journal of Law Reform*, 10(3):419–433.
- Yam B (2004) 'From vocation to profession: The quest for professionalization of nursing', *British Journal of Nursing*, 13(16):978–982. <https://doi.org/10.12968/bjon.2004.13.16.15974>

About the author

Dr Russell Dippy is an Adjunct Associate Professor with Charles Sturt University. He is also an associate with Natural Hazards Research Australia. He is a senior practitioner in emergency management with interests in the human capacities of managers and the professionalisation of emergency management in Australia.

Building the skills of multilingual community connectors: strengthening emergency communications in regional Victoria

Rachel Leigh Taylor^{1,2} 

ORCID: 0009-0000-3827-6131

Sue Sheldrick²

Josie Matthiesson³

Dr Leah Gerber¹ 

ORCID: 0000-0001-7495-0381

Liz Frazer²

1. Monash University

2. Victoria State Emergency Service

3. Bureau of Meteorology

Abstract

Equitable access to emergency information is essential for reducing risks and minimising disaster impacts for non-English speaking and culturally diverse communities. Migrant and refugee groups often rely on trusted sources within their personal and cultural networks to receive, interpret and share critical information during emergencies. This report documents a 'Translating and Interpreting in Disasters' workshop, delivered in regional Victoria in 2025 to exemplify how hazard and response agencies are leveraging existing networks to amplify emergency communications and support multilingual and culturally diverse communities.

We discuss the complex barriers faced by regional multicultural populations during disasters, and emphasise the central role of community connectors in amplifying official communications. This report aims to highlight the importance of ongoing agency community engagement and targeted training to strengthen resilience and improve disaster outcomes for regional communities. Recommendations are provided to inform future practice, support inclusive emergency management practices and foster sustainable community resilience.

Introduction

Multicultural and linguistically diverse communities often face greater risks during emergencies due to language barriers, limited awareness of local hazards and unfamiliarity with emergency management processes (O'Brien and Federici, 2020; Ogie et al. 2018;

Xiang et al. 2021). Recurring disasters including floods, bushfires and the COVID-19 pandemic, have all illustrated the longitudinal challenges in ensuring equitable access to information for multicultural communities in regional Victoria (Ajak et al. 2024; Ethnic Communities' Council of Victoria (ECCV) et al. 2023). Community feedback from these events raised critical concerns about the effectiveness of emergency communication approaches and resources (Wild et al. 2021).

Empirical studies have evidenced the preference of migrant and refugee communities to rely on personal, trusted sources, such as friends, neighbours, community leaders and bilingual community members, for emergency information (Ajak et al. 2024; Atkinson 2023; Ogie et al. 2018; Piller et al. 2020). Information is commonly disseminated through established personal and cultural networks via verbal communication, telephone contact, or digital messaging platforms (ECCV et al. 2023). These 'community connectors' (Ajak et al. 2024) operate as 'bridges' to connect with those who are otherwise hard to reach through traditional emergency communication channels (Wallace et al. 2019). Community connectors play a pivotal role, not just in the provision of translated information, but also through contextualising advice, building community confidence and, through this, enabling safer and better-informed decision-making (ECCV et al. 2023). Through these informal networks, community connectors can positively influence preparedness, response and recovery efforts in migrant and refugee communities (Ajak et al. 2024; Atkinson 2023; Piller et al. 2020).

Background: the role of community connectors during the 2022 Shepparton Floods

The Greater Shepparton region was significantly impacted by flooding in October 2022 (Victoria State Emergency Service (VICSES 2023). Approximately 900 houses were inundated by floodwater, and close to 10% of these properties were partially or completely destroyed or deemed uninhabitable, causing long-term displacement amongst the local population (VICSES 2023). The Greater Shepparton region is culturally and linguistically diverse (Greater Shepparton City Council n.d.) with more than 17% of the region's population speaking a language other than English at home (Bureau of Statistics 2021). However, flood warnings before and during the event were only available in English, and this created considerable challenges for diverse community groups in accessing, understanding and using the information provided by official emergency channels (ECCV et al. 2023). Newly arrived individuals were found to experience unique hardships during the event and reported significant fear and anxiety caused by being trapped in, or surrounded by, rising floodwaters, and not knowing about evacuation arrangements or how to contact authorities for help (ECCV et al. 2023).

The 2022 floods in regional Victoria demonstrated the important role that community connectors play in bridging communication gaps. The ECCV report highlights that during the Shepparton floods, newly arrived individuals and multicultural groups depended heavily on multicultural community leaders and community connectors for interpreted emergency information and guidance (2023). By leveraging their established relationships within language and ethnic communities, community connectors advocated for safe evacuations and access to culturally appropriate support services, directly improving disaster outcomes for vulnerable populations (ECCV et al. 2023). A group of local individuals, having played a crucial role during the disaster, advocated for improved access to training and support in translation and interpreting (T&I) to help them perform these functions more effectively, and professionally. In response to this need, Monash University, funded by Emergency Recovery Victoria (ERV) and the Greater Shepparton City Council (GSCC), developed the Monash University T&I Training Package. One of the workshops within the broader training package focused specifically on translating and interpreting during emergency events.

This report examines the 'Translating and Interpreting in Disasters' workshop delivered in Shepparton, Victoria in June 2025 as part of the broader Monash University T&I Training Package. The workshop trained local community connectors on how to access, navigate and understand critical information contained in official emergency

communications. We first provide background context to the development of the training workshop and detail the training workshop activities. We also share learnings from the workshop, including agency recommendations on ways to capitalise on community connections in diverse regional communities to support community response capability, and enhance local disaster resilience.

'Translating and Interpreting in Disasters': a community-based training workshop

The 'Translating and Interpreting in Disasters' workshop, was collaboratively facilitated by the Monash T&I program, the Australian Bureau of Meteorology (the Bureau) and Victoria State Emergency Service (VICSES). It brought together experts in meteorology, emergency management, translation practice and intercultural communication. The workshop was attended by a cross-section of community members, representing diverse cultural and linguistic groups. The workshop began with a presentation about flood risks in the local area, and an open forum discussion about participants' previous experiences of local hazards or emergency events. Participants described previous emergency events including the 2022 floods and the COVID-19 pandemic and talked about how they distributed information by simplifying and translating information from the TV or radio into short snippets to send to community members. Through these actions, community connectors demonstrated how they promoted public understanding and community safety – confirming the crucial role they play in disseminating emergency information.

A meteorologist from the Bureau presented technical weather terminology and defined concepts commonly used by the Bureau to describe weather patterns (e.g. riverine or flash flooding) or to explain predicted impacts (e.g. damaging winds or moderate flooding). Weather specific glossaries were provided to participants to note down their own definitions and translations for weather specific terminology. Participants then worked collaboratively in their language groups to complete a practice translation of a major flood warning issued by the Bureau (Figure 1), putting their new knowledge into practice. They worked in small groups to translate the sample flood warning into their own language or dialect. Participants discussed how best to convey messages and how to translate non-equivalent concepts, especially in cases where the use of specialist terms required an explanation in English in addition to a translation to aid comprehension.

VICSES staff and volunteers, including Level 2 and 3 Public Information Officers (PIO) with first-hand experience of constructing public information and warnings for regional communities across Victoria, facilitated a session focused

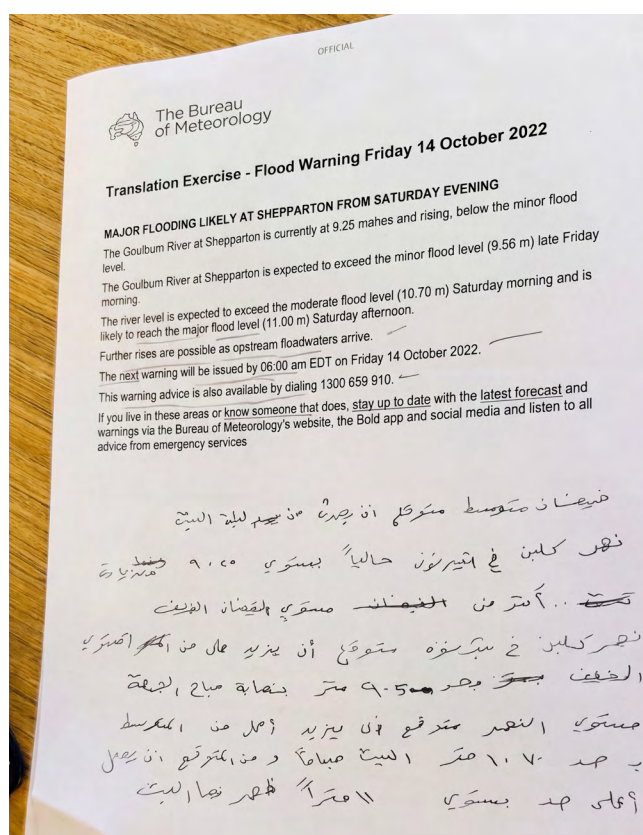


Figure 1: Example translation of a major flood warning completed by a participant in the 'Translating and Interpreting in Disasters' workshop.

Image: Bureau of Meteorology

on the recently introduced Australian Warning System (AWS). The AWS provides a nationally consistent approach to communicating public information and warnings and contains clear and practical action statements telling people what they should do (Australian Institute for Disaster Resilience n.d.). Facilitators explained how the use of colours, symbols and levels can guide understanding of information in a more visual and simplified way. Feedback from workshop participants was particularly positive, highlighting the need for further public education to enhance understanding of common terms and icons.

Participants also learned how to navigate the VicEmergency website to find localised information (Figure 2).

VicEmergency is the state's central point for the distribution of coordinated information and warnings and provides a live map of incidents including storms, floods and fires across the state (Emergency Management Victoria n.d.). A key message emphasised during the session was the necessity of using the VicEmergency hotline, website or smartphone app as the central information and warnings platform for all emergency types across Victoria.

Authentic examples of warnings that were issued through VicEmergency during the 2022 flooding event in the Greater

Shepparton region were shown to participants to provide contextualised learning materials to engage with. Working in small groups, supported by the Bureau and VICSES representatives, participants navigated these resources to locate the critical information, including identifying locations likely to be impacted, understanding specific precautionary advice from authorities, and determining the key pieces of information in a warning that are the most critical to communicate to other community members both before and during emergencies. After the session, participants reported feeling more confident in navigating the VicEmergency website for locally relevant information.

Agency learnings

The workshop provided an important platform, allowing community members to share perspectives and experiences of emergency communication practices and products directly with the responsible agencies. Agencies benefited from the engagement activity, gaining insights to inform service improvements and promote adaptive and more accessible communication strategies. Key takeaways for VICSES included a deeper understanding of which specific terms and concepts, frequently used in emergency warnings, are difficult to translate for certain language groups. VICSES staff also noted the importance of focusing on capacity development, to promote greater understanding of commonly used emergency management terminology. For the Bureau, benefits included a greater appreciation for engaging through existing community networks and how train-the-trainer methodologies can be used to foster community capability.

Participants contributed valuable suggestions:

- Engaging with community members across all levels, extending beyond formally recognised leaders, to ensure broad and inclusive participation.
- Maintaining ongoing partnerships with community connectors to foster trust and responsiveness to emerging community needs.
- Developing linguistic capacity within the community by disseminating accessible resources including glossaries and visual aids which are adapted for the needs of diverse audiences (e.g. digital glossaries).
- Providing ongoing education and support to empower community members in effectively accessing and using official emergency information resources, including centralised communication channels, such as national/regional websites, apps and hotlines.
- Prioritising capacity-building initiatives that draw upon and enhance participants' existing experiences, skills and knowledge.
- Adopting interactive training formats that encourage active participation among community members.



Figure 2: VICSES staff and volunteers demonstrating how to navigate and utilise the VicEmergency website.

Image: Bureau of Meteorology

Advocates have emphasised the importance of developing more effective and ongoing communication and participatory relationships between multicultural communities and emergency management agencies (AIDR 2020; ECCV 2021). Establishing and maintaining partnerships with community leaders and connectors supports timely communication and can build trust between emergency response agencies and the wider community (Duckworth 2022). Additionally, this approach acknowledges the needs and resources that local communities have that can reduce the impacts of disasters (Ma et al. 2023). Recognising and harnessing these community skillsets is paramount for providing more effective and equitable disaster outcomes and promoting greater resilience among diverse groups (ECCV et al. 2023).

Agencies involved in the workshop have committed to using insights from the workshop to guide further engagement and capacity development across Victoria's regional communities. The Bureau is building ongoing relationships with key partners who connect with and represent multicultural communities around Australia. Through initiatives including the Community Preparedness Program, the Bureau is collaborating with emergency management agencies and community organisations to share knowledge and build capacity with multicultural communities nationally. The aim is to enhance the accessibility and effectiveness of Bureau products and services – ensuring they reach all Australians, are clearly understood and support safe decision-making during severe weather events.

Conclusion

The Translating and Interpreting in Disasters workshop, alongside the broader Monash University T&I training program, is expected to enhance the capacity of local multicultural individuals to support others within their cultural and linguistic networks who may be at higher risk during disasters. Community engagement initiatives and resilience-building opportunities such as this are crucial to ensuring non-English speaking individuals and communities have equitable access to emergency information and warnings. By specifically targeting those who serve as community connectors, agencies can improve the accuracy of information relayed during emergency events, build relationships and reinforce trust and public confidence in official communications. Sustained investment of both time and money in community-led interventions is imperative for building robust and inclusive disaster management systems.

References

- AIDR (2020) *Community Engagement for Disaster Resilience*. https://knowledge.aidr.org.au/media/7989/aidr_handbookcollection_communityengagementfordisasterresilience_2020.pdf
- Ajak T, Cameron S, Seumanutafa-Palala R and Steenvoorden, K (2024) Communities and agencies working together: the Multicultural Emergency Management Partnership. *Australian Journal of Emergency Management*, 39(3):106–108

Atkinson S (2023) How does information really flow in communities during a natural disaster? *Australian Journal of Emergency Management*, 38(4):6–8

Australian Institute of Disaster Resilience (n.d.) Australian Warning System website www.australianwarningsystem.com.au, accessed 11 November 2025

Bureau of Statistics (2021) *Greater Shepparton 2021, Census All persons QuickStats*. www.abs.gov.au/census/find-census-data/quickstats/2021/LGA22830

Duckworth M (2022) Just add trust: implementing diversity and inclusion in emergency management, *Australian Journal of Emergency Management*, 37(1):18–20.

Emergency Management Victoria (n.d.) Incidents and Warnings [Homepage]. Emergency Management Victoria website <http://emergency.vic.gov.au/respond>, accessed 11 November 2025

Ethnic Communities' Council of Victoria (2021) Multicultural Emergency Management Partnership. <https://eccv.org.au/projects/emergency-management/multicultural-emergency-management-partnership/>; <https://eccv.org.au/projects/emergency-management/multicultural-emergency-management-partnership>

Ethnic Communities' Council of Victoria, Neighbourhood Collective Australia and Regional Victorians of Colour (2023) Multicultural Communities Experience of the 2022 Victorian Floods. <https://eccv.org.au/wp-content/uploads/2023/09/Multicultural-Communities-Experience-of-the-2022-Victorian-Floods.pdf>

Greater Shepparton City Council (n.d.) Multicultural Communities of Greater Shepparton. Greater Shepparton City Council website <https://greatershepparton.com.au/community/diversity/multicultural-communities>

Ma C, Qirui C and Lv Y (2023) "One community at a time": promoting community resilience in the face of natural hazards and public health challenges. *BMC Public Health*, 23(1):2510 <https://doi.org/10.1186/s12889-023-17458-x>

O'Brien S and Federici FM (2020) Crisis translation: considering language needs in multilingual disaster settings. *Disaster Prevention and Management*, 29(2):129–143. <https://doi.org/10.1108/DPM-11-2018-0373>

Ogie R, Rho JC, Clarke RJ and Moore A (2018) Disaster risk communication in culturally and linguistically diverse communities: the role of technology. *Proceedings*, 2(19):1256 <https://doi.org/10.3390/proceedings2191256>

Piller I, Zhang J and Li J (2020) Linguistic diversity in a time of crisis: language challenges of the COVID-19 pandemic. *Multilingua*, 39(5):503–515. <https://doi.org/10.1515/multi-2020-0136>

Victoria State Emergency Service (VICSES) (2023) *Shepparton, Mooroopna & Kialla Local Flood Guide*. www.ses.vic.gov.au/documents/8655930/9320184

About the authors

Rachel Leigh Taylor is a PhD Teaching Fellow at Monash University researching best practice in intercultural crisis communication, and a volunteer with VICSES.

Sue Sheldrick, as a level 3 multiagency Public Information Officer, was significantly involved with the October 2022 floods.

Josie Matthiesson has worked with the Bureau of Meteorology's Community Engagement team from 2022 to 2026 in the NT and Victoria. She is currently working with Emergency Management Victoria.

Dr Leah Gerber is a Senior Lecturer in translation and interpreting studies.

Liz Frazer specialises in community engagement and emergency preparedness across the Goulburn and Broken River catchments.

The Nature-led Community Resilience Toolkit: including people and nature in emergency management

Kate Lee¹

Amanda Lamont²

Lily van Eeden³

Craig Whiteford⁴

Fern Hames³

1. Department of Energy, Environment and Climate Action

2. Arthur Rylah Institute

3. RMIT University

4. Zoos Victoria

Introduction

Societies internationally are recognising the urgent need for radical transformation in our relationships with nature. Our natural world is changing rapidly and increasing severity and frequency of disasters are affecting communities globally. Evidence and insights from Australia and around the world highlight the critical role of nature in supporting spiritual, emotional, physical and psychosocial recovery after disasters.

The Australian-first Nature-led Community Resilience (NLCR) Toolkit (Lee et al. 2024a) and Story Library (Lee et al. 2024b), draws on the reciprocal connecting and healing of people and nature in recovering from disasters, incorporating nature-based initiatives into disaster resilience. It reinforces community values and leadership capabilities, fostering community participation through volunteering and enhancing local understanding of disaster risks and resilience-building measures for nature. It supports communities to identify, understand, and take meaningful, informed and collaborative action in realising their responsibility as custodians of local natural environments.

A nature and community-led approach to disaster resilience

Activities that enable more effective and sustainable disaster recovery for humans and nature are increasingly being sought by disaster managers, environmental organisations and community groups. NLCR has an important role to play to support disaster recovery and resilience activities, by helping people and nature recover together and build resilience in disasters. This is because disasters can impact people in many and varied ways: physically, financially and psychosocially (e.g., fear, loss, change) (Quinn et al. 2021).

The impact of disasters on nature can also cause trauma to people through a sense of loss of their familiar natural environment and surroundings and agency and control in how they connect with it. Changes in nature not only affect the local community but are far more wide-reaching, because these changes can affect people from far away, even people who have never been to the impacted area. This means that nature recovery, too, can have wide-reaching benefits (Block et al. 2019).

Disasters can have devastating impacts on nature, impacting biodiversity, threatened species, ecosystems and critical habitats (IPCC 2022). Healthy environments and ecosystems are essential to supporting human health and wellbeing (Martin et al. 2020). Supporting and prioritising nature in disasters is therefore critical to supporting community recovery.

What is nature-led community resilience?

NLCR is connecting people with nature to support nature's recovery, and in doing so people are supported in their own recovery and hope for the future. NLCR recognises the symbiotic and reciprocal relationship between people and nature. It involves people healing nature and nature healing people (see Figure 1).

NLCR also galvanises efforts to support nature, and longer-term shifts supporting actions caring for nature within and outside a disaster context. This matters because communities with connection, direction and purpose recover more readily than others (Aldrich 2012).

The role of nature in healing is increasingly backed up by evidence and practice (Block et al. 2019; Porter et al. 2023). As more people in Australia are impacted directly or indirectly by the escalating disaster landscape, we look for



Figure 1: Nature-led community resilience reflects the reciprocal relationship between people and nature.

Source: Lee et al. 2024b.

new ways to cope with climate change and its impact on people and our environment.

The idea of NLCR is not new. For millennia, First Nations Peoples have embodied a way of being that encompasses Caring for Country, Healing Country and Walking Together. Integral to the idea of Caring for Country is that nature needs people, and people need nature, and that people have a responsibility to manage Country (Weir et al. 2011).

Many Indigenous and other cultures conceptualise humans and nature as forming a single balanced and symbiotic relationship. They view humans and nature as connected, not separate entities (West et al. 2020); many people see their wellbeing and identities deriving from

their relationships with both people and nature (Chan et al. 2016; Quinn et al 2022). These ideas of reciprocity, interconnectedness and responsibility for Country provide important foundations for a nature-led community resilience approach.

NLCR approach benefits people and nature

NLCR aims to genuinely and meaningfully engage local communities in nature connection and support human recovery. It is informed by, and enables, the basic elements of psychosocial support in disasters (Hobfoll et al. 2007). These are: generating a sense of physical safety and promoting calm; enabling connection with others and the environment; supporting agency through self and collective efficacy; and instilling hope.

NLCR supports the recovery and resilience of both human communities and natural ecosystems, drawing on globally recognised disaster recovery and resilience principles and trauma-informed practices, alongside local biodiversity recovery needs (see toolkit for more details). NLCR activities focus on decision-making, community engagement, resourcing, working on ground and strategic learning. NLCR actions should be readily included in disaster-end environmental recovery and resilience programs to support impacted communities through connection to, and care for, regenerating nature.

Incorporating NLCR during the different phases of disasters

Although it has its roots in recovery, NLCR can be considered in all phases of disasters. The following roadmap sets out the general stages of action to incorporate NLCR before, during and after disasters (see Figure 2).



Barred Galaxias parade at Playspace opening, Marysville.

The community saw hope and strength in supporting nature's recovery from the bushfires.

"The fish are back and so are we!"

In 2009, when environmental teams visited wildfire-affected areas around Marysville to assess impacts to habitat and wildlife, and monitor regeneration, it sparked community interest. The community were offered the opportunity to learn about the impacted species, participate in recovery efforts, and connect with one another. Some people chose to help plant trees to support habitat recovery, and some joined in setting and checking fish larval drift nets to help identify critical spawning sites. Some of these events closely involved local Aboriginal Traditional Owners. They delivered presentations and talked with people about responsibilities for 'Country', and the concept that we look after Country, and Country looks after us.

The beginnings of NLCR as featured in the NLCR Story Library (Lee et al. 2024b). Image: Fern Hames.

Good disaster recovery and stronger resilience are directly influenced by the investment in planning and preparedness (Australian Government Department of Home Affairs 2018). Before disasters, NLCR activities support communities to build strong social capital and connections with each other and nature. This supports communities in connecting and knowing how to care for their local environments, and in understanding the mitigation, adaptation, preparedness and recovery plans in their area.

NLCR response and relief efforts, during and immediately after disasters, primarily focus on community engagement about what work is being done to support nature in the response phase.

Communications should be considered and regular, sharing impacts, consequences and reassurance (where appropriate).

There are many NLCR opportunities in early-, medium- and long-term recovery. Most immediately, it is important to communicate with communities to alleviate the feeling of nature as a threat. This needs to happen before finding a way to bring communities back to nature through including NLCR in recovery planning and recovery groups, engaging with communities, offering grant opportunities for NLCR activities, or implementing NLCR activities with local communities.

Knowing when to initiate NLCR activities should be guided by the local context and knowledge of the community and their recovery journeys; it will not be the same for everyone. For some, this can be quite early in the recovery process, for others, it may not be for years.

Eventually, NLCR extends beyond recovery and becomes the 'new before', building resilience, expanding and delivering sought-after nature-community connection activities, volunteering opportunities, continued monitoring, evaluation and publishing learnings in different formats to help others learn from this experience.

The NLCR Toolkit and Story Library

The NLCR Toolkit and Story Library has been a journey, decades in the making. The idea of NLCR was more formally developed and piloted by the Victorian Government following the 2009 Black Saturday bushfires (Reeves et al. 2019; Hames 2012). The momentum for NLCR, and associated learnings, continued to build, including recovery actions following the 2019–20 bushfires, where it was also incorporated into grant programs, and then again as part of the Victorian Government's Flood Recovery Program. Consequently, it has yielded insights from different types of disasters and geographic contexts.

The NLCR Toolkit provides a framework for identifying opportunities to incorporate NLCR projects in disaster preparedness, recovery and resilience, and provides

illustrative examples for building human-nature connection across the disaster phases, to support human and nature resilience. It has been developed to support any person, group or organisation that is seeking to meaningfully support disaster impacted communities and recovery for people and nature. This may include community and environment/conservation groups, local, state and national governments, non-governmental organisations (NGOs) and not-for-profit organisations (NFPs), Traditional Owner groups, schools, research organisations and funders.

A range of tools have been developed to support the development, design and implementation of NLCR activities including:

- templates to support planning and implementing NLCR activities
- practical examples showing groups undertaking NLCR actions in the different phases of disasters
- NLCR research and evaluation overview
- NLCR and emergency management principles
- mapping NLCR to existing frameworks
- NLCR resource hub.

The toolkit is accompanied by the Story Library that shares brief stories of NLCR initiatives across different contexts, communities, activities and outcomes. These stories were developed in collaboration with the stakeholders involved in developing the toolkit. They provide inspiration and examples when advocating for funding and planning for NLCR projects.

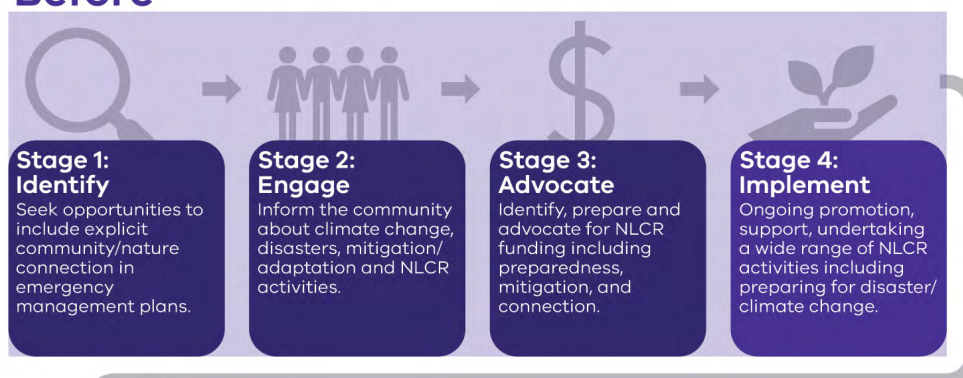
Societies internationally are recognising the urgent need for radical transformation in our relationships with nature as our natural world changes before our very eyes. Nature-led community resilience provides a clear opportunity for communities to be actively involved in supporting their own resilience and the resilience of their local environments. This reciprocal relationship recognises people healing nature, nature healing people.

Acknowledgements

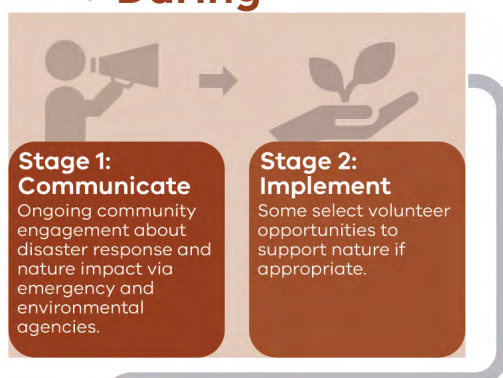
This article is a summary of: Lee K, Lamont A, van Eeden L, Whiteford C and Hames F (2024) *The Nature and community-led approach to disaster resilience: Toolkit*. Department of Energy, Environment and Climate Action, Heidelberg, Victoria

The NLCR toolkit is the result of a collaborative approach with the support of people, organisations and networks including conservation and environmental groups, local governments, state government departments, not-for-profits, First Nations groups, funding organisations, universities and research groups. You can find details of the organisations that were involved in the toolkit.

Before



During



After



Figure 2: Key activities to undertake across the phases of disasters.

Source: Lee et al. 2024b.

References

- Aldrich D (2012) *Building Resilience: Social Capital in Post-Disaster Recovery*. The University of Chicago Press: Chicago, IL and London. <https://doi.org/10.7208/chicago/9780226012896.001.0001>
- Australian Government Department of Home Affairs (2018) *National disaster risk reduction framework*. Home Affairs Website www.homeaffairs.gov.au/emergency/files/national-disaster-risk-reduction-framework.pdf
- Block K, Molyneaux R, Gibbs L, Alkemade N, Baker E, MacDougall C, Ireton G and Forbes D (2019) The role of the natural environment in disaster recovery: "We live here because we love the bush". *Health Place*, 57: 61-69. <https://doi.org/10.1016/j.healthplace.2019.03.007>
- Chan KMA, Balvanera P, Benessaiah K, Chapman M, Díaz S, Gómez-Baggethun E, Gould R, Hannahs N, Jax K, Klain S, Luck GW, Martín-López B, Muraca B, Norton B, Ott K, Pascual U, Satterfield T, Tadaki M, Taggart J and Turner N (2016) Why protect nature? Rethinking values and the environment. *Proceedings of the National Academy of Sciences*, 113(6):1462-1465. <https://doi.org/10.1073/pnas.1525002113>
- Hames F (2012) *Engaging the community in native fish recovery following bushfire: Black Saturday Victoria 2009 – Natural values fire recovery program*. Department of Sustainability and Environment, Heidelberg, Victoria.
- Hobfoll SE, Watson P, Bell CC, Bryant RA, Brymer MJ, Friedman MJ, Friedman M, Gersons BPR, de Jong JTV, Layne CM, Maguen S, Neria Y, Norwood AE, Pynoos RS, Reissman D, Ruzek JJ, Shalev AY, Solomon Z, Steinberg AM and Ursano RJ (2007) Five essential elements of immediate and mid-term mass trauma intervention: empirical evidence. *Psychiatry: Interpersonal and Biological Processes*, 70(4):283-315. <https://doi.org/10.1521/psyc.2007.70.4.283>
- Intergovernmental Panel on Climate Change (IPCC) (2022) *Climate Change 2022: Impacts, Adaptation, and Vulnerability. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change*. In: Pörtner H-O, Roberts DC, Tignor M, Poloczanska ES, Mintenbeck K, Alegría A, Craig M, Langsdorf S, Löschke S, Möller V, Okem A and Rama B (eds) Cambridge, UK and New York, NY: Cambridge University Press. <https://doi.org/10.1017/9781009325844>
- Lee K, Lamont A, van Eeden L, Whiteford C and Hames F (2024a) *The Nature and community-led approach to disaster resilience: Toolkit*. Published Report. Department of Energy, Environment and Climate Action, Heidelberg, Victoria.
- Lee K, Lamont A, Whiteford C, van Eeden L and Hames F (2024b) *The Nature and community-led approach to disaster resilience: Story Library*. Department of Energy, Environment and Climate Action, Heidelberg, Victoria.
- Martin L, White MP, Hunt A, Richardson M, Pahl S and Burt J (2020) Nature contact, nature connectedness and associations with health, wellbeing and pro-environmental behaviours. *Journal of Environmental Psychology*, 68:101389. <https://doi.org/10.1016/j.jenvp.2020.101389>
- Reeves J, Hames F and Graymore M (2019) Watery Places: Stories of Environmental and Community Renewal. In: Campbell D, Duffy R and Edmondson L (eds) *Located Research: Regional Places, Transitions and Challenges*.
- Weir JK, Stacey C and Youngetob K (2011) *The Benefits Associated with Caring for Country*. Caring for Our Country, Australian Institute of Aboriginal and Torres Strait Islander Studies (AIATSIS), pp 21.
- West S, Haider LJ, Stålhammar S and Woroniecki S (2020) A relational turn for sustainability science? Relational thinking, leverage points and transformations. *Ecosystems and People*, 16(1):304-325. <https://doi.org/10.1080/26395916.2020.1814417>
- Quinn P, Gibbs L, Blake D, Campbell E, Johnston D and Ireton G (2021) *Guide to Post-Disaster Recovery Capitals (ReCap)*. Phoenix Australia website www.phoenixaustralia.org/disaster-hub/wp-content/uploads/2021/05/ReCap_2022.pdf
- Quinn P, Williamson B and Gibbs L (2022) Indigenous-informed disaster recovery: Addressing collective trauma using a healing framework. *Progress in Disaster Science*, 16:100257. <https://doi.org/10.1016/j.pdisas.2022.100257>

About the authors

Dr Kate Lee is a social and systems change researcher with the Arthur Rylah Institute, Department of Energy, Environment and Climate Action, whose work connects science, policy and practice.

Amanda Lamont is the founder of Nature Based Resilience and co-founder of the Australasian Women in Emergencies Network. Amanda works at the intersection of emergency management, climate adaptation and nature-based resilience.

Dr Lily van Eeden is a Senior Lecturer and ARC Industry Fellow at RMIT University School of Science, whose research focuses on human behaviour, environmental governance and fostering healthy relationships between people and nature.

Craig Whiteford was the Zoos Victoria conservation projects manager when this work was undertaken. Craig has extensive experience in biodiversity recovery, environmental management and threatened species conservation, and has worked across government and conservation organisations.

Fern Hames PSM FRSV was an honorary professorial fellow at RMIT University, School of Global Urban and Social Studies when this work was undertaken. Fern is an environmental scientist and cultural land management leader.

Resilient Recovery from Disasters



Authors

Mittul Vahanvati, Elizabeth Maly and Titaya Sararit

Reviewed by

Richard Mowll
Consultant

Published by

Palgrave Macmillan
ISBN: 978-981-97-8046-4

The effects and effectiveness of housing recovery programmes following major disasters is explored in this book using 6 major damaging events in India (2001 Gujarat Earthquake, 2008 Kosi River floods), Thailand (2004 Indian Ocean Tsunami, 2011 Ayutthaya floods) and Japan (1995 Great Hanshin Awaji Earthquake, 2011 Great East Japan Earthquake). As such, the case studies presented reflect low-middle income, upper-middle income and high-income countries, respectively. The review of the disaster effects was carried out in 2025, which provided between 14 and 30 years of effectiveness to be considered.

The results are well presented, demonstrating 5 significant factors that contribute to building resilience and capacities: a leading role of government, the role of recovery coordination, land- and settlement-planning and improving building standards, resource/assistance packages to households and sustained capacity building (of stakeholders). Conversely, the factors that hinder resilience were the negative effects of governmental top-down coordination, inadequate financial assistance to households, the shortfalls of market-driven programmes and a lack of capacity building beyond housing reconstruction.

The book outlines the complexity of leading large-scale housing recovery programmes after major damaging events and provides pointers to successful governance, policies and practices, which are relevant to the diversity of contexts covered by the 6 events reviewed. The analysis carried out is, necessarily, qualitative rather than quantitative, due to the nature of the research and the number of case studies available. The advantage of this is that it brings out the texture of learnings from each case study. It firstly identifies, then follows, a structured approach to the analysis, allowing for the breadth of recovery implementation and effects to be reviewed and understood.

The book is structured as if it were 5 academic journal papers, with an abstract at the start and references at the end of each chapter. This gives the book an academic feel but allows the reader to focus on the section of most interest to them. The 3-page conclusion provides a concise overview of the lessons learned.

The book is of value equally to practitioners and policy makers involved in planning or implementing recovery works as well as to academics interested in the outcomes of large-scale housing recovery programs.



9TH INTERNATIONAL
**WILDLAND FIRE
CONFERENCE**
AUSTRALIA 2028

Fire knowledge, shared across the world.

4–7 April 2028

**Melbourne Convention and
Exhibition Centre**

Australia welcomes the global wildland fire community for the 9th International Wildland Fire Conference, returning for the first time since Sydney hosted the event in 2003.

Join practitioners, policymakers, scientists and researchers from around the world to share knowledge and shape the future of wildland fire management. Held alongside the 2nd Global Fire Management Hub Plenary, hosted by the Food and Agriculture Organization of the United Nations (FAO).

wildfire28.com.au