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CELEBRATING 40 YEARS

Australian Journal of Emergency Management

SUPPORTING A DISASTER RESILIENT AUSTRALASIA

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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.

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Foreword


THE MACEDON DIGEST

Produced by the Australian Natural Disasters Organisation

Vol.1 No.1

A NEW INITIATIVE

Editorial Committee

Australian Journal of Emergency Management

In 2026, AJEM celebrates an important milestone – 40 years of publication.

Readers may or may not remember 1986, but Bob Hawke was Prime Minister; Bananarama, Madonna and Paul Kelly were at the top of the music charts; and Top Gun and Crocodile Dundee were on at the movies. The World Wide Web was not yet invented and mobile phones weighed 4 kg.

Much has changed since then. Where we live, how we live, how many of us there are, how we interact with each other and the environment, and what we value. But, like Madonna and Paul Kelly, some things persist over 40 years. Bushfires, floods, cyclones, storms, earthquakes, drought, heatwave and coastal erosion have always occurred and will continue to occur in Australia. Disasters that arise at the intersection of people and natural hazards cause great loss, trauma and disruption. This reminds us of the constant need for shared readiness and resilience.

In 1986 Australia was still recovering from the 1983 Ash Wednesday bushfires in one of the most significant shifts in emergency management from civil defence coming out of the war years to domestic hazard protection. The Civil Defence School, established in 1956, had been reconfigured into the Australian Counter Disaster College in 1978 to develop counter-disaster capability by fostering understanding and cooperation between communities and by understanding research into disasters. In 1993, the college became the Australian Emergency Management Institute (AEMI) in response to the huge importance of applied research, training, resilience and shared knowledge in emergency management. AEMI played a vital role to help prepare Australia for the many challenges it would face in hazard identification, preparedness and response in the years ahead.

From its beginning, AJEM has been a source of knowledge for emergency services and related practitioners, researchers, policy makers and industry. AJEM was first published as a 6-page newsletter in March 1986 as 'The Macedon Digest' to fill an information void within the counter-disaster community. In 1988, it was recast as the 'Australian Newsletter of Disaster Management' and the journal doubled in size as research became more valuable to the sector. In 1995, the publication was registered as the *Australian Journal of Emergency Management* that we know today.

AJEM has changed over the years but still delivers practice-based evidence and knowledge. AJEM focuses on promoting and facilitating evidence, discussion and debate at all levels of emergency management. Peer-reviewed research papers, practice reports and other articles co-exist within each issue, documenting the evolution of knowledge, public policy and practice. Academic in its rigour and practical in its use, AJEM remains a trusted and authoritative body of knowledge.

Across 2026, AJEM will review its 40-year legacy by looking back and forward at changes, challenges, achievements and progression of emergency and disaster management. Each issue will contain 40th anniversary content and we invite you to reflect on 40 years of progress in disaster and emergency management.

This issue includes a recap of AJEM's first decade [1986 to 1996] and reflections by readers on influential past papers. An interview with a past Macedon Digest contributor shares reflections on their published work and offer directions for the future of AJEM. Sitting alongside research papers and other content, this anniversary year is a time to highlight the critical contribution that AJEM has had and continues to have as an accredited and trusted source of evidence and practice knowledge.

AJEM 40: The First 10 Years

John Richardson

Executive Director,
Australian Institute for
Disaster Resilience

"For some time, we have been aware of an information void within the counter disaster community".

With this observation, the then Australian Counter Disaster College (ACDC) at Mount Macedon introduced its first offering in March 1986 to address the need for a publication for ''operatives, planners, trainers and researchers in counter disaster/civil defence field''.

The first edition of *The Macedon Digest* (TMD) was a humble 5 pages long. In these was an overview of a training needs analysis conducted by the College, an announcement of new publications – *Flood Warnings in Australia, Fire Ecology and Land Management in Western Australia* – and the second Australian Disaster Research Directory, detailing all the disaster-related research across the country. The first edition also announced the establishment of the National Bushfire Research Unit at CSIRO, led by Justin Leonard, and highlighted some of the recent acquisitions of the ACDC Library, which included titles on nuclear war and winter, organisational dynamics, emergency medicine, and MacPaint Drawing Drafting Design.

The first edition posed the statement: "The success of the digest will depend to a large extent on reader reaction: contributions and comments on content will be welcomed and will help the Digest to evolve into a useful periodical for all who are involved in the humanitarian field of disaster management". The readers' reactions were clearly positive, reflecting the growth from this humble beginning to what is now the *Australian Journal of Emergency Management* (AJEM).

The second edition highlighted the importance the College placed on disaster studies, enabling teaching at the College to draw upon experience, case studies and information, and reflecting the view that planning can be improved by learning from experience. It goes on to provide an overview of Cyclone Winifred that affected the Innisfail area of Queensland in February 1986.

We can trace our detailed understanding of the human responses to disaster to a comprehensive series of articles across 9 editions by Ruth Wraith and Rob Gordon, drawing on their extensive experience of the Ash Wednesday bushfires in 1983 and the Maryborough bushfires in 1985. They powerfully set the human context in which we continue to work, helping us understand the human impacts of disasters, the reactions and behaviours they provoke and what we can do to support people through such events.

The United Nations speaks of the importance of early warnings in risk reduction and helping people make informed decisions. TMD foresaw this 40 years ago, with an excellent article by John Oliver in Volume 1, Edition 3 titled, *'Warning Lead Time for Disasters',* which covered bushfires, windstorms, hail, frost, earthquakes and tsunamis.

TMD was not without controversy. In March 1987, a seemingly uncontroversial front-page article was titled *'Emergency Management Education in Australia: The Philosophy and Objectives of Emergency Management Training and Education in Australia'.* This article set out some excellent principles for the future of the College, including the need for a systematic all-embracing approach to disaster management across the Prevent/Mitigate, Prepare, Respond, Recover (PPRR) framework, rather than the sole focus on preparedness and response. It emphasised that practice needs to be aligned with scholarship, advisory bodies are required, customers should not control access to the College and target audiences should be defined by function rather than occupation.

Somehow, it seems the article was not reviewed by the powers-that-be in Canberra. In response, the June edition opened with a bolded heading: Commonwealth Policy on Training and Education at the Australian Counter Disaster College:

> *The statements contained in the March edition reflect the personal view of the Director and the staff of the college, and not all of them are consistent with those of the Natural Disasters Organisation, the Department of Defence, or the Commonwealth. The CDC is not an autonomous institution, but under the policy direction of the Director General of the Natural Disasters Organisation. The following statement should clarify the situation…*

In the June 1987 edition, a short article appears at the bottom of page 2 titled *'The Greenhouse Effect'.* The summary, based on the article by Dr Jamie Pittock, outlined predicted changes by 2030 including wetter summers, drier winters, cyclones moving further south and more extreme temperatures. TMD highlighted these findings in Volume 3, Edition 1 with the headline, *'Greenhouse Effect Predicts more Cyclones'.* This quote is particularly poignant, seemingly crafted with the optimism of a scientist or problem solver who knows exactly what is needed to fix the problem and assumes the necessary action will be taken:

> *The insurance industry had closely monitored the scientific studies on greenhouse warming, and they accepted that it would probably occur within 50 years. At least the long lead time would give the community time to plan and adapt for the changes. If as predicted cyclones become more intense and more widespread, insurance companies would require new standards of housing and construction and design. But because of new technology and materials, they need not be much more expensive.*

I admire this quote from Geoff Boughton in Volume 5, Edition 2/3 (1990) that reminds us that disasters are not natural, but the consequences of human decisions:

> *Disasters occur because of either the past mistakes of planners and engineers in ignoring these basic principles or the occurrence of an event that is more intense than one anticipated in the planning, design and construction of the community. Disaster planning is required to deal with this scenario.*

A topic close to my heart is featured in Volume 3, Edition 1 (1988). The article outlines the National Registration and Inquiry System, a tracing service for those separated by disaster that was the forerunner of Register Find Reunite. One paragraph stands out, calling for system improvements and the "development of a more sophisticated phonetic search, highly desirable improvement in view of the multilingual character of today's population".

The late Philip Buckle – a former manager of mine – outlined Victoria's State Disaster Recovery Plan in Volume 3, Edition 1. What stands out to me is the practice we take for granted and which is sometimes claimed as 'new':

> *Area recovery committees, chaired by municipal representatives, with representatives of local communities foretold community centred recovery.*

Also fascinating is an example of the notion of build-back-better:

> *The need to link recovery from disaster with disaster prevention so that recovery processes "can incorporate measures" to reduce the likelihood of recurrence and prevention.*

Philip returns many times in the first decade, including his observation in Volume 7 Edition 2 (1992) that the cost of disasters and the benefits of prevention extend beyond saving lives. This is a concept that we have tried to embed in our preparedness frameworks over the past 40 years:

> *Anecdotal evidence and the informed intuition of disaster managers is that the costs of the losses of disasters (property loss, production loss, opportunity loss) as well as the direct and indirect costs of prevention, response and recovery are greater than many people imagine. There is also the suspicion that disaster prevention expenditure may reduce costs resulting from damage by minimising damage levels, and expenditure on direct recovery services may reduce costs which would otherwise be incurred bystanding social and medical services.*

Another former manager of mine, the late Kerry Gartland, outlined the recovery principles we all take for granted in Volume 4, Edition 3 (1990) in the article, 'State of the Art: Recovery from Disasters and Emergencies'. She also takes the time to reflect on the importance of public awareness and education.

Professor John Handmer, a regular contributor to AJEM over its 40 years, first appeared in 1989 with a piece co-authored with Denis Parker and Jeremy Neal on flood warnings and liability.

We begin to see the emergence of health and disaster planning with an article on the role of the health surveyor and disaster planning in Volume 3, Edition 1 (1988) followed by a special themed edition on health and disaster planning in Volume 6, Edition 1 (1991) dedicated to the social and health aspects of disasters and anchored around World Health Day. The issue focuses on infectious diseases, triaging, rapid medical response capability, hospital planning, exercises and, interestingly, an article titled *'Health Implications for Natural Disaster Management Arising from Predicted Climate Change'.* While it addresses fire, flood, storm, and drought, there is no mention of extreme heat.

In Volume 3, Edition 4 (1988), we see ACDC begin producing knowledge-synthesis articles, including John Slater and Mike Tarrant's *'Computer Manipulated Census Data and Disaster Management',* and Pam Millican's *'Human Risk Perception',* heralding a shift in the role of the College to knowledge synthesis.

Volume 5 opens the new decade of the 1990s. The editions have more of a newsletter feel, announcing ACDC events and including sections on the Natural Disasters Organisation operational activities. However, in Volume 6 (1991) informative articles return.

As the decade progresses, an increasingly sophisticated understanding of the complexity of emergency management emerges.

"It is a fundamental tenet of emergency management that there is no hazard without people," opens an excellent first piece on recognising the need to understand community in planning for disaster by New South Wales State Emergency Service's Chas Keys in Volume 6, Edition 2 (1991). His analysis concludes with:

> *The underlying message which arises from this discussion is that there is no single public, but rather a host of them, society is differentiated along numerous planes, and we need to know how to identify the elements most in need to help before and in times of crisis. By understanding more fully the consequences of this pluralism, the emergency management "industry" will be able to serve its community more effectively.*

An interesting piece by P.R. Hughes in Volume 6, Edition 4 (1991) transposes the Newcastle earthquake from 28 December 1989 to 26 October of the same year and estimates that instead of 13 deaths, there could have been between 700 and 950 deaths with 200 to 300 of them children at school. This edition has a strong theme on the somewhat forgotten seismic risk and the Newcastle earthquake.

One piece that resonates with me, particularly as I often speak about how simplistic Hollywood-style disaster narratives shape our responses, is Nicholas Kanarev's 1992 article *'Thematic Approaches to introduce a disaster story'.* The media, communications and disasters are examined in a special issue in Volume 8, Edition 2 (1993). The journalist, Rodney Cavalier, imparts this sage advice at the opening of his article, saying ''I wanted to say, by way of preface, we need to put even disasters in a scale of importance in the ongoing lives of people''.

In Volume 9, Edition 4 (1994), we see the emergence of another longstanding contributor to AJEM – and another former manager – Andrew Coghlan. Together, with Philip Buckle, he provides a detailed overview of a community-based recovery program, applying the community development model that was embedded in Victoria's disaster recovery arrangements, including the employment of community development officers across flood affected communities in the north-east of Victoria.

Gayle Cullinan's *'Understanding the Emergency Worker'* (Volume 9, Edition 2, 1994) presented at the Women in Emergencies Symposium in Brisbane in 1992, is a powerful piece, both for the breadth of topic it covers and for addressing the hyper-masculinity of emergency services.

Tucked away on page 21 of the winter 1993 edition, Ian Duggan, a Western Australian Police Inspector, presents the following conclusion to his article, *'Recording Dreamtime Disasters':*

> *Emergency management planners often study disaster events of the past in their planning. Yet one important source has traditionally been neglected. Investigating Aboriginal historical sources dealing with disaster may contribute to the creation of a new risk map for West Australia from Aboriginal folklore, language and art.*

Then, in its 10th year, Volume 10 morphed from TMD to AJEM. The then Director of the Australian Emergency Management Institute (AEMI) commented:

> *This change does not herald any significant alteration of content, style or editorial policy, but merely reflects what the publication now represents within the Australian emergency management community. When it started life, The Macedon Digest was primarily a summary of the doings and opinions of the staff at the, then, Australian Counter Disaster College. The publication has grown enormously in quality, variety of input and the range of issues addressed. It is no longer an in-house newsletter but a widely read magazine, both in Australia and overseas, which addresses a broad range of issues of relevance to all sectors of the emergency management community. The new title reflects this status.*

The initial decade of TMD reflects many firsts and provides the foundations on which we base our current work. It also reflects much of what we try to do, as the successor to ACDC and AEMI: sharing information about training through updates from AIDR; providing best practice guidance via the Australian Disaster Resilience handbooks; sharing knowledge through *What's New in Knowledge*; and offering incidents overviews in the *Major Incidents Reports.*

Let's see what the following decades bring.

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.

Listening to Macedon: early lessons in children's psychosocial recovery after Ash Wednesday

An interview with Ruth Wraith

In the early 1980s, there was an emerging awareness in Australia of the psychosocial impacts of disasters on people, their families, and communities. At the time of the Ash Wednesday Bushfires in 1983, I was a child psychotherapist at the Royal Children's Hospital with a particular interest in community-based children's health. My colleague Rob Gordon, a psychologist, and I were seconded to the Macedon area on a short-term, part-time basis to support children involved in the fires.

Without specific knowledge of how bushfire experiences impacted children, and unable to identify any local mentors, I approached our library and asked them to search for any publications that might help us. A total of 8 related papers, all from overseas, were found, but none directly addressed children caught in a disaster such as a bushfire.

In the mid-1980s, there were no formal structures for recovery. As a result of my experience with, and passion for, outreach services, we engaged with early childhood development centres, kindergartens, and primary and secondary schools to understand the experience of their children and families. We listened to what staff and parents were saying and drew on our theoretical knowledge and clinical practice experience to gain insight into, and understanding of, what was unfolding.

We focused on working to understand how the damaging impact of being caught in the fires was affecting the children, their families, and community. At the same time, we were working to understand the myriad challenging consequences that emerged through the recovery period for individuals and the community.

We sought to identify capacities supporting resilience and how to help children, parents, and teachers draw upon them and manage their own recovery. A learning challenge, and consequent skill to develop, was knowing when and how to help – and when not to get in the way.

As a result of working in the Macedon community, we visited the Australian Counter Disaster College to see if they could help raise awareness of the psychosocial impacts of the fires. They asked us to present our evolving knowledge to their courses. Doone Robertson, the first editor of the newly launched The Macedon Digest, asked us to develop the series of 9 articles that were published in consecutive editions over 2 years. It was a testament to the leadership of the College – which was focused on civil defence in the Cold War period – that it learned and adapted accordingly.

At the time, we didn't know whether the papers had an impact, but we continued to be invited to present on the courses over many years, and also contributed to the early handbooks on the subject. In 2006, on the 20th anniversary of the Australian Journal of Emergency Management (AJEM), we were asked to write a reflections paper on what we had learned in the preceding 20 years.

In 1996, I wrote a paper for the journal titled, *'Women in Disaster Management: Where are they?'*. This paper explored the disparity of tasks, roles, and responsibilities between women and men in the emergency sector, including staff volunteer numbers, access to training at the Australian Emergency Management Institute, recognition through honours and awards, and leadership positions. Women were seen as the sandwich makers. In those days, it was tough for the handful of women working in the emergency field, as we were not seen to have authority or expertise of value to contribute, even though we were acknowledged and sought as experts in our respective areas. In this environment, I learned not to give up but to be clear and committed to the goals I was trying to achieve. I also recognised that these attitudes were not personally directed at me, but were embedded in the prevailing cultural context. This helped me to persist and remain for

the long haul. I reflected in the closing paragraphs of the paper:

> *Participation of women in emergency management would expand the official emergency management agenda beyond bridges and dollars (to put it crudely) into the other real world of nurturing, caring, and psychological and social functioning.*

I hinted, perhaps, towards a better system which I now see firmly established, but with progress still to be made.

Recently, when I revisited the initial articles, I found that they remain strong foundational pieces. What has advanced over the years is our understanding of the human brain and of how children develop and function neurologically.

The principles of the impact of disasters and the recovery processes discussed in the articles still apply. These include a community-centred and careful understanding of the individual, whether infant, child, adolescent, or adult; acknowledgement of and response to the disruption across some or many aspects of people's lives and the communities in which they live, work, or recreate; and the impacts on workers.

I also noticed that we did not use the word trauma in the articles. I consider that we have arrived at a stage where for many people, any events that are worrying, demanding, or stressful are described as traumatic. I wonder if we overuse the word in much of our discourse and risk losing its meaning: damage to any part of a person's being or community.

Over the years since these articles were published, there has been much needed, comprehensive, and skilled development of knowledge, services, and trained personnel. However, I continue to see reinventions of the wheel, disaster after disaster. In the best interests of the impacted people and communities, taking the time to review existing evidence – such as accessing articles in AJEM – prevents the waste of resources, and supports timely and quality service delivery.

AJEM is an important resource, as it is the primary source in Australia and the region for sharing knowledge across emergency management systems.

References

Wraith R and Gordon R (1986a) 'Human responses to disasters', *The Macedon Digest,* 1(2):3-4.

Wraith R and Gordon R (1986b) 'The myths of response to disaster by people and communities', *The Macedon Digest,* 1(3):3-5

Wraith, R and Gordon R (1986c) 'General principles of human response to crisis situations', *The Macedon Digest,* 1(4):3-4.

Wraith R and Gordon R (1987a) 'Short term human responses to disaster', *The Macedon Digest,* 2(1):3-5.

Wraith R and Gordon R (1987b) 'Medium term responses to disaster', *The Macedon Digest,* 2(2):3-5.

Wraith R and Gordon R (1987c) 'Long term responses to disaster', *The Macedon Digest,* 2(3):3-5.

Wraith R and Gordon R (1987d) 'Workers' responses to disaster', *The Macedon Digest,* 2(4):3-5.

Wraith R and Gordon R (1988a) 'Community responses to natural disaster', The Macedon Digest, 3(2):4-7.

Wraith R and Gordon R (1988b) 'Principles for support and recovery for human services', *The Macedon Digest,* 3(3):4-7.

Wraith, R (1996). 'Women in disaster management: Where are they?' *Australian Journal of Emergency Management,* 11(4):26-28 https://search.informit.org/doi/10.3316/informit.401409507028568

AJEM readership favourite papers

Associate Professor Melissa Parsons

University of New England

AJEM Editor-in-Chief

Since 1986, 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 importance of queer community resilience

By Billy Tusker Haworth

Volume 37(1):31–32, 2022

https://knowledge.aidr.org.au/resources/ajem-january-2022-the-importance-of-queer-community-resilience

Submitted anonymously

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

LGBTQIA+ vulnerabilities remain a key challenge for disaster management research, policy and practice. It also takes an opportunity to highlight the capacities and resilience qualities of LGBTQIA+ people and groups.

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

I am now embarking on a research PhD on LGBTQIA+ personnel's experiences working in Australian emergency services.

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

Addressing the challenges of translating research into disaster policy and practice.

NEWS AND VIEWS

The importance of queer community resilience

Billy Tusker Haworth
University of Manchester

A few years ago, I was asked to write a blog post about what I saw as key challenges for disaster management research, policy and practice. Since then, I have learnt that LGBTQIA+ inclusion requires supporting resilience capacities as much as it does addressing disaster vulnerabilities.

Queer community resilience during COVID-19

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New approaches to assessing vulnerability and resilience

By Phillip Buckle, Graham Mars and Syd Smale

Volume 15(2):8–14, 2000

www.austlii.edu.au/au/journals/AUJlEmMgmt/2007/17.pdf

Submitted by: Melissa Parsons

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New approaches to assessing vulnerability and resilience

by Phillip Buckle, Manager, State Emergency Recovery Unit, Dept of Human Services, Victoria; Dr Graham Mars, Lecturer, School of Social Science and Planning, RMIT University; and Rev Syd Smale, State Disaster Recovery Coordinator, Victorian Council of Churches

Introduction

Identifying who exactly are the vulnerable people in the community has been accepted for some time as a necessary part of effective emergency and disaster planning. With the introduction and general commitment throughout Australia to a risk management approach to emergency management, the need to identify vulnerabilities has been given impetus (Salter 1997). The authors are particularly interested in developing the concept of vulnerability and of improving methods for assessing that vulnerability. However, it seems to us that there is still a limited understanding of what the terms vulnerability and resilience include.

This lack of understanding often constrains the effective practice of emergency management. As well as dealing with a variety of potential risks, emergency managers have to deal with a range of potential needs and potential capacities to cope of individuals, groups, communities and agencies about which they have only a partial and incomplete understanding. This necessarily limits the options that can be developed to reduce risk to the community. Equally, individuals, communities and agencies have an equally demarcated understanding of risks, hazards, vulnerabilities and capacities. As a result, understanding of options for effective risk management as well as for supporting local capability are also limited.

Some people, of particular note Ken Granger and his colleagues engaged in the Cities Project (Granger et.al. 1999), are developing a better and more detailed understanding of risk and vulnerability. However, we believe that there are a number of additional facets to resilience and vulnerability that need further exploration as we discuss below.

In this paper we identify specific issues that are central to a proper and complete understanding of vulnerability and resilience.

As we progress in our study of vulnerability and resilience we hope to incorporate these elements into a coherent framework that is capable of systematic application by emergency managers and community members to generally inform the process of risk assessment and risk management planning more thoroughly than is now possible. This will be a practical and applied aim.

We also expect to develop a better theoretical basis for the understanding of vulnerability and resilience and to integrate with other disciplines such as community development, social psychology, community economics and environmental management.

Background

Recent events in Victoria and elsewhere have stimulated an interest in assessing vulnerability that had recently become evident and which was developing in significant ways. The January 1997 bushfires in the Dandenong Ranges was a generally well managed community support and recovery process. The lead taken by local government, and the level of support provided by the local community to its own members, serves as a model of local coordination and management.

However, there are some indications that it took some time for the recovery process to identify all vulnerable groups. In particular single parent families, usually with low incomes and typically with constraints upon the time of the sole parent and comprising just over 10% of the total population, may have lacked opportunities to fully participate in some community recovery activities. Following the East Gippsland floods of June 1998 it also became apparent that there were a number of distinct groups that had special needs.

Families in remote areas lacked access to child care facilities (other than a traveling child care support group whose funding was shortly due to cease); other people in remote areas had very considerable distances to travel to access services and support; in some of the farming areas an aged population faced difficulties in recovering from their losses and the whole area was made more vulnerable through the effects of 2 years of drought preceding the floods.

Vulnerability was as much a result of exposure to 2 years of drought and many years of environmental alteration, and the effects of isolation (extended travel time, poor communications and so forth), as it was to the passing effects of the flood itself.

The Gas Shortage of September 1998 in Victoria also highlighted particular vulnerabilities in the community when gas restrictions were applied. Aged people, new born babies and infants, people with particular medical conditions or with terminal illnesses requiring palliative care, people on life support systems, and the disabled all had special requirements for support. Yet many of the aged who were expected to be vulnerable actually coped better than was expected by emergency managers. The elderly had experience and coping strategies not available to younger people, that they had gained from working through previous life difficulties such as the Great Depression and the Second World War.

Of less immediate priority were a number of other groups. People laid off from work that experienced an unexpected reduction in income, businesses forced to close temporarily and people that needed to purchase electrical cooking and heating.

On a broader scale still, there were groups of people that required specialist information on dealing with the effects of the loss of gas in terms of alternative cooking and heating options, the safe disposal of food and other putrescible materials, and safe methods of heating and using water for bathing.

These events, and the ways in which they have highlighted community needs occurring in the context of a change from a hazard based focus on emergency management to a risk based focus, set a starting point for our consideration of vulnerability as it applies to emergency management.

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Australian Journal of Emergency Management

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

This paper introduced me to disaster resilience. As an environmental scientist, I had been doing river research using the Resilience Alliance body of work about resilience in social-ecological systems. When I started writing and teaching a unit on natural hazards I came to realise, with the help of the definitions and ideas in this paper, that disaster resilience was a divergent social science concept that I should delve into. So, I guess that Buckle et al. seeded an interest that has led to my ongoing learning, teaching, and research in disaster resilience. Perhaps most importantly, the Buckle et al. paper explained the differences and similarities between disaster vulnerability and disaster resilience. That Australian communities may simultaneously be at risk, vulnerable, and have agency and resilience remains one of the most important highlights from this paper for me, and one of the most important practice foundations to disaster preparation, mitigation, response and recovery.

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

The paper also introduced me to the idea that agency and capacity could be operationalised into elements that support resilience (such as sustainability of social and economic life, established networks, resources and skills, and social infrastructure) and that these could subsequently form the basis for assessing resilience. My research to develop the Australian Disaster Resilience Index applied the same idea, where we assessed disaster resilience as a set of 8 capacities (or elements) that represent our defined system of supporting resources.

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

Concepts of disaster risk, vulnerability, and resilience have been studied and applied almost in a decades long sequence, and generally as separate concepts. I'd like to hope that in an era of increasing natural hazard complexity and impact, that theoreticians and practitioners can integrate the cognate ideas of risk, vulnerability, and resilience into new and thoughtful ways to support and serve communities.

Changing the rules of the game: mechanisms that shape responsibility-sharing from beyond Australian fire and emergency management

By Blythe McLennan and John Handmer

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Submitted by: Jim McLennan

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

The paper was the first critical analysis I read of the then Federal government's newly announced policy of 'shared responsibility'. Because I was so heavily involved in post-Black Saturday field research involving interviews with householders who had been impacted by disaster-level bushfires I had not really paid attention on the emergence of the policy. Due to my background in industrial and organisational psychology, I was not really attuned to the importance of the wider socio/political contextual issues for any programs aimed at improving community and householder bushfire safety. The paper by B McLennan and J Handmer was an eye opener.

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

It made me sadder, but wiser. In its wake I became less naively optimistic about improving levels of community and householder bushfire safety amid climate change and the increasing frequency and severity of natural hazard dangers.

Changing the rules of the game: mechanisms that shape responsibility-sharing from beyond Australian fire and emergency management.

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ABSTRACT

In this paper, we look beyond Australian fire and emergency management to compare ways that responsibility-sharing – broadly conceived – has occurred in other places and sectors where risks to community safety are faced. Responsibility-sharing occurs any time there is collective action, and formal and informal institutions provide the "rules of the game" that prescribe how responsibility should be shared amongst the parties involved. We reviewed a broad sample of risk research literature in order to examine by what mechanisms responsibility-sharing institutions have been shaped in other places and sectors where risks to community safety are faced. Our review revealed more alternatives for shaping responsibility-sharing institutions than are widely considered by policy and decision makers in Australian fire and emergency management. It therefore raises an important question about why certain mechanisms are chosen, prioritised, overlooked or resisted in this sector. An alternative way of conceiving and pursuing shared responsibility is also discussed.

Introduction

Within the Australian fire and emergency management sector, the concept of 'shared responsibility' is most commonly used to refer to the need for communities to be more self-reliant in the face of risks associated with natural hazards such as bushfire and flood. It reflects a strong recognition that public expectations and demands of emergency services in Australia may be unrealistically high, and that communities have a vital role to play in securing their own safety. However, this represents a specific understanding of a more general idea: one that is embedded in a particular context, place and time. A broader view that compares the goals and processes of sharing responsibility across a wider range of risk and safety contexts may therefore provide some valuable food for thought about confronting local challenges.

In this paper, we therefore look beyond Australian fire and emergency management to compare ways that responsibility-sharing – broadly conceived – has occurred in other places and sectors where risks to community safety are faced. Importantly, finding ways to share responsibility amongst multiple parties, and particularly between governments and communities, is a challenge faced across a wide range of sectors. Risk research literature abounds with studies that expose responsibility-sharing dilemmas in fields such as air pollution (Bickerstaff & Walker 2002), public health (Guttman & Ressler 2001), workplace safety (Gray 2009), food safety (Henderson, Coveney & Ward 2010), transportation (Sanne 2008), policing (Hughes & Rowe 2007), and new technologies (Black & Wishart 2008). We reviewed a broad sample of this literature in order to examine by what mechanisms responsibility-sharing was shaped. A more detailed account of the review and how it was undertaken is available elsewhere (*McLennan & Handmer 2011a*) In this paper, we focus on conceptualising the idea of shared responsibility in a more general, context-independent way, presenting key results, and outlining broad implications from this cross-sectoral review for Australian fire and emergency management.

Responsibility-sharing institutions

To begin, we need to be clear about what we mean by 'shared responsibility'. We take a broader view than the understanding most common in Australian fire and emergency management.

In the context of risk, the concept of responsibility incorporates the notion that certain parties have an obligation (be this moral, social or legal) to undertake actions to manage risk, either their own or someone else's (*McLennan & Handmer 2011a, 2012*). These obligations stem from the expectations, rules, and norms in society about the roles of various parties with respect to risk (see also Birnbacher 2001). They are forward-looking because they exist prior

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

I am no longer actively involved in community and house holder bushfire safety research. But I remain convinced that the focus must remain on raising community-level awareness of natural hazard threat and preparedness so that this translates in householder awareness and preparedness. The power of so-called 'descriptive norms' remains unsurpassed: householders tend to do what they see other householders (like 'them') do about potential hazards.

To contribute

We want to hear from you about your favourite or most influential paper. All you need to do is to revisit AJEM's vast content and reflect on the paper(s) that have been novel, inspirational and even transformative. Provide a few short answers to questions about why that paper was significant to you, how it has influenced your practice and what might be built on from the paper. Selected reflections will be published in AJEM throughout 2026.

Make your contribution at https://unesurveys.au1.qualtrics.com/jfe/form/SV_4Ts0FudXHh0tpZQ

This call for contributions will remain open up to end of August 2026.

Pregnant women and new mothers' experiences and needs in Australian natural disasters: a narrative review

Abstract

Pregnancy and new motherhood are common experiences of women. Ensuring that the needs of women are properly included in disaster planning requires these circumstances to be considered and addressed. This review explored the experiences of pregnant women and new mothers during emergencies in Australia. Experiences of pregnant women identified related to bushfire smoke exposure, restricted access to health care, physical impediments of pregnancy, maternal nutrition detriments, mental health effects and support, post immediate disaster effects and research gaps. Experiences of new motherhood or infant care identified included being the primary and often sole caregiver, emergency preparedness and evacuation challenges, the continuing care needs of infants, bushfire smoke exposure, physical impediments of caring for an infant and health care access issues. Domestic violence and socio-economic and other disadvantages were cross-cutting issues for pregnant women and new mothers as were their roles as emergency responders and essential workers. Motherhood should be recognised as an inter-sectional status requiring specific consideration and support during disasters. Further research as well as specific planning and resource development should be undertaken to take account of the particular needs of women.

Peer reviewed

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Introduction

The *Sendai Framework for Disaster Risk Reduction 2015-2030* (UNDRR 2015) recognises the importance of including the experiences and perspectives of women in disaster planning, response and recovery in order to reduce individual, community and national disaster vulnerability. Although, it is often said that women are disproportionately affected in disasters, the extent to which this is the case depends on the specific country context, disaster type and outcome measure (Cutter 2017). As described by Chowdhury et al. (2022), women's social, economic and cultural context also influence their vulnerability. Therefore, understanding how individual circumstances shape women's experience of disasters is vital.

Much of the attention to women in disasters has been on the influence of social expectations of women and men and women's experiences of sexism and domestic violence (Enarson 2012; Parkinson and Zara 2013; Chowdhury et al. 2022). Despite pregnancy and new motherhood being significant life processes for many women, the effect of women's reproductive work, including pregnancy, breastfeeding and the care of infants on their experiences and needs during disasters have been largely overlooked. Ensuring that women are properly included in emergency and disaster planning requires that pregnancy and new motherhood experiences are considered.

Australia's *National Disaster Risk Reduction Framework* (Commonwealth of Australia 2018) states that, 'greater policy-research connection and innovation is needed

to ensure necessary evidence bases are available to inform efforts to identify, prioritise and reduce disaster risks' (p.13). As an evidence-base starting point, this narrative review focuses on the natural disaster experiences of pregnant women and new mothers in Australia. The aims are to collate and synthesise existing knowledge to identify knowledge and support gaps for pregnant women and new mothers that will inform future research and improve planning and response.

Method

This review took a narrative approach, which is a scholarly summary of a body of evidence on a specific subject and may include peer-reviewed academic literature as well as other evidence sources (Greenhalgh et al. 2018). In a narrative review, evidence is selected 'judiciously and purposefully with an eye to what is relevant' (Greenhalgh et al. 2018). This review followed an established review process including the steps of 1) specifying the review question, 2) developing a search strategy, 3) selecting sources of evidence and 4) synthesising the evidence (Mays et al. 2005).

The review question was: 'What are the natural disaster experiences and support needs of pregnant women and mothers of infants (0-11 completed months) in Australia?'.

Searches of PubMed® were undertaken between 5 and 6 October 2024 using the keywords: 'Australia', 'pregnancy', 'pregnant', 'infant', 'baby', 'babies', 'child', 'children', 'breastfeeding', 'disasters', 'emergencies', 'flood', 'cyclone', 'bushfire', 'storm' and 'heat wave'. Documents identified in this search were eligible for inclusion if they were published from 2014 onwards and addressed the experiences or needs of pregnant women or mothers of children 0–11 months old during a disaster event in Australia. The year 2014 was chosen as the baseline for inclusion to support the currency of findings. Given the focus on pregnancy and care of infants, papers involving women who experienced a disaster during pregnancy but only considered the impact on the development of their children beyond infancy were excluded.

The titles and abstracts of publications captured in Pubmed® searches were read and screened for inclusion. Publications that did not meet the inclusion criteria (e.g. they were in relation to a non-Australian disaster event) were excluded. The remaining publications were read in full and retained for analysis if they contained content on the experiences or needs of pregnant women and mothers of infants during a disaster in Australia. Publications were analysed using simple conventional content analysis (Hsieh and Shannon 2005). This followed a process by which each publication was read and re-read by the author to identify themes and sub-themes.

Following this analysis, the grey literature was searched via Google® with the purpose of identifying documents containing content adding to the understanding of or illustrating the themes and sub-themes identified in the academic literature. Additional grey literature documents were identified within the academic literature and grey literature. Submissions made to the 2020 Royal Commission into Natural Disaster Arrangements were searched using the search terms 'pregnant', 'pregnancy', 'baby', 'babies', 'infant' and 'child'. Submissions made by pregnant women or mothers of children 0–11 months old or from others addressing the experiences or needs of such individuals were included.

Older publications referred to in the selected academic or grey literature were included on an exceptional basis if they were deemed to add important information related to an identified theme or sub-theme. For example, difficulty with formula feeding was an identified sub-theme but there was a lack of data on the effects on child health. However, an included document cited a 2012 conference abstract that reported an association between a lack of resources for food preparation and infant hospitalisation after the 2011 Brisbane floods and Cyclone Yasi. This abstract was obtained and included given the seriousness of the finding and the lack of any other document addressing this issue.

Results and discussion

Searches of PubMed® yielded 407 documents of which 90 were identified for full text review after reading the abstracts and 28 were included in the review after reading the full text. A 2013 academic paper and a 2012 conference abstract published in a peer-reviewed journal that were cited in included documents and identified during the analysis process as of particular importance were also included. In addition, a paper that was 'in press' at the time of the analysis and met the inclusion criteria was included in the review.

Searches of Google® and reading of included academic and grey literature identified 25 relevant documents from the grey literature (excluding royal commission submissions). These were mostly policy documents (5), reports from government inquiries (4), program reports from organisations (4) and news reports (4) but also included conference posters (2), fact sheets (2), a submission to a government inquiry from a medical organisation, a media release from a university, a handbook for evacuation planning as well as an academic book that was not found in the PubMed® search. One 2011 news report that was referred to in an included document and identified as of particular importance was also included. Ninety-seven submissions to the royal commission mentioned emergency experiences or response to children (of any or unspecified age) or pregnant women and were included in

the review. Research not specific to disasters in Australia but that explained findings (e.g. why pregnant women may find it particularly difficult to breathe when the air is smokey) were considered appropriate.

Women's experience of pregnancy during a disaster

Twenty-three academic publications focused on pregnancy and birth experiences or outcomes and 4 focused on motherhood but also included non-trivial content on pregnancy experiences or outcomes. These publications included cohort studies, studies that recruited pregnant women and collected quantitative and/or qualitative data and reviews. The 8 cohort studies considered pregnancy outcomes for women who had experienced bushfire, flood, cyclones or heat and involved data from thousands to hundreds of thousands of women (Jegasothy et al. 2022; Nyadanu et al. 2024; Parayiwa et al. 2022; Yang et al. 2024; Brew et al. 2022; Parayiwa et al. 2023; O'Donnell and Behie 2013; Zhang et al. 2023).

Fourteen papers reporting on recruitment studies involved tens to hundreds of women and explored aspects of women's experiences as well as physical and mental health effects of disasters (Chen et al. 2020; Cherbuin et al. 2024; Davis et al. 2024; Kildea et al. 2018; Simcock et al. 2018; Davis et al. 2023; Dancause et al. 2017; McLean et al. 2021; Paquin et al. 2021; Beyene et al. 2022; Hamrosi and Gribble 2025; Roberts et al. 2023; Gribble et al. 2023a; Gribble et al. 2024). This research was in relation to just 2 events (2011 Brisbane floods and 2019–20 bushfires), 6 of these papers were from the same study on 2011 Brisbane flood experiences and 2 studies contributed 2 and 3 papers each to this dataset. Another paper considered views towards pregnant women's involvement as disaster responders (Smith et al. 2018). There were also 4 review papers that considered various health aspects of disasters on women and infants (Murphy et al. 2021; Evans et al. 2022; Kumar et al. 2021; Foo et al. 2024).

This research indicates that being pregnant when exposed to emergency and disaster conditions can have a profound effect on women and their fetuses/infants. Themes identified were related to bushfire smoke exposure, restricted access to health care, physical impediments of pregnancy, maternal nutrition detriments, mental health effects and support as well as post-immediate disaster effects. Research gaps were also identified.

Bushfire smoke exposure

Conditions, such as bushfire smoke, have a disproportionately negative effect on pregnant women. Pregnancy is physically demanding. Pregnant women experience a 15% increase in their metabolic rate, an overall 20% increase in oxygen consumption, a 40% increase in the volume of air they inhale and exhale in one minute and a 40% increase in their cardiac output as compared to non-pregnant women (Soma-Pillay et al. 2016). These changes make pregnant women more vulnerable to respiratory stressors, including air pollutants. However, 70% of healthy pregnant women report feeling breathless while undertaking their normal daily activities even in the absence of pollution (LoMauro and Aliverti 2015).

It is unsurprising that women who experienced the 2019–20 bushfires reported that smoke made it hard to breathe and that it was difficult for them to wear a mask to protect themselves and their fetus (if they were able to obtain one) (Gribble et al. 2023a). Women described having to choose between undertaking prescribed activities, such as walking to assist in managing gestational diabetes, and being exposed to smoke (Roberts et al. 2023). Some pregnant women acted to reduce the effects of the smoke by purchasing an air filter or leaving the disaster-affected area. However, these options were not available to everyone (Davis et al. 2024; Roberts et al. 2023). Pregnant women often had the care of young children (Gribble et al. 2023a) and needed to balance risk of exposure to smoke for themselves and their children against the requirement of young children to be physically active and/or cope with keeping toddlers occupied and happy within a confined space (Roberts et al. 2023; Rodney et al. 2023). Some women found themselves facing the strenuous activity of giving birth within a smokey hospital environment (Roberts et al. 2023; Davis et al. 2023).

Within the literature, concern regarding the effects of smoke on the fetus was noted as a pervasive source of stress and distress for pregnant women effected by bushfire (Davis et al. 2024; Gribble et al. 2023a). Not being able to access information about what the possible consequences are and how to manage the situation adds to their distress (Rodney et al. 2023; Roberts et al. 2023). A dearth of research hampers health professionals, such as midwives, from providing detailed advice (Williamson et al. 2023). In a submission to a New South Wales parliamentary inquiry, the Royal Australian and New Zealand College of Obstetricians and Gynaecologists noted that specific information for pregnant women over the 2019–20 bushfire season was limited (Royal Australian and New Zealand College of Obstetricians and Gynaecologists 2020). However, the College warned against being too alarmist noting that the risks of bushfire smoke are possibly less than smoking during pregnancy (Royal Australian and New Zealand College of Obstetricians and Gynaecologists 2020). Nonetheless, researchers described women who experienced bushfire smoke while pregnant as 'berating' themselves and 'apologis[ing] to their foetuses for being unable to breathe in a way that protects them from possible harm' (Roberts et al. 2023, p.183).

Restricted access to health care

The effect of disasters on access to health care is described within the literature as of particular concern to pregnant women as their expected due date approaches. Babies wait for no one and women give birth whenever it is time, including in evacuation centres (Rourke 2011; Feng 2019). The risk of preterm birth is elevated during and in the immediate aftermath of emergencies such as cyclones and heat waves, although the mechanism for this is unclear (Sun et al. 2020; Jegasothy et al. 2022). For example, during Cyclone Yasi in North Queensland in 2011, 3 women were reported in the media as having given birth in evacuation centres (Rourke 2011). Also, as Cyclone Veronica approached Western Australia's Pilbara Coast in 2019, 5 women gave birth within a 24-hour period at one small health service. This was noted as a highly unusual occurrence (Feng 2019).

During the 2019–20 bushfires, general practitioners reported distressed and heavily pregnant women presenting at an evacuation centre needing psychological support and of arranging to get them closer to the hospital when the road conditions allowed (Hamrosi and Gribble 2025). Pregnant women approaching their due date may evacuate distant from the affected area until they birth or the threat has passed in order to ensure continuity of health care. This was described by a woman quoted in the report of the 2020 Royal Commission:

> *Although there is a hospital less than 2kms from my house, there is no obstetric [doctor]. We would have been safe sheltering in our home but due to being 9 months pregnant I could not risk being cut off from the hospital 60kms away. As a result, my husband, 3 year old daughter, cat and dog had to evacuate for almost 2 weeks, and I gave birth to my son during our [e]vacuation.* Commonwealth of Australia (2020 p.278)

The Western Australian Government recommends pregnant women plan for cyclone season and advises that, 'Pregnant women should discuss cyclone events as part of their birth plans and preparations' (Department of Health [no pagination]). However, no specific guidance was identified on how to do this.

Physical impediments of pregnancy

Being pregnant can reduce the ability of women to escape disaster. This is especially the case in advanced pregnancy when the size and weight of a pregnant belly make movement more difficult. In 2023, a 9-months pregnant woman who was trapped by floodwater in Cairns with her 2-year-old toddler was advised by a triple zero (000) call operator to climb on the roof of her house, something she was unable to do (she was thankfully rescued by surf lifesavers) (Duffy 2023). Heavily pregnant women may be unable to drive because the size of their pregnant belly means they cannot reach vehicle driving controls (Gribble et al. 2023a). Women may also face difficulties escaping due to pelvic girdle pain that is common in pregnancy (incidence up to 84%) and can make it difficult to stand, walk or run (Walters et al. 2018). During the 2019–20 bushfires, pregnant women reported facing difficulties related to standing for long periods of time, not having a chair to sit on, not having a toilet nearby and not having an appropriate place to sleep (Gribble et al. 2023a). Queuing to access resources was also a difficult task for pregnant women (Gribble et al. 2023a).

Maternal nutrition detriments

Pregnant women who experienced the 2019–20 bushfires and who also had young children described prioritising their children's needs over their own, including food and drink (Gribble et al. 2023a). Some of these women fainted while queuing for supplies during and immediately after the bushfires, possibly connected to dehydration or because they had not eaten (Gribble et al. 2023a). Research considering the effect of the 2011 Brisbane floods identified a decline in the quality of pregnant women's dietary content and that one-quarter of study participants skipped meals (Dancause et al. 2017). Those women who were most adversely affected by the emergency were also most likely to have experienced a negative influence on their diet. Restricted maternal and infant access to food was noted as being of concern after the 2022 flooding of northern New South Wales and southern Queensland (O'Dell et al. 2023).

Mental health effects and support

Women can experience poor mental health during pregnancy and afterwards in non-emergency circumstances (Woody et al. 2017; Cherbuin et al. 2024) and disasters increase this risk. Research on the experiences of women who were immediately preconception (<3 months), pregnant or postpartum at the time of the 2019–20 bushfires found that women who had high bushfire exposure had a greater than fourfold risk of having moderate to severe depression in the 7 to 11 months after the bushfires than did women who had minimal bushfire exposure (Cherbuin et al. 2024).

Health care provision during and after pregnancy can make a difference to women's wellbeing. Research following the 2011 Brisbane floods found women who received continuity of midwifery care (care by a small group of known midwives) did not have elevated rates of postnatal depression with increased hardship or stress caused by the disaster (Kildea et al. 2018). This was in contrast to women who received standard hospital care. Analysis controlling for relevant variables suggested that it was the model of care that made a difference to maternal mental health. Notably, women who had continuity of midwifery care

had more postnatal visits than those with standard care (average of 6 versus 2), which may have contributed to their protected mental health (Kildea et al. 2018).

The different coping strategies that pregnant women use after experiencing a disaster was found to affect their level of distress (Chen et al. 2020). This suggests that psychological support post-disaster may ameliorate mental health decline. Other pregnant women and new mothers are notable as important sources of emotional support for women during and after disasters (Davis et al. 2024; Gribble et al. 2023a).

Post-immediate disaster effects

The effect of disasters on the health of pregnant women and their foetuses is not limited to the immediate disaster period. Disaster exposure (including during early pregnancy) may influence foetal growth and birth timing. Pregnant women living in areas affected by the 2009 Black Saturday bushfires were 50% more likely to give birth to extremely premature babies (20 to 27 weeks, which carries certain or very high risk of newborn death) than women who gave birth in the same location in years prior or outside of bushfire-affected areas at the same time as the fires (O'Donnell and Behie 2013).

Experience of cyclone early in pregnancy in Queensland was found to increase the risk of preterm birth (Parayiwa et al. 2022). Analysis of nearly 30 years of birth data from Sydney and Brisbane identified that experiencing a severe flood during early pregnancy was associated with low birthweights and stillbirths (Yang et al. 2024). Other research found that bushfire smoke exposure is also associated with adverse birth outcomes including premature birth and stillbirth (Nyadanu et al. 2024).

Research gaps

Other health effects of disasters on pregnant women have not been researched in Australia even though it is likely that effects exist. For example, given that pregnant women are more vulnerable to infections (Sordillo and Polsky 2010), it is probable that pathogens that may be present after flooding when sewage contaminates water and surfaces present a particular risk. However, research is lacking and much of the research on disasters and pregnancy focuses on the developmental and health effects on the fetus and then child rather than on the woman (e.g. Murphy et al. 2021; McLean et al. 2020; Simcock et al. 2018; Zhang et al. 2023).

Women's experiences as new mothers

Nine academic publications focused on new motherhood or infant care in disasters in Australia. These include an audit of disaster plans (Gribble et al. 2019) and an analysis of oral histories about Australian disasters over 50 years (Pascoe et al. 2023). It also included 6 papers reporting on recruitment studies, one of which tested breastmilk of smoke-exposed women while the remainder collected data on disaster experiences via survey or interview of parents, emergency responders or health providers (Beyene et al. 2023; Hamrosi and Gribble 2025; Hine et al. 2023; Gribble et al. 2023a; Gribble et al. 2024; Roberts et al. 2023; Newby et al. 2012). Four of the papers reporting on recruitment research considered 2019–20 bushfire experiences and 3 of these papers were from a single study that involved a few hundred participants.

Themes identified were:

- mothers as primary and often sole caregivers of infants
- emergency preparedness issues
- evacuation experiences
- continuing care needs of infants
- bushfire smoke exposure
- physical impediments of caring for an infant
- health care access issues.

Mothers as primary and often sole caregivers of infants

Mothers of infants face challenges related to their care for these youngest children during and after emergencies. Infants are vulnerable due to their specialised nutritional needs, immature immune systems, are susceptibility to heat, dehydration and cold and their total dependence on others (Gribble et al. 2019). These needs contribute to the challenges and vulnerabilities experienced by their mothers who are overwhelmingly their primary caregivers. While cultural expectations and sexism are considered drivers for the disproportionate care work that women undertake (Elson 2017), the care of infants is a special case as there is a biological underpinning for maternal care (Gribble et al. 2023b). Indeed, infants and their mothers form a dyad, with a physiological link maintained via breastfeeding (Gribble et al. 2023b). Support for women who are mothers of infants must take account of their infant caregiving work.

The effect of parenthood on the division of labour between men and women and experiences during disasters has been long observed (Pascoe et al. 2023). In 2-parent families with an infant, if one adult is leaving to protect property or is involved in response efforts, it is probable that this will not be the mother. However, the result of this is that women are often left to care for children and to evacuate on their own in emergencies (Pascoe at al. 2023). This may continue into the recovery stage with women caring for children while the men undertake clean up or other activities. As was described by one emergency responder:

> *So, the women were literally holding the baby. Literally holding the baby or babies, or babies and young children or older children. So, the men were off in the trucks, in*

their ute …. They were all out doing their blokey thing. This is generalising massively, but basically, the town was left with women, children, and older relatives.
Gribble et al. (2023a, p.32)

Emergency preparedness issues

Historically, the needs of infants and their caregivers in emergency and disaster planning and response has been overlooked by governments in Australia. A 2018 audit of Australia's national and state and territory emergency plans and guidance revealed an almost total lack of planning and guidance dealing with the needs of infants (Gribble et al. 2019). Research on the experiences of parents of young children during the 2019–20 bushfires found that there was a lack of specific guidance on planning with young children including what to pack when evacuating (Gribble et al. 2024). More than one-third of parents in this study evacuated later than they wanted to, including because they had to pack for their children and items they needed such as infant formula and nappies were sometimes forgotten (Gribble et al. 2023a; Gribble et al. 2024).

Mothers may be hampered in preparedness or response by partners who discourage or prevent them making an emergency plan, preparing to evacuate or evacuating (Gribble et al. 2023a). A pattern of men being less responsive to risk is recognised (Zara et al. 2016). In addition, the demands of caring for an infant and sleep deprivation were among the reasons that decision-making during an emergency was difficult for women (Gribble et al. 2024).

Evacuation experiences

During the 2019–20 bushfires, mothers commonly presented at evacuation centres by themselves with an infant and sometimes multiple other children to care for (Gribble et al. 2023a). These women were often under extreme physical and emotional strain attempting to keep their children safe from strangers, animals and other hazards (Gribble et al. 2023a). They did not always ask for assistance because they did not know whom to ask or were too busy or did not feel confident to do so (Gribble et al. 2024). Parents and evacuation centre managers and workers suggested that a separate and supported space for families with very young children be provided in these venues (Gribble et al. 2024; Hine et al. 2023). Evacuation centres with multiple rooms were identified as beneficial in terms of facilitating the needs of parents and young children (Gribble et al. 2023a). Research by Hine et al. (2023) recommended that maternal and child health centres could be designated as evacuation centres for mothers and their infants (and presumably their other young children). In addition, during the 2019–20 bushfires, multiple individuals acted in an ad hoc manner to provide venues like doctors' surgeries and childcare centres as refuges for families that had evacuated with infants (Gribble et al. 2023a; Hamrosi and Gribble 2025).

Mothers commonly present at evacuation centres by themselves or with multiple children.

Image: UNICEF. Available under Creative Commons Attribution 2.0 Generic license (https://creativecommons.org/licenses/by/2.0/deed.en)

Evacuation to the homes of family and friends was identified as a safer, better-resourced and less difficult environment for caring for infants (Gribble et al. 2023a). However, many women reported that other people helped them wherever they evacuated to. One mother said, 'I walked on the beach with my 4-month-old in the carrier and my 2-year-old on my hand and people just swarmed to look after me' (Gribble et al. 2023a, p.23). Small actions can make a big difference. For example, an emergency responder safely delayed an evacuation convoy so that a crying infant could be fed before leaving. This provided critical assistance to a very stressed woman and her baby (Gribble et al. 2023a).

Continuing care needs of infants

The continuing needs of infants for physical and emotional care presents a challenge for mothers during disasters. During the 2019–20 bushfires, dealing with feeding and nappy changes of infants during evacuations was difficult. Mothers who, if driving to evacuate, had to choose to stop and meet these needs or unbuckle their infant while travelling or continue to travel and leave their infant to cry (Gribble et al. 2023a). Breastfeeding was considered as protective, providing safe food, hydration and comfort but was also a source of distress for women who lacked confidence in their ability to breastfeed (Davis et al. 2024; Gribble et al. 2023a). Dehydration

and busyness contributed to reduced breastfeeds and genuine milk supply decline for some women (Gribble et al. 2023a). Feeding their infant and not adequately feeding themselves resulted in significant weight loss for a breastfeeding mother in one study (Gribble et al. 2023a). Access to breastfeeding support was not always available nor a priority, as one evacuation centre worker described:

> *…when you come forward with a request like that, they're like, 'That's not on our priority list'. And you're thinking, 'Oh actually it should be. It's got to be on someone's priority list if this baby can't feed'.*
> Gribble et al. (2023a, p.37)

Disruption of food supplies and lack of access to amenities like power and hot water presented difficulties for mothers who were formula feeding their infants (Davis et al. 2024; Gribble et al. 2023a). Frantically seeking resources like infant formula was time consuming and a source of great stress and women were sometimes placed in circumstances where they had to undertake unsafe practices like washing bottles in unhygienic toilet sinks or not washing them at all. This is particularly concerning for younger infants (Gribble et al. 2023a). The health effects for children and the associated distress for mothers in such circumstances may be significant. Newby (2018) considered factors associated with illness in children following the 2011 Brisbane floods and Cyclone Yasi found that infants who were formula fed were nearly 10 times more likely to be taken for medical treatment after the disaster than breastfed infants. A lack of resources for safe preparation of appropriate infant foods and fluids was also associated with infant hospitalisation (Newby et al. 2012). Although not widely studied, the presence of breastfeeding women during disasters may be protective and this was recognised when, during the 2011 Brisbane floods and Cyclone Yasi, a number of women breastfed infants other than their own as an emergency measure (Newby et al. 2012).

Bushfire smoke exposure

Mothers in bushfires are often worried about the effect of smoke on their infants. During the 2019–20 bushfires, the smoke was so thick in areas that infants could not breathe or feed properly and would come off the breast to gasp for air (Gribble et al. 2024; Davis et al. 2024; Stevenson 2020). Information was lacking on the effects of smoke on very young children and what to do to protect them. The evacuation of Mallacoota in Victoria in early 2020 saw adults, older children and pets rescued by the Australian Navy but pregnant women and those with babies and toddlers were left behind in the heavy smoke because they could not climb a rope ladder onto the ship (Topsfield 2020). It was a number of days before they could be evacuated by helicopter during which time they endured extremely thick smoke. Fortunately, contamination of breastmilk by bushfire smoke is a rare concern (Beyene et al. 2023) and testing of breastmilk of smoke-exposed women identified contamination did not reach levels thought to be concerning for infant health.

Physical impediments of caring for an infant

Similar to being pregnant, caring for an infant or very young child can impede physical escape such as was described during the flash flooding of the Lockyer Valley in 2011 (Pascoe et al. 2023). During the 2019–20 bushfires, one mother who had evacuated alone to a surf club with her newborn and toddler described being the last person to evacuate this venue when it too came under threat from the fires (Gribble et al. 2023a). Her baby was born via caesarean section and she was (as a result) unable to carry her toddler. Another mother with a newborn and toddler did not evacuate her home when advised to as she thought it was too difficult. She said that she would stay until there was 'an immediate threat' (Gribble et al. 2024). Just how she would then have managed escape is unclear. These accounts outline the very real threat to life that may be faced by mothers with infants in disaster events.

Caring for an infant and continuing to meet their needs and sometimes also the needs of other children makes obtaining resources and support and actions such as queuing and completing paperwork or undertaking clean-up activities more physically and emotionally challenging (Gribble et al. 2023a).

Health care access issues

The needs of new mothers for health support continues beyond the acute disaster period. However, health and family support workers in rural and remote areas may also be affected by the disaster and services may be closed (Hine et al. 2023). Being cut off from health care due to such isolation is a fear of mothers of infants (Carter et al. 2024) as they may need more health care and support than usual. Women may also be emotionally isolated. Following the 2019–20 bushfires, one mother said, 'I had no one around. There were many days where my husband was doing overtime to support people that needed help but then couldn't be there for us' (Hamrosi and Gribble 2025).

Mothers of infants and young children experienced distress, including high rates of sadness, anxiety and being overwhelmed (Hamrosi and Gribble 2025). However, even when they were struggling psychologically, many women with young children did not seek mental health support because they did not have childcare or they were too overwhelmed to do so (Hamrosi and Gribble 2025). Family and child health nurses described how their telephone calls to mothers were longer than usual after the bushfires and how women would attend mothers' groups early to speak privately with them (Hine et al. 2023). These nurses emphasised the importance of being empathetic

and stated that supporting community connectedness to reduce loneliness was needed post-disaster (Hine et al. 2023). They also said that enhanced mental health support for mothers should be provided immediately after the disaster and extend for 2 years (Hine et al. 2023).

General practitioners also are an important support for new mothers during such times and should proactively enquire as to their wellbeing when they attend for care for their children or physical health needs and allow more time for consultations (Hamrosi and Gribble 2025). Unfortunately, specific recovery interventions for pregnant women and new mothers, including to support their psychological wellbeing and child caregiving, is lacking in Australia (Gribble et al. 2024).

Shared disaster experiences of pregnant women and new mothers

Cross-cutting themes identified in this study relating to experiences of pregnant women and new mothers were domestic violence, their role as emergency responders and effects of disadvantage.

Domestic violence

Studies by Parkinson and Zara (2013) and Parkinson (2017) established that there is a rise in domestic violence initiation and escalation following disaster events. Pregnancy and new motherhood are likewise a time when domestic violence commences or increases (O'Doherty et al. 2015). Australian research considering the interaction of disaster events and pregnancy on domestic violence perpetration and experiences is lacking. However, outside of emergencies, the highest rate of detection of domestic violence in any health setting is during antenatal care provision (O'Doherty et al. 2015). Similarly, rural family and child health nurses working in post-disaster settings describe how their mothers' groups became a legitimate reason for women to leave the farm in situations of coercive control (Hine et al. 2023). Continuation of maternity and family and child health nursing services during and after disasters is important from a domestic violence standpoint as well as for the physical and mental health of women and children.

Pregnant women and new mothers as emergency responders

Pregnant women and mothers of infants and young children may be involved in emergency or essential services during and after disasters. Smith et al. (2018) considered the attitudes of paramedics and community members in Victoria and showed that there was no expectation that pregnant paramedics had a duty to treat others during disasters. Aligned with this, the ACT Government Service Standard 3.1.12 provides for pregnant or breastfeeding ACT Rural Fire Service volunteers to continue or not in a frontline operational role with informed decision-making and medical assessment in the final 6 weeks of pregnancy (ACT Government 2021). However, such consideration may not be applied in other services. For example, Gribble et al. (2023a) reported a pregnant health worker in an area severely affected by the 2019–20 bushfires sought to evacuate due to smoke and a high-risk pregnancy but was reprimanded for seeking to leave. In addition, health workers were separated from their children when they attended work and were unable to return home because of bushfire-related road closures.

Influence of disadvantage on women's disaster experiences

Women who are disadvantaged due to socio-economic status or rural or remote location are exposed to greater adverse consequences in disasters. Those who are socio-economically disadvantaged may be living in areas of higher risk (e.g. more susceptible to flooding such as in Lismore, New South Wales (O'Dell et al. 2023)) or in housing that is 'leakier' and allows easy smoke entry during fires. After a disaster, obtaining rental housing can be a greater challenge for those with less financial resources (O'Dell et al. 2023). Women who experience socio-economic disadvantage are more likely to have adverse birth outcomes related to bushfire smoke exposure (Nyadanu et al. 2024). This may be connected to these women being more likely experience other health risks such as having a poorer diet or being a smoker (Nguyen et al. 2023). Those with less social and financial resources may be unable to take actions like travelling interstate to family or friends or be able to get air filters, camping equipment, generators or caravans that may buffer the effects (Gribble et al. 2023a; Davis et al. 2024).

Disasters in Australia also occur in rural and remote areas where health services are less extensive and access to specialist pregnancy and neonatal care can be difficult to obtain (Parayiwa et al. 2022; UNICEF 2023). Pregnant women and new mothers in rural and remote areas should therefore also be considered as more vulnerable in disasters because of the lack of breadth and depth in health services available to them. Enhanced training should be provided to maternal and child health staff in these areas with dedicated, targeted resources for rural and remote areas (Hine et al. 2023). Family and child health nurses also identify women with a disability or pre-existing health challenges, Indigenous women, young mothers, women with partners who are incarcerated and women experiencing domestic violence as needing additional support in emergencies (Hine et al. 2023).

Improving emergency management for pregnant women and new mothers

The concept of intersectionality assists in the consideration of the specific needs of pregnant women and new

mothers. Intersectionality highlights the ways in which different systems of inequality interact with one another (Bastos et al. 2018). It is known that women can be disproportionately affected by disasters (Chowdhury et al. 2022) and that pregnancy and caring for children makes these events more challenging. Through their intersectional status as both women and parents, mothers face compounded disadvantage. This is magnified for mothers of infants due to the intense care needs and because they are overwhelmingly the infant's primary caregiver. Article 25 of the Universal Declaration of Human Rights states that, 'Motherhood and childhood are entitled to special care and assistance' (United Nations 1948, p.76). It is clear that improvement in Australia's disaster and emergency management is needed to ensure appropriate support to pregnant women and new mothers.

In Australia, there is still lack of knowledge by governments as to the experiences and needs of pregnant women and new mothers and this prevents adequate emergency planning and response. The usual methods of information gathering post-disaster have not engaged well with these women nor those supporting them. For example, of the 1,400 submissions made to the 2020 Royal Commission into Natural Disaster Arrangements, there were just 2 short submissions from women pregnant at the time and 2 from mothers of infants. No organisation or expert submission focused on the experiences and needs of pregnant women and only a handful had substantial content on the needs and experiences of infants and their caregivers (most mentions of children were incidental). The needs of pregnant women and new mothers in disasters, their suffering and the dangers they and their children faced are largely invisible in this inquiry.

The Australian Breastfeeding Association has information about preparedness for families.

Image: Australian Breastfeeding Association

It is notable that while there were 27 academic publications providing information on the experiences of pregnant women in disasters in Australia identified for this review there was limited breadth and depth in the research. Most of these studies focused on pregnancy, birth or child outcomes. Very few addressed the personal experiences of pregnant women, what their support needs were and how to provide them with support. One-quarter of these publications (6) were from a single study. Similarly, there were very few publications on the experiences of mothers of infants during disasters. However, it is encouraging that since the 2019–20 bushfires there have been significant pieces of research on the experiences and needs of pregnant women and new mothers by Davis et al. (2024), Gribble et al. (2023a) and Hine et al. (2023).

There is evidence of a growing awareness. The Australian National Breastfeeding Strategy (COAG Health Council 2019) includes as a priority action that a national policy be developed on infant and young child feeding in emergencies and that breastfeeding support be available to mothers experiencing in emergencies. In addition, the Australian Institute for Disaster Resilience *Evacuation Planning Handbook* includes content on supporting pregnant women and new mothers (Australian Institute for Disaster Resilience 2023). Finally, the Australian Government has funded initiatives by Emerging Minds (2024) and the Australian Breastfeeding Association (2024a, 2024b) to develop resources for caregivers of infants during disasters. However, there are no similar initiatives for pregnant women.

Conclusion

This review revealed that pregnancy and new motherhood profoundly affect women's experiences during disasters. In order to assist these women and their children, support must be provided. While progress has been made and awareness is increasing, further research and specific planning and resource development will improve this situation especially if these improvements take account for the particular needs of pregnant women and mothers with infants.

References

ACT Government (2021) Service Standard 3.1.12 Pregnancy and Safe Work. https://esa.act.gov.au/sites/default/files/2021-09/3.1.12%20Pregnancy%20and%20Safe%20Work%20Service%20Standard%20%282021%29.pdf

Australian Breastfeeding Association (2024a) Emergency resources for babies and toddlers. ABA website www.breastfeeding.asn.au/emergency-resources-babies-and-toddlers, accessed 22 November 2024.

Australian Breastfeeding Association (2024b) Supporting families in emergencies. ABA website www.breastfeeding.asn.au/supporting-families-emergencies, accessed 22 November 2024.

Australian Institute for Disaster Resilience (2023) *Evacuation Planning.* https://knowledge.aidr.org.au/media/10505/handbook_evacuation_planning_2023.pdf

Bastos JL, Harnois CE and Paradies YC (2018) 'Health care barriers, racism, and intersectionality in Australia', *Social Science and Medicine,* 199:209–218. https://doi.org/10.1016/j.socscimed.2017.05.010

Beyene T, Murphy VE, Gibson PG, McDonald VM, van Buskirk J, Holliday EG, Vertigan AE, Horvat JC, Zosky GR, Morgan GG, Jegasothy E, Hanigan I, Mattes J, Collison AM and Jensen ME (2022) 'The impact of prolonged landscape fire smoke exposure on women with asthma in Australia', *BMC Pregnancy Childbirth,* 22:919. https://doi.org/10.1186/s12884-022-05231-8

Beyene T, Zosky GR, Gibson PG, McDonald VM, Holliday EG, Horvat JC, Vertigan AE, van Buskirk J, Morgan GG, Jegasothy E, Hanigan I, Murphy VE and Jensen ME (2023) 'The impact of the 2019/2020 Australian landscape fires on infant feeding and contaminants in breast milk in women with asthma', *International Breastfeeding Journal,* 18(1):13. https://doi.org/10.1186/s13006-023-00550-8

Brew BK, Donnolley N, Henry A, Dahlen H, Jalaludin B and Chambers GM (2022) 'Double jeopardy-pregnancy and birth during a catastrophic bushfire event followed by a pandemic lockdown, a natural experiment', *Environmental Research,* 214(1):113752. https://doi.org/10.1016/j.envres.2022.113752

Carte, E, Chan JK, Chang EP, Carburn K, Dudgeon P, Elliot E, O'Dell A, Rego N and Thomas S (2024) *Flood Response and Recovery in Fitzroy Crossing Needs Assessment,* Marninwarntikura Women's Resource Centre, Royal Far West, UNICEF Australia. https://cbpatsisp.com.au/wp-content/uploads/2024/08/2023-Flood-Response-and-Recovery-in-Fitzroy-Crossing-Needs-Assessment.pdf

Chen T, laplante DP, Elgbeili G, Brunet A, Simcock G, Kildea S and King S (2020) 'Coping During Pregnancy Following Exposure to a Natural Disaster: The QF2011 Queensland Flood Study', *Journal of Affective Disorders,* 273:341–349. https://doi.org/10.1016/j.jad.2020.03.165

Cherbuin N, Bansal A, Dahlstrom JE, Carlisle H, Broom M, Nanan R, Sutherland S, Vardoulakis S, Phillips CB, Peek MJ, Christensen BK, Davis D and Nolan CJ (2024) 'Bushfires and Mothers' Mental Health in Pregnancy and Recent Post-Partum', *International Journal of Environmental Research and Public Health,* 21(1):7. https://doi.org/10.3390/ijerph21010007

Chowdhury TJ, Arbon P, Kako M, Muller R, Steenkamp M and Gebbie K (2022) 'Understanding the experiences of women in disasters: lessons for emergency management planning', *Australian Journal of Emergency Management,* 37(1):72–77. http://www.doi.org/10.47389/37.1.72

COAG Health Council (2019) *Australian National Breastfeeding Strategy: 2019 and beyond.* Department of Health, Disability and Ageing website www.health.gov.au/resources/publications/australian-national-breastfeeding-strategy-2019-and-beyond?language=en, accessed 26 November 2024.

Commonwealth of Australia (2018) *National Disaster Risk Reduction Framework,* Canberra, Commonwealth of Australia. www.homeaffairs.gov.au/emergency/files/national-disaster-risk-reduction-framework.pdf

Commonwealth of Australia (2020) *Royal Commission into National Natural Disaster Arrangements Report.* Royal Commissions website www.royalcommission.gov.au/natural-disasters/report, accessed 26 November 2024.

Cutter SL (2017) 'The forgotten casualties redux: Women, children, and disaster risk', *Global Environmental Change,* 42:17–121. https://doi.org/10.1016/j.gloenvcha.2016.12.010

Dancause KN, Mutran D, Elgbeili G, Laplante DP, Kildea S, Stapleton H, McIntyre D and King S (2017) 'Dietary change mediates relationships between stress during pregnancy and infant head circumference measures: the QF2011 study', *Maternal and Child Nutrition,* 13:e12359. https://doi.org/10.1111/mcn.12359

Davis D, Barnes K, Williamson R, Behie AM, Phillips C, Aroni R, Roberts C, Kurz E, Schoenake D and Nolan CJ (2024) 'Pregnant women's experiences of extreme exposure to bushfire associated smoke: a qualitative study', *Environmental Research: Health,* 2:015003. https://doi.org/10.1088/2752-5309/ad0d7d

Davis D, Roberts C, Williamson R, Kurz E, Barnes K, Behie AM, Aroni R, Nolan CJ and Phillips C (2023) 'Opportunities for primary health care: a qualitative study of perinatal health and wellbeing during bushfire crises', *Family Practice,* 40(3):458–464. https://doi.org/10.1093/fampra/cmac133

Department of Health (n/d) Managing health conditions during cyclone season. Department of Health website www.healthywa.health.wa.gov.au/Articles/J_M/Managing-health-conditions-during-cyclone-season, accessed 26 November 2024.

Duffy C (26 December 2023) Pregnant Holloways Beach mum and toddler rescued by surf life savers (online). *Cairns Post* website https://archive.md/cd3O0, accessed 9 October 2025.

Elson D (2017) 'Recognize, Reduce, and Redistribute Unpaid Care Work: How to Close the Gender Gap', *New Labor Forum,* 26(2):52–61. https://doi.org/10.1177/1095796017700135

Emerging Minds (2024) Supporting infants and children in disasters: a practice guide. Emerging Minds website https://emergingminds.com.au/practitioners/supporting-infants-and-children-in-disasters-a-practice-guide, accessed 26 November 2024.

Enarson E (2012) *Women confronting natural disaster: from vulnerability to resilience,* Boulder, Lynne Rienner Publishers.

Evans J, Bansal A, Schoenaker DAJM, Cherbuin N, Peek MJ and Davis DL (2022) 'Birth outcomes, health, and health care needs of childbearing women following wildfire disasters: an integrative, state-of-the-science review', *Environmental Health Perspectives,* 130:086001. https://doi.org/10.1289/ehp10544

Feng S (26 March 2019) Cyclone Veronica heralds baby boom in WA's Pilbara, with five bubs born in 24 hours (online). *ABC News* website www.abc.net.au/news/2019-03-26/cyclone-veronica-heralds-local-baby-boom/10937718, accessed 22 November 2022.

Foo D, Stewart R, Heo S, Dhamrait G, Choi HM, Song Y and Bell ML (2024) 'Wildfire smoke exposure during pregnancy and perinatal, obstetric, and early childhood health outcomes: A systematic review and meta-analysis', *Environmental Research,* 241:117527. https://doi.org/10.1016/j.envres.2023.117527

Greenhalgh T, Thorne S and Malterud K (2018) 'Time to challenge the spurious hierarchy of systematic over narrative reviews?', *European Journal of Clinical Investigation,* 48(6):e12931. https://doi.org/10.1111/eci.12931

Gribble K, Hamrosi M and Tawia S (2023a) 'Want to help the children? Help the parents': challenges and solutions from the Babies and Young Children in the Black Summer (BiBS) Study', Western Sydney University. https://doi.org/10.26183/ggeh-p937

Gribble K, Peterson M and Brown D (2019) 'Emergency preparedness for infant and young child feeding in emergencies (IYCF-E): an Australian audit of emergency plans and guidance', *BMC Public Health,* 19:1278. https://doi.org/10.1186/s12889-019-7528-0

Gribble KD, Hamrosi M and Tawia S (2024) 'Experiences and support for caregivers of infants and young children: 2019–20 bushfires', *Australian Journal of Emergency Management,* 39(4):34–41. https://doi.org/10.47389/39.3.34

Gribble KD, Smith JP, Gammeltoft T, Ulep V, van Esterik P, Craig L, Pereira-Kotze C, Chopra D, Siregar A, Hajizadeh M and Mathisen R (2023b) 'Breastfeeding and infant care as 'sexed' care work: reconsideration of the Three Rs to enable women's rights, economic empowerment, nutrition and health', *Frontiers in Global Women's Health,* 11:1181229. https://doi.org/10.3389/fpubh.2023.1181229

Hamrosi M and Gribble K (2025) 'General practitioner disaster support for pregnant women, new mothers, infants and young children: Findings from the Babies and Young Children in the Black Summer (BiBS) study', *Australian Journal for General Practitioners,* 54(1–2):34–40. https://doi.org/10.31128/ajgp-06-24-7311

Hine RH, Mitchell E, Whitehead-Annett L, Duncan Z and McArdle A (2023) 'Natural disasters and perinatal mental health: what are the impacts on perinatal women and the service system?', *Journal of Public Health,* 32:805–812. https://doi.org/10.1007/s10389-023-01855-y

Hsieh H-F and Shannon SE (2005) 'Three approaches to qualitative content analysis', *Qualitative Health Research,* 15(9):1277–1288. https://doi.org/10.1177/1049732305276687

Jegasothy E, Randall DA, Ford JB, Nippita TA and Morgan GG (2022) 'Maternal factors and risk of spontaneous preterm birth due to high ambient temperatures in New South Wales, Australia', *Paediatric and Perinatal Epidemiology,* 36(1):4–12. https://doi.org/10.1111/ppe.12822

Kildea S, Simcock G, Liu A, Elgbeili G, Laplante DP, Kahler A, Austin M-P, Tracy S, Kruske S, Tracy M, O'Hara MW and King S (2018) 'Continuity of midwifery carer moderates the effects of prenatal maternal stress on postnatal maternal wellbeing: the Queensland flood study', *Archives of Women's Mental Health,* 21:203–214. https://doi.org/10.1007/s00737-017-0781-2

Kumar R, Eftekhari P and Gould GS (2021) 'Pregnant Women Who Smoke May Be at Greater Risk of Adverse Effects from Bushfires', *International Journal of Environmental Research and Public Health,* 18. https://doi.org/10.3390/ijerph18126223

Lomauro A and ALiverti A (2015) 'Respiratory physiology of pregnancy: physiology masterclass', *Breathe,* 11(4):297–301. https://doi.org/10.1183/20734735.008615

Mays N, Pope C and Popay J (2005) 'Systematically reviewing qualitative and quantitative evidence to inform management and policy-making in the health field', *Journal of Health Services Research and Policy,* 10:6–20. https://doi.org/10.1258/1355819054308576

McLean MA, Cobham VE, Simcock G, Lequertier B, Kildea S and King S (2021) 'Childhood Anxiety: Prenatal Maternal Stress and Parenting in the QF2011 Cohort', *Child Psychiatry and Human Development,* 52:389–398. https://doi.org/10.1007/s10578-020-01024-2

McLean MA, Simcock G, Elgbeili G, Laplante DP, Kildea S, Hurrion E, Lequertier B, Cobham VE and King S (2020) 'Disaster-related prenatal maternal stress, and childhood HPA-axis regulation and anxiety: the QF2011 Queensland Flood Study', *Psychoneuroendocrinology,* 118:104716. https://doi.org/10.1016/j.psyneuen.2020.104716

Murphy VE, Karmaus W, Mattes J, Brew BK, Collison A, Holliday E, Jensen ME, Morgan GG, Zosky GR, McDonald VM, Jegasothy E, Robinson PD and Gibson PG (2021) 'Exposure to Stress and Air Pollution from Bushfires during Pregnancy: Could Epigenetic Changes Explain Effects on the Offspring?', *International Journal of Environmental Research and Public Health,* 18(14):7465. https://doi.org/10.3390/ijerph18147465

Newby R (7 December 2018) Floods, cyclones bring sickness threat to babies [Online]. USC website www.usc.edu.au/about/unisc-news/news-archive/2018/december/floods-cyclones-bring-sickness-threat-to-babies, accessed 22 November 2024.

Newby RM, Brodribb W and Davies PSW (2012) 'Infant and young child feeding during Queensland's summer of disasters: challenges and outcomes', *Australasian Medical Journal,* 5(12):675.

Nyadanu SD, Foo D, Pereira G, Mickley LJ, Feng X and Bell ML (2024) 'Short-term effects of wildfire-specific fine particulate matter and its carbonaceous components on perinatal outcomes: a multicentre cohort study in New South Wales, Australia', *Environment International,* 191:109007. https://doi.org/10.1016/j.envint.2024.109007

Nguyen B, Smith J, Clare P, Phongsavan P, Cranney L and Ding D (2023) 'Sixteen-year trends in multiple lifestyle risk behaviours by socioeconomic status from 2004 to 2019 in New South Wales, Australia', *PLOS Global Public Health,* 3:e0001606. https://doi.10.1371/journal.pgph.0001606

O'Dell A, Clancy V, Eagland S, Iellamo T and Anicich F (2023) *2022 Flood Response and Recovery Children's Needs Assessment,* Royal Far West, UNICEF. www.royalfarwest.org.au/wp-content/uploads/2023/02/2022_FloodResponseRecovery_LoRes.pdf

O'Donnell MH and Behie AM (2013) 'Effects of bushfire stress on birth outcomes: a cohort study of the 2009 Victorian Black Saturday bushfires', *International Journal of Disaster Risk Reduction,* 5:98–106. https://doi.org/10.1016/j.ijdrr.2013.08.002

Paquin V, Elgbeili G, Laplante DP, Kildea S and King S (2021) 'Positive cognitive appraisal "buffers" the long-term effect of peritraumatic distress on maternal anxiety: The Queensland Flood Study', *Journal of Affective Disorders,* 278:5–12. https://doi.org/10.1016/j.jad.2020.09.041

Parayiwa C, Harley D, Clark R, Behie A and Lal A (2022) 'Association between severe cyclone events and birth outcomes in Queensland, Australia, 2008–2018: a population based retrospective cohort study', *Australian and New Zealand Journal of Public Health,* 46(6):835–841. https://doi.org/10.1111/1753-6405.13273

Parayiwa C, Harley D, Richardson A and Behie A (2023) 'Severe cyclones and sex-specific birth outcomes in Queensland, Australia: An interrupted time-series analysis', *American Journal of Huma Biology,* 35:e23846. https://doi.org/10.1002/ajhb.23846

Parkinson D (2017) 'Investigating the increase in domestic violence post disaster: an Australian case study', *Journal of Interpersonal Violence,* 34:2333–2362. https://doi.org/10.1177/0886260517696876

Parkinson D and Zara C (2013) 'The hidden disaster: domestic violence in the aftermath of natural disaster', *Australian Journal of Emergency Management,* 28(2):28–35. https://knowledge.aidr.org.au/media/2297/ajem-28-02-09.pdf

Pascoe Leahy C and Gay C (2023) 'Care and crisis: disaster experiences of Australian parents since 1974', *History of the Family,* 29:131–156. https://doi.org/10.1080/1081602X.2023.2278161

Roberts C, Rasmussen ML, Allen LH and Williamson R (2023) *Reproduction, kin and climate crisis: making bushfire babies,* Bristol University Press. https://doi.org/10.46692/9781529226874

Rodney R, Macleod E and Calear A (2023) *Human effects of the 2019-20 bushfire season on the community of the Australian Capital Territory,* Australian National University. www.actsoe2023.com.au/wp-content/uploads/2023/10/Human-Effects-of-the-2019-20-Bushfire-Season-on-the-Community-of-the-Australian-Capital-Territory.pdf

Rourke A (3 February 2011) Queensland baby arrives in cyclone Yasi shelter (online). *The Guardian* website www.theguardian.com/world/2011/feb/03/queensland-baby-cyclone-yasi-shelter, accessed 22 Novermber 2022.

Royal Australian and New Zealand College of Obstetricians and Gynaecologists (2020) Submission 30: Inquiry into yhe Health Impacts of Exposure to Poor Levels of Air Quality Resulting from Bushfires and Drought. www.parliament.nsw.gov.au/lcdocs/submissions/67372/0030%20Royal%20

Australian%20and%20New%20Zealand%20College%20of%20Obstetricians%20and%20Gynaecologists%20(RANZCOG).pdf

Simcock G, Kildea S, Kruske S, Laplante DP, Elgbeili G. and King S (2018) 'Disaster in pregnancy: midwifery continuity positively impacts infant neurodevelopment, QF2011 study', *BMC Pregnancy and Childbirth,* 18:309. https://doi.org/10.1186/s12884-018-1944-5

Smith E, Burkle FM, Gebbie K, Ford D and Bensimon C (2018) 'Acceptable Limitations on Paramedic Duty to Treat During Disaster: A Qualitative Exploration', *Prehospital and Disaster Medicine,* 33:466–470. https://doi.org/10.1017/s1049023x18000857

Soma-Pillay P, Nelson-Piercy C, Tolppanen H and Mebazaa A (2016) 'Physiological changes in pregnancy', *Cardiovascular Journal of Africa,* 27:89–94.

Sordillo EM and Polsky B (2010) 'Infections in Pregnancy', *Principles of Gender Specific Medicine,* 17. https://doi.org/10.1016/B978-0-12-374271-1.00047-2

Stevenson DA (2020) *Submission to the Royal Commission into National Natural Disaster Arrangements number NND.001.00957.* Trove website https://webarchive.nla.gov.au/awa/20211005052337/https://naturaldisaster.royalcommission.gov.au/submissions/published-submissions, accessed 22 November 2024.

Sun S, Weinberger KR, Yan M, Brooke Anderson G and Wellenius GA (2020) 'Tropical cyclones and risk of preterm birth: a retrospective analysis of 20 million births across 378 US counties', *Environment International,* 140:105825. https://doi.org/10.1016/j.envint.2020.105825

Topsfield J (4 January 2020) Families stuck in Mallacoota after Navy ships discouraged children under 5 (online). *The Age* website www.theage.com.au/national/victoria/families-stuck-in-mallacoota-after-navy-ships-discouraged-children-under-5-20200104-p53otm.html, accessed 22 November 2024.

UNICEF (2023) *Fitzroy Crossing Policy Brief,* UNICEF.

United Nations (1948) Universal Declaration of Human Rights. UN website www.un.org/en/about-us/universal-declaration-of-human-rights, accessed 20 October 2020.

UNDRR (United Nations Office for Disaster Risk Reduction) (2015) *Sendai Framework for Disaster Risk Reduction 2015-2030*, Geneva, United Nations. UNDRR website www.undrr.org/publication/sendai-framework-disaster-risk-reduction-2015-2030, accessed 26 November 2024.

Walters C, West S and Nippita T (2018) 'Pelvic girdle pain in pregnancy', *Australian Journal of General Practice,* 47(7):439-443. https://doi.org/10.31128/AJGP-01-18-4467

Williamson R, Roberts C, Rasmussen ML, Dugdale P and Vardoulakis S (2023) *Infrastructures of care: pregnancy and birth during the 2019-20 bushfires.* https://healnetwork.org.au/wp-content/uploads/2023/04/HEAL2022-e-poster-Rebecca-Williamson.pdf

Woody CA, Ferrari AJ, Siskind DJ, Whiteford HA and Harris MG (2017) 'A systematic review and meta-regression of the prevalence and incidence of perinatal depression', *Journal of Affective Disorders,* 219:86–92. https://doi.org/10.1016/j.jad.2017.05.003

Yang Z, Huang W, McKenzie JE, Yu P, Wu Y, Xu R, Ye T, Ju K, Zhang Y, Huang Y, Guo Y and Li S (2024) 'The association of adverse birth outcomes with flood exposure before and during pregnancy in Australia: a cohort study', *The Lancet Planetary Health,* 8(8):e54–e563. https://doi.org/10.1016/S2542-5196(24)00142-6

Zara C, Parkinson D, Duncan A and Joyce K (2016) 'Men and disaster: Men's experiences of the Black Saturday bushfires and the aftermath', *Australian Journal of Emergency Management,* 31():40–48. AIDR website https://knowledge.aidr.org.au/resources/ajem-jul-2016-men-and-disaster-mens-experiences-of-the-black-saturday-bushfires-and-the-aftermath/, accessed 26 November 2024.

Zhang Y, Ye T, Yu P, Xu R, Chen G, Yu W, Song J, Guo Y and Li S (2023) 'Preterm birth and term low birth weight associated with wildfire-specific PM2.5: a cohort study in New South Wales, Australia, during 2016–2019', *Environment International,* 174:107879. https://doi.org/10.1016/j.envint.2023.107879

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Abstract

Queensland's exposure to high-risk weather events highlights the need to continuously review emergency communication practices. Between July 2023 and April 2024, Queensland faced 26 extreme weather events, including Tropical Cyclone Kirrily, which struck near Townsville in January 2024. This study assesses the alignment of 12 emergency alerts issued during Tropical Cyclone Kirrily in Queensland in January 2024 with the IDEA model (Internalisation, Distribution, Explanation, Action) and guidelines from the Australian Institute for Disaster Resilience. The alerts were assessed for their alignment with the IDEA model's elements and the clarity of the recommended actions for affected communities. They were systematically analysed to determine their effectiveness in providing timely and understandable messages, their level of personalisation and if they were disseminated through official channels. The findings revealed that the alerts exhibited deficiencies in the IDEA model's internalisation, explanation and action components.

Evaluating emergency alerts through the IDEA model: insights from Tropical Cyclone Kirrily

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Introduction

Queensland is regarded as Australia's 'most disaster-prone state' (Queensland Fire and Emergency Services 2023, p.19). Human activities and climate change increase the chances of emergencies and disasters as well as related dangers from severe weather events (Sloggy et al. 2021; Kankanamge 2021). Improving risk communication is vital to reduce harm, minimise injury and loss to individuals, and to make communities safer (Ogie et al. 2018; McLean and Ewart 2020).

From July 2023 to April 2024, Queensland experienced 26 extreme weather events including floods, bushfires, cyclones and their associated effects (Queensland Disaster Management Committee 2024). On 17 January 2024, Tropical Cyclone Kirrily developed in the Coral Sea. The cyclone reached its peak as a Category 3 system before making landfall roughly 50 km northwest of Townsville as a Category 2 cyclone on the evening of 25 January. The cyclone brought intense rainfall, caused extensive flooding, damaged infrastructure and resulted in power outages that affected 41 local government areas (Australian Associated Press 2024; Gurtner and King 2024; Queensland Disaster Management Committee 2024).

This study evaluates whether the emergency alerts issued from 24 to 26 January 2024 incorporated the essential principles of effective risk communication. To investigate this, the study used the IDEA model (Internalisation, Distribution, Explanation, Action) as described by Sellnow et al. (2017) to analyse the alerts. The IDEA model was chosen for its effectiveness in evaluating crisis messages that require clarity, relevance and actionable guidance. The analysis is informed by risk communication literature and the emergency alert guidelines established by the Australian Institute for Disaster Resilience (AIDR) (AIDR 2021a; 2021b; 2021c). This research is particularly

important for communities that are exposed to high-risk weather hazards. This study aimed to identify issues in the communication approaches used during these events. Improved risk communication enables people to make informed decisions and take appropriate actions for their protection (Sellnow et al. 2017; Sellnow-Richmond et al. 2018). This can reduce the potential for loss of life and property-related damage (Coombs 2018). The need for better risk communication is highlighted by the growing cultural diversity of communities in Australia (Ogie et al. 2018; Bromhead 2023) that have different levels of English proficiency (AIDR 2021a) and the influx of people to Queensland from interstate and overseas who may be unfamiliar with the locality's exposure to extreme weather (ABS 2021a; ABS 2024).

Literature review

Risk communication and the IDEA model

Communicators often face the challenge of advising at-risk individuals on the best self-protective actions to take during emergencies and crises (Coombs 2009; Sellnow-Richmond et al. 2018; Grantham 2023). Communicating risk is often met with societal or cognitive resistance, which can hinder the acceptance of the risks presented (Covello 2006). Over decades of scholarship, a clear pattern has emerged in the elements that shape risk communication. Several scholars emphasise message framing (Fischhoff 2017; Pidgeon 2021), timeliness (Balog-way et al. 2020; AIDR 2021a), source credibility (Mehta et al. 2017), risk perception (Ulmer et al. 2010; Slovic and Weber 2013) and 2-way public engagement (Balog-way et al. 2020; Lazarus 2024). However, effective risk communication is not limited to the dissemination of information (Coombs 2009) because receivers need to base their decisions on factual and instructional indications (Sellnow et al. 2017; Sellnow-Richmond et al. 2018). Literature on disaster warnings emphasises such a need. Individuals are unaware of what constitutes appropriate action during emergencies (Sellnow et al. 2017). Similarly, poorly framed and equivocal messages decrease risk communication effectiveness and undermine the source's credibility (Sellnow et al. 2017; Mehta et al. 2017; Lazarus 2024). Including instructions about appropriate actions during emergencies increases the effectiveness of communication as it empowers individuals to prioritise their personal safety (Sellnow et al. 2017). Despite this, an information-only approach is often adopted by communicators who may focus on providing scientific information about the risk or the number of people affected (Sellnow et al. 2017). Slovic (2010) suggests this approach decreases the effectiveness of the intended message. Although information is essential, relying solely on it is insufficient if communicators need to prompt action-taking from individuals (Sellnow et al. 2017). Sellnow and Sellnow's (2013) IDEA model encapsulates the above by offering a clear and effective framework for emergency alert creation (Sellnow et al. 2017; Sellnow-Richmond et al. 2018). The IDEA model is structured in 4 components of internalisation, distribution, explanation and action.

Internalisation aims to gain the audience's attention by explaining the significance of the imminent risk to current circumstances. This component has 3 elements of proximity, timeliness and personalisation. Proximity is when the message includes the geographical location of the risk and its effects on the audience. Timeliness includes the urgency of taking immediate action, conveying how imminent the risk may be. Personalisation specifies that the message must address the audience directly, detailing how the risk could personally affect them and those they care about. It must also use a language that resonates with the audience. Internalisation seeks to answer the question: 'How am I and those I care about affected (or potentially affected) and to what degree?' (Sellnow et al. 2017, p.555).

Distribution involves selecting communication channels that aim to make the message accessible to all segments of the affected population. Communicators should consider the audience's diversity and use the most appropriate and varied media to disseminate the message. 'Effective risk communicators must thoughtfully choose the media through which to share our messages to reach all segments of an at-risk population' (Sellnow and Sellnow 2013, p.3).

Explanation aims to provide a clear and straightforward account of the unfolding events in an easily presented and accessible way. Messages should be concise and free from scientific jargon, making them understandable to a broad and diverse audience. The explanations are issued by credible sources (experts, doctors, authorities) and include internalisation elements with an emphasis on personalisation (Sellnow and Sellnow 2013). This component aims to answer the question: 'What is happening, why and what are officials doing in response to it?' (Sellnow et al. 2017, pp.555–556).

Action indicates that when audience members comprehend the risk event and recognise its relevance to them, they seek guidance on how to minimise their personal risk (Sellnow and Sellnow, 2013). The message at this point needs to provide them with specific options and clear instructions to mitigate the risk. This component aims to answer the question: 'What specific actions should I and those I care about take (or not take) for self-protection?' (Sellnow et al. 2017, p.556).

Literacy and social capital

Social capital is acknowledged as it is vital to understand and enhance community resilience. The concept of social capital refers to the exchange of information and the building of trust, relationships and values among individuals, groups, families and communities within

a network for mutual benefit (Putnam 1994; McLean and Ewart 2020). Unlike physical capital (tools), human capital (skills and expertise) or economic capital (money), which can be tangible, concrete and often owned by individuals or communities, social capital is generated by the established bonds among people and exists abstractly (Coleman 1987; McLean and Ewart 2020; Behera 2023). The essence of social capital lies in the connections within a person's network that can be relied on during emergencies. Having a strong social network with other individuals in a community, local emergency services organisations or volunteers is considered crucial for individuals to be better placed during emergencies (McLean and Ewart 2020). Disaster literacy is an individual's capacity to interpret information to make informed decisions about mitigation, preparedness, response and recovery (Genc et al. 2022). It also involves adhering to instructions and choosing the best self-protecting actions to take (Genc et al. 2022). According to AIDR (2021a), 44% of people in Australia experience difficulties with numeracy and literacy in English (p.18). A significant portion of the population (30%) is at a level comparable to Year 7 to Year 10 education, and a further 38% are at a level equivalent to Years 11 and 12 (Equity Economics 2022; ABS 2013). Nearly 23% of the population uses a language other than English at home. This speaks to Australia's linguistic diversity, with more than 300 languages spoken in the country (ABS 2022). Consequently, ineffective or overly complex messages can deter individuals from making the best decisions during emergencies and severe weather events (Ogie et al. 2018; Grantham 2023). Therefore, considering Australia's demographics, cultural composition and language proficiency, effective communication during emergencies is crucial for policymakers and emergency services to minimise harm and damage to at-risk individuals and communities (Teo et al. 2019; McLean and Ewart 2020; Grantham 2023).

Method

The analysis of emergency alerts involved examining a dataset consisting of 12 alerts collected from the live dashboards as they were published by local government councils. This included 4 alerts on 24 January, 6 alerts on 25 January and 2 alerts on 26 January (Table 1). The focus was to identify whether the warnings satisfied the components of the IDEA model, particularly in terms of timeliness, message framing and personalisation as supported by the AIDR guidelines (AIDR 2021a; 2021b; 2021c) and risk communication literature.

The IDEA model definitions were drawn up as a codesheet. Using 2 researchers, 3 alerts were selected for a pilot coding process. This resulted in substantial similarity between the 2 coding outputs. However, there were differences in the interpretation of internalisation and action components. These were discussed, and the codesheet was updated to provide consistency in analysis. The pilot coding returned a Cohen's Kappa of 0.57, which is classified as moderate agreement. Upon clarification and further coding, the Cohen's Kappa was increased to 0.89, which is considered almost perfect agreement.

The alerts were analysed based on the 4 components of the model. For internalisation, the definition as outlined by the IDEA model was used, which looks at how the message holds attention by stressing the urgency of the risk. This included elements of proximity and timeliness that were marked as present or not. Proximity was marked as present when the geographical position of the cyclone was mentioned. Timeliness was marked as present if information regarding the movement of the cyclone was mentioned. The AIDR guidelines (AIDR 2021b) state that effective alerts must address critical details, including 'where the threat is, when it will occur, who will be affected, how they will be affected, what they can/

Table 1: Emergency alerts collected and analysed.

No.	Name	Date and time	Type
1	Whitsunday Islands	10 am – Wednesday, 24 January 2024	Full message
2	Gumlow, Townsville	12.15 pm – Wednesday, 24 January, 2024	Full message
3	Cungulla, Townsville	12.15 pm – Wednesday, 24 January, 2024	Full message
4	Saunders Beach, Townsville	12.15 pm – Wednesday, 24 January, 2024	Full message
5	Burdekin	12:42 pm – Thursday, 25 January 2024	Text message
6	Townsville	3.51 pm – Thursday, 25 January 2024	Text message
7	Whitsundays (Bowen and surrounds)	4.15 pm – Thursday, 25 January 2024	Text message
8	Hinchinbrook	5.22 pm – Thursday, 25 January 2024	Text message
9	Burdekin	6.20 pm – Thursday, 25 January 2024	Text message
10	Townsville	9.09 pm – Thursday, 25 January 2024	Text message
11	Townsville	6 am – Friday, 26 January 2024	Full message
12	Townsville	8:27 am – Friday, 26 January 2024	Text message

Source: Queensland Government Disaster Management at www.disaster.qld.gov.au/disaster-management-portal.

should do to respond' (p.6). Personalisation was assessed based on the alert delivering a personable message. This involves using simple, clear language such as 'shorter, more common words where possible, removing operational language or jargon (e.g. mention a fire truck rather than a fire appliance), using short, to-the-point sentence construction, and keeping instructions brief and specific' (AIDR 2021b, p.6). This guideline and scholarship made the element of personalisation another measure marked as present or not. If all parts of the internalisation definition were marked, then the alert 'satisfied' the element. If one or more elements were missing, then the component was categorised as 'not fully satisfied', and if no elements were marked, then the element was 'not satisfied'. This procedure was replicated for the other components.

Distribution was satisfied if the official channel for issuing the alerts was used, which was identified as issued by the local government councils via their respective dashboards. The analysis of this element was limited to the alert system, rather than the entire distribution network across the government. Therefore, the distribution element was always 'satisfied'.

The element of explanation was assessed as present if the message was clear and accessible by:

> *…ordering information so that the most critical information is first, providing instructions in a logical sequence. We particularly looked for where the alerts used headings to break up text and help people navigate to the information they require.*
> AIDR (2021b, p.6)

Finally, the element of action was assessed as satisfied if the message provided clear instructions to people on how 'to reduce their personal risk' (Sellnow and Sellnow, 2013, p.3). AIDR guidelines (2021 b, p.9) were used to determine the presence of elements of actions if the message 'provide targeted and tailored instructions to at-risk community members about what protective action(s) to take and why these protective actions are necessary', in line with Sellnow and Sellnow (2013) and Sellnow et al. (2017).

These elements are inherently intertwined with not only the IDEA model being the primary framework but also with the AIDR guidelines and research guiding this study. Combining these resources created a structured framework to evaluate the effectiveness of the alerts and to identify elements that may require enhancement.

Five alerts considered for the study, issued on 24 January 2024, were those found in the emergency alerts dashboard on the Queensland Government Disaster Management website. Community members could access these alerts via a link provided in text messages they received from the emergency services. The remaining 7 alerts were messages sent by the Queensland State Disaster Coordination Centre. Data collected was based on what was available to the researcher who was not at the location of the event. Table 1 lists the 12 alerts used in this study.

Based on the selected literature and methodology, this research responds to the following research question: 'Did emergency alerts issued during TC Kirrily in January 2024 adhere to key foundational elements of risk communication based on the IDEA model?'.

Ethics statement

Ethics approval was not required for this study as the data used was publicly available and no human subjects were involved in the study. However, analysis used work by Gurtner and King (2024) to conceptualise findings. Those authors provided permission to use the research data and findings.

Data analysis

Overview of findings

Table 2 summarises the analysis of the 12 emergency alerts and shows that only one alert fully satisfied the element of internalisation. The majority (11 alerts) failed to fully personalise or make the information relatable to the audience. When examining the element of distribution, all 12 alerts were issued by official channels, thus satisfying this component. The explanation component reveals that 6 of 12 alerts provided clear and understandable information. However, 6 alerts did not fully meet this standard in terms of explaining how the situation developed and in making the message personable.

For the action component, only one alert (Townsville 9.09 pm) satisfied the specific and actionable instructions requirement. The remaining 11 alerts did not meet this standard. This is a significant area for improvement.

Findings

Drawing from Table 2, the first alert analysed was issued by the Whitsunday Regional Council on 24 January (Figure 1). The explanation and distribution components were satisfied, given the message stated the development of the event and it was issued via the official local council dashboard. The internalisation and action components were not fully satisfied as the personalisation element was lacking and specific actions were omitted. This alert states, 'If you have medical needs or are visiting the area, leaving now is the safest option'. It seems to not be specific to the local population as it lacks options on where people can go and does not provide precise actions to take apart from 'prepare for isolation' or 'listen to the radio' and 'visit the dashboard website'. Similar conditions were found in the next 3 alerts issued by the Townsville Local Disaster Management Group for the local government areas of Gumlow, Cungulla and Saunders Beach.

Table 2: Summary of the analysis of human-generated alerts.

Alerts	Internalisation	Distribution	Explanation	Action
1) Whitsunday Islands, 10 am, Wednesday 24 January 2024 (full message)	Not fully satisfied	Satisfied	Satisfied	Not fully satisfied
2) Gumlow, Townsville, 12:15 pm, Wednesday 24 January 2024 (full message)	Not fully satisfied	Satisfied	Satisfied	Not fully satisfied
3) Cungulla, Townsville, 12.15 pm, Wednesday 24 January 2024 (full message)	Not fully satisfied	Satisfied	Satisfied	Not fully satisfied
4) Saunders Beach, Townsville, 12:15 pm, Wednesday 24 January 2024 (Full message)	Not fully satisfied	Satisfied	Satisfied	Not fully satisfied
5) Burdekin, 12:50 pm, Thursday 25 January 2024 (text message)	Not fully satisfied	Satisfied	Not fully satisfied	Not satisfied
6) Townsville, 3:51 pm, Thursday, 25 January 2024 (text message)	Not fully satisfied	Satisfied	Not fully satisfied	Not satisfied
7) Whitsundays, Bowen and surroundings, 4.15 pm, Thursday 25 January 2024 (text message)	Not fully satisfied	Satisfied	Not fully satisfied	Not satisfied
8) Hinchinbrook, 5.22 pm, Thursday 25 January 2024 (text message)	Not fully satisfied	Satisfied	Not fully satisfied	Not fully satisfied
9) Burdekin 6.20 pm, Thursday 25 January 2024 (text message)	Not fully satisfied	Satisfied	Not fully satisfied	Not satisfied
10) Townsville, 9.09 pm, Thursday 25 January 2024 (text message) cyclone crossing	Not fully satisfied	Satisfied	Satisfied	Satisfied
11) Townsville, 6 am, Friday 26 January 2024 (text message)	Not fully satisfied	Satisfied	Satisfied	Not fully satisfied
12) Townsville, 8:27 am, Friday 26 January 2024 (Text message)	Not fully satisfied	Satisfied	Not fully satisfied	Not fully satisfied

Source: Queensland Government Disaster Management at www.disaster.qld.gov.au/disaster-management-portal.

Explanation and distribution were satisfied in these instances, but internalisation and action lacked personalised messages and omitted specific actions to follow. These 3 alerts advised people to 'decide now where you will go' and 'prepare your home', which are general instructions. They also emphasise specific actions such as 'block toilets, sinks and drains with sandbags' or 'empty and turn off fridges and freezers'. Evacuation procedures and evacuation centres or shelters are indicated in the lower section of the message. Although being issued by different disaster management groups, 5 of the 6 alerts issued on 25 January (the day the cyclone made landfall) presented a similar approach (Figure 2). In this instance, the alerts were text messages sent by the Queensland State Disaster Coordination Centre via the number 0444 444 444. For these alerts, the elements of internalisation, explanation and action were not fully satisfied and distribution was satisfied. The alert for Whitsundays (Bowen and Surrounds), as appeared on mobile phones (Figure 2), includes general instructions like 'warn others, stay off roads and take shelter now', which were analysed as not specific enough. The alert for Whitsunday Islands at 10 am on 24 January includes 'leaving now is the safest option', while a more direct message could be, 'make arrangements to stay with family or friends away from the affected areas immediately'. This lack of personalisation and specific actions is consistent across the alerts related to Burdekin (x2), Townsville, Whitsundays (Bowen and Surrounds) and Hinchinbrook.

The alert issued for Hinchinbrook at 17:22 pm on 25 January was the only text message alert that mentioned evacuation centres. The alert issued at 9.09 pm on 25 January 2024 satisfied all the components. The alert warns of the risk associated with the cyclone's eye and adds that Tropical Cyclone Kirrily was making landfall, stressing the importance for people to stay sheltered unless advised otherwise. It said:

> *Severe Tropical Cyclone Kirrily is currently crossing the coast as a Category 3. Shelter in place and stay indoors until advised. Winds could stop suddenly if the eye of the cyclone goes over your area. Very dangerous winds could start again quickly.*

The last 2 alerts analysed were issued by Townsville Disaster Management Group on 26 January, the day after Tropical Cyclone Kirrily made landfall; one at 6 am and one at 8:27 am. The first alert indicated that the threat had passed and it was safe for people to leave their place of shelter. This message also advised people to be aware of fallen powerlines but did not instruct them on what to do if they encountered one. While distribution and explanation were satisfied, internalisation and action were not fully satisfied as the message could have included specific information and instructions about the most compelling hazards people could encounter and how to deal with them. The second message addresses residents directly and advises them to conserve water due to power outages. Lastly, the message explains why residents need to conserve water, but it does not provide an explanation of what was being done to restore access to water nor provides information on how long it is going to take to restore services.

PREPARE FOR ISOLATION - Whitsunday Islands - Tropical low as at 10am Wednesday 24 January 2024

Warning Level: Watch and Act

Warning Area: Hamilton Island, Hayman Island, Daydream Island

This warning is from: Whitsunday Regional Council

People in the Whitsunday Islands should PREPARE FOR ISOLATION by Wednesday 24 January by 5pm.

This estimate is based on when air and sea transport may be affected by severe weather.
Very strong winds and heavy rain from Tropical Low 05U is expected to cause significant damage and heavy rainfall around Cardwell to Airlie Beach.
This could cut off transport routes in and out for several days.
Help may not be able to reach you quickly when air and sea transport routes are cut.

Impacts:

Strong winds from the cyclone.
- Flash flooding and rising water in creeks and rivers. Floodwater can be very deep, rise quickly and move fast.
- Homes and buildings could be flooded in some places.
- Fallen trees and powerlines in some places.
- Power, water, sewerage and phone services could be lost in the area. They could be out for a long time.
- Roads or bridges could be flooded, closed or damaged.
- Landslides have happened in some places - watch out for fallen earth, rocks, debris or trees.

What you should do:

If you have special medical needs or are visiting the area, leaving now is the safest option.

Further Information:

For warnings, visit the Dashboard (whitsundayrc.qld.gov.au) website regularly.
- Listen to your local radio station.
- For weather information, visit the Bureau of Meteorology Queensland website.
- For power outage information, visit the Ergon website.
- For road closures, visit the QLD Traffic website or call 13 19 40.

The next update will be when the situation changes. If your life is in danger, call Triple Zero (000) immediately.

Figure 1: Emergency alert (full message) for Whitsunday Islands, 10 am on 24 January 2024.

Discussion

To make meaningful interpretations of the data, it is essential to associate the findings with the perspectives of people who have experienced the emergency firsthand. For this reason, while the following examples taken from trending social media applications are not part of the formal dataset used for analysis, their inclusion in the discussion serves a supplementary role. These examples

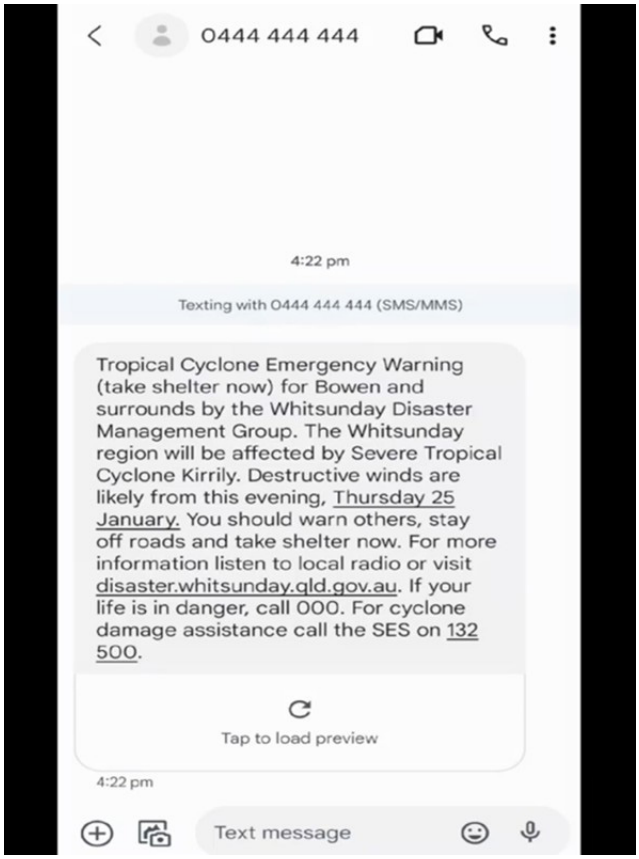

Figure 2: Emergency alert (text message) for Whitsundays, Bowen and surroundings on 25 January 2024.

were selected to provide real-world illustrations that contextualise the findings and offer practical relevance.

TikTok has become an important platform for authorities and communities to share, get information and organise during emergencies (Lewis and Grantham 2022; Stolero et al. 2024). Further examples are drawn from a survey following Tropical Cyclone Jasper in December 2023 and Tropical Cyclone Kirrily in January 2024 (Gurtner and King 2024). These examples demonstrate the broader applicability of the theoretical framework, allowing for a rich discussion of the data. Gurtner and King's (2024) survey received 267 responses (209 Tropical Cyclone Kirrily, 58 Tropical Cyclone Jasper) from people who experienced these events. The findings shed light on the need to improve communication, particularly related to warnings and evacuation (Gurtner and King 2024). An emergency alert delivering the intended internalisation element remains central to high effectiveness. Emphasising the proximity of the risk and the importance of timeliness increases the perceived personal effect (personalisation) of the risk by the receiver. Only the alert issued for Townsville at 21:09 came close to satisfying the components.

A common challenge for emergency communicators is getting the audience to internalise messages about risks

when the effects are not immediately apparent (Sellnow and Sellnow 2013). Although social media was not analysed in this study, it was observed that many Townsville residents used these platforms to express their concerns (Grantham 2025). For example, one TikTok video showed a woman at home with her child who commented about the unclear messages related to the expected landfall. This video has been removed from the platform, but the dynamics show the importance of emergency alerts, clearly conveying the proximity and relevance of the impending risk to the intended audience, as well as when they can expect it to affect them (Grantham 2025).

Gurtner and King (2024) reported that inaccurate and/or conflicting information could lead to complacency when similar alerts are issued in future events, affecting the risk perception and decreasing the overall effectiveness of the intended messages. Framing messages properly is also critical for effective alerts, as different people interpret the same indication differently (Fischhoff 2017). One of the respondents in Gurtner and King (2024) commented that the map that tracked Tropical Cyclone Kirrily led some people to panic when they saw the forecasted cyclone crossing line in their area. It also caused complacency for other people outside of the area. Crafting messages that indicate the best self-protective actions to take remains a challenge for communicators (Coombs 2009; Sellnow-Richmond et al. 2018) and is in line with this study's findings related to shortcomings in the explanation and action components. Gurtner and King (2024) also reported that people complained and suggested improvements concerning 'communication and information, especially in areas of warnings and evacuation' (p.31). Some respondents stated that warnings started too early and information was given too early or too late. This diluted the warning effectiveness. This also suggests that the alerts leading up to Tropical Cyclone Kirrily's landfall needed to be timed better despite satisfying the timeliness element of the internalisation component. This example shows the need for alerts to be personalised to the intended audience and is supported by research by Lazarus (2024), Mehta et al. (2017) and Sellnow et al. (2017) about the risk of alerts losing their credibility if not issued in a timely and clear manner with an action-prompting effect.

While the IDEA model provides a good framework to construct emergency messages, meeting the timeliness criterion does not necessarily guarantee that alerts will be issued at the appropriate time. In other words, although the IDEA model promotes the importance of timeliness, it does not inherently ensure that alerts will align with the critical timing required by the affected population. Timeliness is a feature of a message being personable. Another example of the importance of well-crafted alerts can be drawn from an Irish backpacker on her working holiday visa in Townsville expressing her concerns via her TikTok account about not knowing the actions and preparedness steps to take. This video was viewed and used as a practical example of real-world dynamics occurring. In the literature, disaster literacy is directly linked to the level of social capital people enjoy (McLean and Ewart 2020). Although emergency services organisations and Townsville Disaster Management Group sent text alerts, the lack of literacy and the relatively limited social capital of recently arrived migrants and travellers can hinder their understanding of the best self-protective actions to take (Teo et al. 2018; McLean and Ewart 2020).

Gurtner and King (2024) reported that family and friends were among the most important sources of information during Tropical Cyclone Kirrily. The nature of backpackers being away from their families and friends suggests they cannot rely on this network for information. Additionally, it is important that backpackers and tourists may move independently or be part of a group, potentially exacerbating their circumstances. What dynamics might have occurred if non-English speakers were present instead of an Irish national? And where can people with low social capital get this information if the official communications exclude this? In light of these questions, it is important that alerts consider the factors of potentially limited social capital. Queensland experienced significant migration and immigration and has increased its population by 2.64% in 2023, which equates to 140,426 people (ABS 2021a; ABS 2024; iD Community N/D). In particular, official data from the ABS (2021b; City of Townsville 2021) shows that in 2021, 14% of Townsville's population was born overseas and 39% of Townsville's overseas-born residents use a language other than English. This indicates that newcomers may not possess the same English literacy level and experience as locals.

Teo et al. (2019), Zahnow et al. (2019), AIDR (2021a) and Bromhead (2023) indicate that language barriers as well as limited social capital for overseas and interstate migrants increase a person's vulnerability during disasters. While the importance of well-crafted emergency alerts is pivotal to trigger the action-prompting effect desired, warnings rely on the audience's ability to understand and interpret the messages (Bartolucci et al. 2023). This emphasises the relevance of the internalisation component and the AIDR guidelines (AIDR 2021a) about delivering messages in a language that audiences can understand. The only alert satisfying internalisation was the alert issued at 21:09 on 25 January by Townsville because the function of this alert was to advise of Tropical Cyclone Kirrily conditions, which at that stage was crossing the coastline. There was nothing left to instruct or suggest because people had to stay in their place of shelter and wait for the cyclone to pass.

Analysis of the alerts revealed concerns regarding the brevity and lack of detailed, action-oriented instructions

in the text messages. As the data shows, the text message alerts from Burdekin (x2), Townsville, Whitsundays (Bowen and surroundings) and Hinchinbrook, apart from indicating to 'warn others, stay off roads and take shelter now', did not provide specific actions to take unless people clicked on the link provided. By accessing the full messages of the alerts, people were provided with detailed guidance on actions to take. However, as seen in the alerts from Whitsunday Islands, Gumlow, Cungulla, Saunders Beach and Townsville (x2), their effectiveness is questionable when considering the cognitive and emotional state of recipients. People experiencing stress, panic or fear often struggle to absorb detailed or lengthy information. Additionally, the AIDR guidelines suggest that 'community members may be reluctant to click on links received via text messages or emails for fear of scams' (AIDR 2021b, p.11). During such demanding moments, directing people to take additional steps could make communication less effective (Lazarus 2024). When an emergency requires a prompt response, people need clear, actionable instructions directly within the message. Sellnow et al. (2017) suggest it is unreasonable to make people navigate additional steps or click-throughs, resulting in delayed or improper actions. The post-cyclone Townsville alert issued at 6 am on 26 January does not provide specific instructions about what to do when encountering fallen powerlines, apart from advising people to call the authorities. Furthermore, since this was a full message rather than a text message, it raises questions about whether other 'full message' alerts provide the necessary instructions. Therefore, to answer the research question, this analysis showed that the alerts could have benefited from a close alignment to the IDEA model components, particularly Internalisation, Explanation and Action. This suggests that failure to satisfy such components is related to the messages not being personable and that the accuracy of the alerts is contingent on how close the threat is to the community. It is possible to observe this given that the final 3 alerts, one when the cyclone was crossing the area and 2 when it had passed, satisfied all the components, although with a few considerations. Based on the IDEA model, distribution was satisfied given that the alerts provided external links, such as the local disaster dashboard, the Bureau of Meteorology website or Queensland Fire and Emergency Services website, as well as encouraged people to listen to the local radio for updates, and they were issued and available for perusal via a trustworthy and consistent channel.

Conclusions

This study examined the effectiveness of emergency alerts issued during Tropical Cyclone Kirrily in Queensland. Through applying the IDEA model, this research provides insights into ways to improve the effectiveness of emergency alerts. The analysis of the alerts based on the IDEA model revealed that while these messages successfully distributed information through trusted channels, they often lacked the necessary personalisation and actionable guidance to motivate the public to take appropriate protective measures. The findings demonstrate that most alerts failed to fully internalise the risk for the intended audience, potentially leading to confusion and uncertainty.

The study did not specifically consider the unique communication methods and cultural nuances of local Indigenous communities, such as the people of Palm Island who were affected by Tropical Cyclone Kirrily. Indigenous cultures have distinct communication styles and channels that differ from mainstream approaches. This aspect could be the focus of future research requiring face-to-face interviews to gather important insights into risk communication effectiveness within these communities.

While the study acknowledged the importance of 2-way communication, community engagement and risk perception, it did not incorporate these aspects into the research methodology. This decision was influenced by logistical constraints, including the need for ethical approval to conduct interviews to gather firsthand perspectives from community members.

This study incorporated TikTok examples to offer practical examples of the dynamics that occur using real anecdotes to illustrate concepts. These examples bring attention to the role of limited social capital and disaster literacy among tourists, effectively corroborating the analysis. However, given that this serves as an example only, it was not formally analysed.

Finally, it is acknowledged that other models or theories could have been used to develop this study. Future research could apply such models to investigate similar problems through different lenses.

References

ABS (Australian Bureau of Statistics) (2021a) Queensland 2021 Census All Persons QuickStats. ABS website www.abs.gov.au/census/find-census-data/quickstats/2021/3, accessed 10 October 2024.

ABS (Australian Bureau of Statistics) (2021b) Townsville: 2021 Census All Persons QuickStats. Latest release. ABS website https://abs.gov.au/census/find-census-data/quickstats/2021/318, accessed 9 October 2024.

ABS (Australian Bureau of Statistics) (2022) Cultural diversity of Australia. ABS website www.abs.gov.au/articles/cultural-diversity-australia, accessed 9 October 2024.

ABS (Australian Bureau of Statistics) (2024) Statistics about the population and components of change (births, deaths, migration) for Australia's capital cities and regions. ABS

website www.abs.gov.au/statistics/people/population/regional-population/latest-release#queensland, accessed 9 October 2024.

ABS (Australian Bureau of Statistics) (2013) *Programme for the International Assessment of Adult Competencies, Australia,* catalogue number 4228.0. ABS website www.abs.gov.au/statistics/people/education/programme-international-assessment-adult-competencies-australia/latest-release, accessed 5 June 2024.

AIDR (2021a) Public information and warnings. AIDR website https://knowledge.aidr.org.au/media/9104/aidr_handbookcollection_publicinfoandwarnings_2021.pdf

AIDR (2021b) Guideline 1: Warning Message Construction: Choosing your words. www.aidr.org.au/media/9105/aidr_choosingyourwords_companion_2021.pdf

AIDR (2021c) Australian Warning System. https://knowledge.aidr.org.au/media/9105/aidr_australian-warning-system_companion_2022-03-11_v12_web.pdf

Australian Associated Press (27 January 2024) *Nearly 50,000 still without power in Townsville in wake of ex-Tropical Cyclone Kirrily as clean-up begins. The Guardian* website www.theguardian.com/australia-news/2024/jan/27/nearly-50000-still-without-power-in-townsville-in-wake-of-ex-tropical-cyclone-kirrily-as-clean-up-begins, accessed 20 September 2024.

Balog-Way D, McComas K and Besley J (2020) 'The evolving field of risk communication', *Risk Analysis,* 40(10):2240–2262. https://doi.org/10.1111/risa.13615

Behera JK (2023) 'Role of social capital in disaster risk management: A theoretical perspective in special reference to Odisha, India', *International Journal of Environmental Science and Technology,* 20(4):3385–3394. https://doi.org/10.1007/s13762-021-03735-y

Bromhead H (2023) 'Making messages effective for all: South East Queensland flood warnings and alerts', *Australian Journal of Emergency Management,* 38(4):40–46. https://knowledge.aidr.org.au/resources/ajem-october-2023-making-messages-effective-for-all-south-east-queensland-flood-warnings-and-alerts/

City of Townsville (2021) 2021 Census results: City of Townsville. www.townsville.qld.gov.au/__data/assets/pdf_file/0014/12092/Community-profile-City-of-Townsville.pdf

Coleman JS (1987) 'Social Capital in the Creation of Human Capital', *American Journal of Sociology,* 94. https://doi.org/10.1086/228943

Covello VT (2006) 'Risk communication and message mapping: A new tool for communicating effectively in public health emergencies and disasters', *Journal of Emergency Management,* 4(3):25-40. http://dx.doi.org/10.5055/jem.2006.0030

Coombs WT (2009) 'Conceptualizing crisis communication', in RL Heath and HD O'Hair (Eds.), *Handbook of Risk Communication,* 99–118. New York, Routledge

Coombs WT (2018) 'Crisis communication', in R. P. Gephart Jr., C. C. Miller, & K. S. Helgesson (Eds.), *The Routledge companion to risk, crisis and emergency management* (pp.49–66). Routledge.

Equity Economics (2022) Submission to the Productivity Commission Inquiry into the National School Reform Agreement: Improving Literacy Outcomes in Australia. Department of Education. Equity Economics website www.equityeconomics.com.au/report-archive/submission-to-the-productivity-commission-inquiry-into-the-national-school-reform-agreement, accessed 10 October 2024.

Fischhoff B (2017) 'Breaking ground for psychological science: The U.S. Food and Drug Administration', *American Psychologist,* 72(2):118–125. https://psycnet.apa.org/record/2017-07146-002

Genc FZ, Yildiz S, Kaya E and Bilgili N (2022) 'Disaster literacy levels of individuals aged 18–60 years and factors affecting these levels: A web-based cross-sectional study', *International Journal of Disaster Risk Reduction,* 76:102991. https://doi.org/10.1016/j.ijdrr.2022.102991

Grantham S (2023) '#bnefloods: An analysis of the Queensland Government media conferences during the 2022 Brisbane floods', *Australian Journal of Emergency Management,* 38(2):42-48. http://www.doi.org/10.47389/38.2.42

Grantham S (2025) 'Balancing tradition and technology: The evolving role of crisis communication during tropical cyclone (TC) weather events', *The Communication Review,* 1–26. https://doi.org/10.1080/10714421.2025.2545677

Gurtner Y and King D (2024) 'Cyclone and Flood Post Disaster Surveys: Cyclone Jasper December 2023 and Cyclone Kirrily January 2024'. Centre for Disaster Studies, James Cook University. www.jcu.edu.au/__data/assets/pdf_file/0009/2163339/Online-Community-Surveys-in-Response-to-Cyclones-Jasper-and-Kirrily-2024.pdf

iD Community (n.d.) Australia community profile, Population estimates, Queensland. Idcommunity website https://profile.id.com.au/australia/population-estimate?WebID=120&BMID=42, accessed 5 September 2024.

Kankanamge N, Yigitcanlar T and Goonetilleke A (2021) 'Public perceptions on artificial intelligence driven disaster management: Evidence from Sydney, Melbourne and Brisbane', *Telematics and Informatics,* 65:101729. https://doi.org/10.1016/j.tele.2021.101729

Lazarus R (2024) 'Mediating emergencies: Defining the relationship between intimate and

distant disaster communication models', *Media, Culture & Society,* 46(4):798–815. https://doi.org/10.1177/01634437231217655

Lewis M and Grantham S (2022) 'From Fork Hands to Microchips: An Analysis of Trending# Covidvaccine Content on Tiktok', *International Journal of Communication,* 16:24. https://ijoc.org/index.php/ijoc/article/view/18972

McLean H and Ewart J (2020) *Political leadership in disaster and crisis communication and management: international perspectives and practices.* Palgrave Macmillan.

Mehta AM, Bruns A and Newton J (2017) 'Trust, but verify: social media models for disaster management', *Disasters,* 41(3):549–565. https://doi.org/10.1111/disa.12218

Ogie RI, Rho JC and Clarke RJ (2018) 'Artificial Intelligence in Disaster Risk Communication: A Systematic Literature Review', *2018 5th International Conference on Information and Communication Technologies for Disaster Management* (ICT-DM), Sendai, Japan, 2018, pp.1–8. https://ieeexplore.ieee.org/document/8636380

Pidgeon N (2021) 'Engaging publics about environmental and technology risks: frames, values and deliberation', *Journal of Risk Research,* 24(1):28–46. https://doi.org/10.1080/13669877.2020.1749118

Putnam RD (1994) 'Social Capital and Public Affairs', *Bulletin of the American Academy of Arts and Sciences,* 47(8):5–19. https://doi.org/10.2307/3824796

Queensland Disaster Management Committee (2024) Annual Report 2023-24. Queensland Government. www.disaster.qld.gov.au/__data/assets/pdf_file/0021/502653/queensland-disaster-management-committee-annual-report-2023-2024.pdf

Queensland Fire and Emergency Services (2023) Queensland 2023 State Disaster Risk Report. Brisbane, Australia. www.disaster.qld.gov.au/__data/assets/pdf_file/0020/436070/2023-State-Disaster-Risk-Report.pdf

Sellnow T and Sellnow DD (2013) 'The Role of Instructional Risk Messages in Communicating about Food Safety: The IDEA Model', in *Food Insight,* July 2023, p.3). International Food Information Council, Washington D.C. Academia website www.academia.edu/9111360/The_Role_of_Instructional_Risk_Messages_in_Communicating_about_Food_Safety_The_IDEA_Model, accessed 10 September 2024.

Sellnow DD, Lane DR, Sellnow TL and Littlefield RS (2017) 'The IDEA Model as a Best Practice for Effective Instructional Risk and Crisis Communication', *Communication Studies,* 68(5):552–567. https://doi.org/10.1080/10510974.2017.1375535

Sellnow-Richmond DD, George AM and Sellnow DD (2018) 'An IDEA Model Analysis of Instructional Risk Communication in the Time of Ebola', *Journal of International Crisis and Risk Communication Research,* 1(1):135–166. https://jicrcr.com/index.php/jicrcr/article/view/7

Sloggy MR, Suter JF, Rouhi Rad M, Manning DT and Goemans C (2021) 'Changing opinions on a changing climate: the effects of natural disasters on public perceptions of climate change', *Climatic Change,* 168(25). https://doi.org/10.1007/s10584-021-03242-6

Slovic P (2010) 'The more we die, the less we care', in P Slovic (Ed.), The Feeling of Risk: New Perspectives in Risk Communication, pp.69–78. New York, NY: Earthscan.

Slovic P and Weber EU (2013) 'Perception of risk posed by extreme events, in Applegate, Gabba, Laitos and Sachs (Eds.), Regulation of Toxic Substances and Hazardous Waste (2nd edition). Foundation Press.

Stolero N, Elkady S, Labaka L, Verlin J, Branlat M and Adini B (2024) 'Using social media in disaster management: The perceptions of emergency responders versus the public', Risk, Hazards, & Crisis in Public Policy, 15(2):128–161. https://onlinelibrary.wiley.com/doi/full/10.1002/rhc3.12301

Teo M, Goonetilleke A, Ahankoob A, Deilami K and Lawie M (2018) 'Disaster awareness and information seeking behaviour among residents from low socio-economic backgrounds', International Journal of Disaster Risk Reduction, 31:1121–1131. https://doi.org/10.1016/j.ijdrr.2018.09.008

Teo M, Goonetilleke A, Deilami K, Ahankoob A and Lawie M (2019) 'Engaging residents from different ethnic and language backgrounds in disaster preparedness', International Journal of Disaster Risk Reduction, 39:101245. https://doi.org/10.1016/j.ijdrr.2019.101245

Ulmer RR, Sellnow TL and Seeger MW (2010) Effective crisis communication: Moving from crisis to opportunity. Sage Publications.

Zahnow R, Wickes R, Taylor M and Corcoran J (2019) 'Community social capital and individual functioning in the post-disaster context', Disasters, 43(2):261–288. https://doi.org/10.1111/disa.12317

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Abstract

Cyclone Gabrielle struck Aotearoa New Zealand in February 2023 and was one of the most devastating disaster events in the country's recent history. Response efforts involved a wide range of stakeholders and exposed critical coordination challenges. This study examined the effectiveness of these responses through 15 semi-structured interviews with representatives from national and local emergency management agencies, non-government organisations and community groups, as well as marae [meeting place] leaders involved in the response. It focused on the coordination among these different actors to identify strengths, gaps and challenges, and to understand the implications for disaster resilience. Findings reveal systemic issues in communication and coordination that hindered timely and equitable response, particularly in reaching people in rural areas, collaborating with Māori communities and engaging volunteers. Cultural disconnects, under-utilisation of local networks and training gaps for surge staff and emergency personnel also limited response effectiveness. The study highlights the need to strengthen pre-disaster relationships with iwi [tribes], marae and community-based groups to enhance workforce preparedness and embed culturally responsive practices.

Coordinating response during disaster: the 2023 Cyclone Gabrielle in the Hawke's Bay Region as case study

Peer reviewed

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Introduction

The increasing frequency and intensity of extreme weather events, combined with population growth, inadequate urban planning and rising social and economic inequalities, present significant global challenges. As a result, disaster risk reduction and management (DRRM) has become essential for global and national governance (Akter and Wamba 2019). There is a growing recognition of the role played by DRRM actors in supporting affected people during emergencies and disasters. Response efforts are expected to be rapid, contextually appropriate and align with the priorities of those affected while also catering to local coping mechanisms (Nyahunda et al. 2022). Effective collaboration among stakeholders including government agencies, international organisations, non-government organisations and local communities is crucial to maximise resources and deliver coordinated actions. Such cooperation helps prevent duplication of effort and should reduce the burden on affected people during a crisis (Akter and Wamba 2019; Rawsthorne et al. 2023).

Cyclone Gabrielle formed in the Coral Sea in early 2023 and made landfall in Aotearoa New Zealand over 12 to 16 February. The cyclone had devastating consequences for the Hawke's Bay and Tairāwhiti regions as it brought intense rainfall, 10-minute sustained wind speeds of up to 150 km/h and widespread flooding and landslides. These extreme conditions significantly affected lives, livelihoods and local infrastructure. At the height of the cyclone, approximately 225,000 households experienced power outages and thousands of people were forced to evacuate due to rising floodwaters. Sadly, 11 lives were lost and more than 10,000 people were displaced from their homes. The cyclone caused extensive damage to critical infrastructure along the

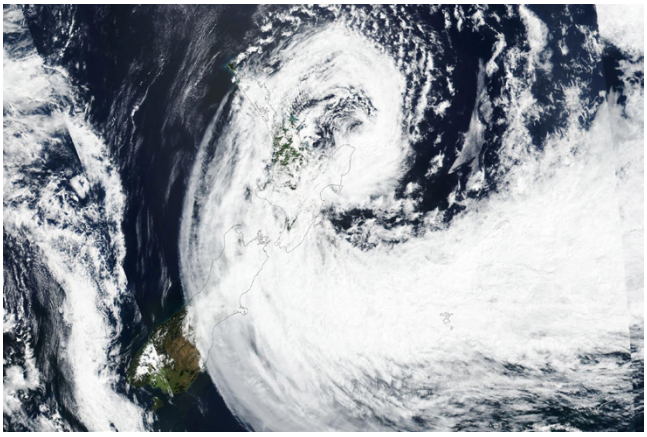
east coast of the North Island including roads, power lines, water systems and telecommunications networks (MFAT 2023). The total cost of the destruction was estimated at NZ$14.5 billion (New Zealand Government 2023). Cyclone Gabrielle ranks as the second costliest recorded hazard-related disaster in Aotearoa New Zealand; second only to the Christchurch earthquakes in 2011 (Sowden 2023).

For the third time in its history, a State of National Emergency was declared in Aotearoa New Zealand. The New Zealand Government received international assistance from countries such as Australia, Fiji, the United Kingdom and the United States. In the most severely affected regions of Hawke's Bay and Tairāwhiti, more than 50 organisations participated in the response. However, the scale of the disaster posed significant challenges for the emergency management sector leading to criticisms regarding delays and the appropriateness of the response (Bush 2023). Several months after Cyclone Gabrielle, media narratives framed the event as a 'wake-up call', emphasising the urgent need for greater attention to extreme weather risks and their management (Goode 2025).

This study examined the response efforts implemented during Cyclone Gabrielle in the Hawke's Bay region with a particular focus on coordination and effectiveness. The research aimed to identify best practices, challenges and gaps as well as opportunities to improve response.

Disasters and response efforts: an overview

Disasters are characterised by their economic, human, physical and environmental impacts on communities. People's experiences of emergencies and disasters can differ widely depending on their economic situation, social networks, access to external resources, belief systems as well as their past disaster knowledge (Appleby-Arnold et al. 2021). They may have highly diverse expectations of external aid agencies, priorities for response and recovery and may develop very different coping mechanisms. It is, therefore, critical that resources are mobilised and actions are conducted in contextually relevant ways that consider the social, cultural and economic aspects that characterise local communities (Graveline et al. 2024: Versaillot and Honda 2024).



Satellite imagery of Cyclone Gabrielle approaching Aotearoa New Zealand, 9 February 2023.

Image: NASA Worldview, public domain (https://worldview.earthdata.nasa.gov/), photo by Lauren Dauphin, 14 February 2023.

Emergency and disaster response should be informed by proper assessments of the effects and needs of communities on the ground (Sarabia et al. 2020). People and community-based organisations are often the first to respond since they live in the areas affected, are familiar with the local geography and are cognisant of the local norms and available resources (Quarantelli 1988). For example, during the 2010 Haiti earthquake, local communities including neighbourhood committees, volunteers, faith-based organisations and community health workers mobilised to help their fellow citizens with rescue efforts, food, water and shelter (Kay and Johnson 2012). These groups leveraged existing networks to coordinate relief efforts, provide emotional support and offer shelter to people affected (Smith and Williams 2013).

Policymakers, practitioners and scholars widely recognise the importance of integrating community organisations and volunteer groups into disaster response efforts (Skar et al. 2016; Kristian and Fajar Ikhsan 2024). The *Sendai Framework for Disaster Risk Reduction 2015-2030* (UNDRR 2015) underscores the value of citizen participation in disaster risk management. In Aotearoa New Zealand, the *National Disaster Resilience Strategy* (MCDEM 2019a) emphasises that emergency response should 'enable and empower community-level response, and ensure it is connected into wider coordinated responses, when and where necessary' and specifically calls for 'building the relationship between emergency management organisations and iwi/groups representing Māori, to ensure greater recognition, understanding, and integration of iwi/Māori perspectives and tikanga in emergency management' (MCDEM 2019c, p.3). However, in practice, top-down approaches often prevail, overlooking local knowledge and established community networks. Scholars and practitioners frequently highlight coordination challenges when emergency management organisations operate according to legislation, procedures and codes of conduct that may conflict with the informal structures of local communities (Grant and Langer 2019; Haynes et al. 2020). Research emphasises the importance of pre-disaster preparedness and strong inter-organisational relationships to enhance response effectiveness (Le Dé et al. 2024).

Ongoing challenges in coordination among response stakeholders, compounded by a lack of collaboration and competition for limited information and funding, often result in inefficiencies, resource misallocation, service

gaps and even chaotic response efforts (Steets and Meier 2012; McLennan et al. 2016). For example, following the 2004 Indian Ocean tsunami and the 2010 Haiti earthquake, numerous organisations deployed personnel and resources simultaneously, but without effective coordination, resulting in operational overlap and inefficiencies (Parkash 2015). Similar challenges were observed during the 2011 Christchurch earthquakes, underscoring the need for enhanced coordination within Aotearoa New Zealand's disaster response framework (Bourk and Holland 2014; Burke 2018). Insufficient collaboration among stakeholders can result in overlapping aid distribution, inefficient resource allocation and unmet needs among affected populations.

Since the late 1990s, various tools and mechanisms have been introduced to improve coordination, such as the Sphere Standards (Sphere Association 2000) and the UN Cluster Approach, first introduced by the Inter-Agency Standing Committee (IASC 2005) and later detailed in the UNHCR Emergency Handbook (UNHCR 2023). These frameworks are designed to enhance response to humanitarian crises, for example, initiatives that improve inter-agency learning have resulted in the Active Learning Network for Accountability and Performance in Humanitarian Action networks in 1997 (Brown and Donini 2014). The Sphere Standards provide principles and guidelines for the provision of humanitarian assistance and aim to enhance humanitarian responses while holding organisations accountable for their actions. The United Nations Office General Assembly resolution (UNOCHA 1998) emphasises the importance of adhering to humanitarian principles, which include human dignity, impartiality, neutrality and independence. These principles are crucial for effective coordination in times of crisis (Lie 2020). They are geared towards accountability and response ethics and foster trust among affected populations.

The Cluster Approach was developed by the United Nations to enhance cooperation and the exchange of information between different international, national and local organisations operating in the same sector or region (Knox-Clarke and Campbell 2018). At the core of the UN cluster system is the need for coordinated efforts and optimisation of resources and actions in a disaster-affected area. The coordination mechanism has been used by more than 60 countries since its establishment. In Aotearoa New Zealand, the Coordinated Incident Management System (CIMS) is central to coordinating responses during emergencies and disasters. CIMS adapts the Australasian Inter-service Incident Management System© (AIIMS) and the Incident Command System (ICS) from the USA. Such coordination mechanisms have been criticised for not being suitable for coordinating responses required in complex disasters (Buck and Aguirre 2006; Miller et al. 2025). In Aotearoa New Zealand, CIMS serves as the primary framework for managing responses, though critiques persist regarding its accessibility and effectiveness for informal actors such as non-government organisations, community-based organisations, iwi [tribes] and marae (Simo and Bies 2007; Mathias et al. 2022). While formal efforts have been made to increase iwi and marae participation within CIMS structures, their full integration remains in progress and varies considerably across regions.

Critique of Aotearoa New Zealand's emergency management system has centred on its ability to facilitate inter-organisational collaboration during emergencies. Case studies such as the 2010–11 Christchurch earthquake sequence and the 2017 Port Hills fires revealed challenges in multi-agency coordination, including unclear mandates, strained relationships and inconsistent communication (Phibbs et al. 2012; AFAC 2017; Department of the Prime Minister and Cabinet 2018; New Zealand Government 2024). In a review of the all-of-government response to the COVID-19 pandemic (Office of the Auditor-General 2022), difficulties were highlighted in unifying diverse agencies under a coherent operational structure (Ongesa et al. 2025). These issues are often driven by differences in organisational culture, priorities and procedures resulting in fragmented and inefficient responses (Comfort 2007).

Background on the Hawke's Bay region

The Hawke's Bay region in the North Island is prone to a variety of hazards such as earthquakes, floods, tsunamis, droughts, bushfires and cyclones. The 1931 Hawke's Bay earthquake remains the deadliest disaster in New Zealand's history with a total of 256 fatalities. Most of the population lives on floodplains and, even though extensive flood control works have taken place, flooding remains a significant risk (East Coast LAB 2018). Landslides threaten transport networks and economic productivity (e.g. wineries, orchards, tourism). People living in coastal areas experience land erosion, tsunamis, flooding and sea-level rise. Climate change is expected to cause more frequent and intense extreme weather events in this region.

According to the 2023 Census, the Hawke's Bay region had a population of 175,074 with 64,695 residents in Napier and 85,965 in Hastings (Stats NZ 2024a; Stats NZ 2024b). Māori make up approximately 30% of the population (Stats NZ 2024a). The region has high levels of socio-economic deprivation and a large number of residents live in areas classified within the most deprived deciles of the New Zealand Deprivation Index (NZDep 2023)[1] (Atkinson et al. 2024). These characteristics have important implications for emergency planning and response. Given the region's extensive rural landscape and dispersed population, marae

1. Atkinson J, Salmond C, Crampton P, Viggers H and Lacey K (2024) *NZDep2023 Index of Socioeconomic Deprivation: Research Report,* 31 October 2024. Wellington: University of Otago, Department of Public Health. www.otago.ac.nz/__data/assets/pdf_file/0026/593135/NZDep2023-Research-Report-31-October-2024.pdf

Aerial view of flood damage and sediment deposition along the Tūtaekurī River, Hawke's Bay region, February 2023.

Image: Todd Miller

have become essential community-led hubs for response and recovery as they afford culturally grounded and trusted spaces rooted in tikanga Māori [Māori customary practices] and the principles of manaakitanga [hospitality and care] (Hawke's Bay Civil Defence Emergency Management Group 2024).

During emergencies, marae frequently operate as evacuation centres or welfare hubs offering shelter, information and support to individuals and whānau [family]. Because marae occupy a central position within both Māori and wider communities, marae leaders and whānau are able to rapidly mobilise resources facilitate local coordination and act as conduits to distribute essential supplies. This underscores the importance of marae not only as logistical hubs but also as culturally embedded institutions that foster community cohesion, leadership and wellbeing in times of crisis (Kenney and Phibbs 2015). A study conducted with Māori communities in the Hawke's Bay region highlighted the significance of marae in disaster contexts and emphasised that concepts such as Aroha ki te Tangata [the capacity to provide support within the community] and Manaakitanga are central to the Māori conceptualisation of resilience (Le Dé et al. 2021; Laking et al. 2024).

Method

Careful consideration was given to the methodological design to minimise the burden on affected communities while ensuring the collection of valuable insights. Given the presence of multiple disaster agencies and an overwhelmed local populations, ethical concerns regarding participant wellbeing were prioritised (Gaillard and Peek 2019; Beavan 2023). A decision was made to interview key informants from organisations involved in disaster response rather than local community members so as to not add extra pressure and avoid research fatigue.

The recruitment process included key informants from central and local government agencies, non-government organisations and marae who were identified using purposive sampling and existing professional networks. Participants were selected for their direct involvement in the Cyclone Gabrielle response to provide a comprehensive understanding of the response efforts.

There was an attempt to capture a wide range of perspectives by interviewing participants operating at different scales and representing organisations with diverse roles. The number of interviews was determined based on the principle of data saturation, where additional interviews are unlikely to yield new insights. Interviewees expressed their own opinions and did not speak on behalf of their organisation. This distinction was made clear in the ethics documents provided to interviewees and was emphasised before each interview.

Semi-structured interviews were conducted with 15 key informants:

- 3 from central government agencies
- 4 from local government agencies
- 2 from non-government organisations
- 3 from community-based organisations (marae)
- 3 from emergency services organisations.

The interviews were conducted in person and online between December 2023 and February 2024. Each interview lasted between 30 and 70 minutes depending on the participant's availability and flow of the interview. The semi-structured format enabled participants to share their views and allowed for general themes to be explored such as inter-agency collaboration, response being socio-culturally adapted and rural response capacity including challenges, gaps and opportunities.

Data analysis followed an inductive thematic approach and was guided by Braun and Clarke's (2006) 6-step framework. Transcripts were coded to identify themes that emerged from the study. To provide credibility, data triangulation was employed and interview findings were cross-referenced with policy documents and media reports. Participants were provided with summaries of their statements for validation.

Ethics statement

Ethical considerations were central to this research. Participant identities were anonymised and interview

recordings and transcripts were securely stored. Informed consent was gained from all participants before interviews commenced. Clear explanations regarding the purpose of the study, voluntary participation and the right to withdraw at any stage was provided. Ethics approval was granted by the Auckland University of Technology (#23/278).

Results

Three key themes emerged from the data analysis:

- coordination and collaboration
- challenges in training and communication
- the importance of building relationships.

Coordination and collaboration

Ninety per cent of the participants emphasised the critical importance of a swift response effort. While emergency services organisations rapidly mobilised teams to the affected regions, one-third of participants described the initial operations at the emergency coordination centre as 'disorganised' or 'chaotic'. Perceived confusion regarding roles and responsibilities was seen to have contributed to inefficiencies in response activities. This lack of clarity may have led to duplicated situational assessments and delays in mobilising critical resources:

> *Overall, the coordination did work, but I think it took a lot of effort and a lot of people to make it work. It could have been a little bit more efficient if there'd been a clearer definition of 'this is your job' and 'this is what you do', and people stuck to that a bit more, and so a lot of what we were doing was having to negotiate that with other agencies along the way so that we were clear that's your job, this is our job.*
> (PM11, 07/02/2024)

> *I think the story of how every organisation turned up with the same piece of paper asking for the same information might say there were some issues, for sure. I think when it came to the showgrounds, I think different organisations have different priorities and different mandates, and sometimes those were conflicting. They struggled to be able to get some of their supplies out as well as they would have liked, I think.*
> (PM04, 05/02/2024)

These challenges illustrate the complexities of collaboration during response operations and the difficulties of aligning efforts towards common objectives. Interviews revealed that some responding organisations lacked adequate preparedness, which led them to resort to ad hoc decision-making during the crisis. The absence of a Common Operating Picture and underdeveloped inter-agency relationships impeded coordination and resulted in miscommunication, role ambiguity and delays in decision-making:

Cyclone Gabrielle aftermath, Eskdale, Hawke's Bay - silt deposition and flood damage across orchards in the Esk Valley.

Image: Unsplash, free to use under Unsplash License (https://unsplash.com/photos/pv-SuZjqXNs), photo by Leonie Clough, February 2023.

> *There were huge gaps because there was no playbook for planning, preparedness and about coordination. The response was appalling because despite New Zealand being flood prone, there was no standardised guidelines for agencies to respond.*
> (PM15, 22/02/2024)

Participants felt that significant role confusion among agencies in the early response phase hindered situational awareness and collaboration. Despite these challenges, participants emphasised the need for coordinated efforts across government, non-government organisations and community stakeholders. Some effective inter-agency cooperation was evident as reflected in the following examples:

> *FENZ came and dropped off one of their tents, one of their major incident tents, and that was here for a few months. There was lots of connection with Tai Whenua, the iwi, civil defence obviously at that time.*
> (PM05, 06/02/2024)

> *We were very much involved with local Māori leadership. As I mentioned, we were directly involved in [removed name] Marae. And that was really a positive response. And so, we were coordinating with them extensively. And there was, I believe, in those, so yes, we were coordinating with several other churches and so leadership at that level. And in some cases, I saw some good coordination between those church leaders and other government and non-governmental leadership.*
> (PM02, 19/01/2024)

Rural Advisory Groups (RAGs) provide local councils with a rural perspective on issues affecting rural communities. However, this study found that welfare staff from local government and partner community service organisations (e.g. Red Cross, Salvation Army, iwi-based providers)

New Zealand Emergency Management Assistance Team temporary treatment tents established in Hawke's Bay, February 2023.
Image: Todd Miller

often lacked an understanding of rural needs and failed to involve advocacy groups such as the RAG to bridge this knowledge gap. For example, animal welfare efforts prioritised domestic pets over livestock, which are vital to farmers' livelihoods. Additionally, connections to rural support and health networks were weak compared to previous emergency events. Both the welfare and logistics functions operated sub-optimally. Logistics personnel initially assessed the needs of isolated communities and later informed welfare providers (already in contact with those communities) that needs like food, medical aid and agricultural support could not be met. This was perceived to be due to insufficient resources, logistical constraints and an inadequate initial assessment of community needs. This contributed to unrealistic expectations among affected communities (e.g. assumptions of immediate delivery of supplies) and consequent gaps in service delivery. One-quarter of the participants from government organisations stated it was difficult to meet the needs of affected people:

> *I think there's still a gap... disasters are just so huge and they are so complicated... it continues to be hard to... make a guarantee that everybody's requirements are met.* (PM09, 06/02/2024)

The distribution centres involved staff from the Ministry of Civil Defence Emergency Management, New Zealand Defence Force, and iwi and volunteers to dispatch supplies to Hawke's Bay's most remote and affected communities. This provided communities with water, food, baby products and generators. Several key informants noted that the planning for distribution centres was unclear and could have benefited from greater delegation at community and marae levels. A decentralised model of aid distribution may have ensured alignment with community-specific needs. The aid packages distributed to people did not adequately cater to the distinctive needs of different communities and demographics such as eldercare facilities and rest homes, remote communities, migrants and refugees and people dependent on regular medications, medical equipment or ongoing treatment. This was partly due to inadequate coordination and duplication of effort. While participants recognised the importance of tailoring aid to these groups, they also acknowledged the logistical and financial challenges of providing highly customised supplies during large-scale emergencies where speed and resource constraints often limit flexibility:

> *One of the things that was quickly realised as well, but took a bit longer to sort out, was that when it comes to food, what do you call it, when you make up a box for a family and then deliver that box 2 days in a row, there'll be overlap of items that aren't needed. For example, female sanitary items or diapers or baby formula. Those were put into boxes and then at the end of the day at the community hubs you might have loads of pads or something like this that just weren't needed because people didn't need them at that point in time.... And then dry goods and stuff like this. Some of it was desperately needed and then after a while it wasn't so much, and they were looking for other things. They didn't really want or need a stranger's donation (clothes). So, they've got all their clothes, they've got all their stuff. What they*

needed was something else. It's fuel, it's some staples, but no clothes.
(PM04, 05/02/2024)

During the response to Cyclone Gabrielle, the Group Emergency Coordination Centre established geographic zones with hubs where communities could gather to provide services to isolated communities in the region, rather than relying on the established marae network. One of the participants from a marae noted that Māori leaders and communities found themselves facing significant frustration regarding the zoning strategy. The zoning approach was intended to divide the disaster response efforts into manageable sections, each overseen by a designated team. The rationale behind the zoning strategy was not explicitly detailed in participant interviews, however, it is possible that factors such as infrastructure (e.g. proximity to main roads, emergency facilities or helicopter landing sites), access constraints (e.g. road access, river crossings or terrain challenges) or logistical efficiency influenced the decision (e.g. ease of coordinating aid distribution).

However, these considerations did not always account for the established networks, governance structures and traditional land divisions of Māori communities, leading to inefficiencies in aid distribution and challenges in coordination. Furthermore, this approach created confusion among Māori wardens and iwi liaisons. Māori wardens play a key role in supporting local communities: they provide cultural leadership, help whānau access critical services and resources, offer advice, coordinate with disaster response organisations and are often among the first on site during an emergency. Poor communication regarding the zoning strategy disregarded the established expertise of mana whenua [Māori who have cultural ties to the land] who felt under-valued in the response efforts. These inconsistencies between external assistance and local cultural norms hindered an effective response in the region:

The challenge with Civil Defence was that they had military and too many people from out of town here, so they didn't understand culturally how to respond.
(PM05, 06/02/2024)

Challenges around training and communication

The findings revealed that both volunteers from Volunteer Hawke's Bay and staff from Civil Defence Emergency Management lacked adequate training in CIMS, posing a significant challenge in responding to a large-scale disaster. A lack of training was most evident in participants' limited grasp of how the intelligence, welfare and logistics functions interrelate, which affected operational cohesion. It was not only volunteers but also staff who struggled to understand the interconnections between key functions. This lack of familiarity with CIMS hindered the completion of critical tasks, ultimately affecting the overall effectiveness of the response. A significant discrepancy emerged between those who were confident in using CIMS and those untrained or unfamiliar with its structure, which created operational disconnects:

I witnessed firsthand multiple people who are employed in civil defence, councils and government, full-time basically losing their mind within that first day because they were just completely unprepared for what was going to happen. And yeah, they were just overwhelmed, it was really, it was sad because, you know, when the wheels start to fall off within the centre, you can only imagine, like if we can't get our crap together in the centre, there is no way that we're providing the support that our community needs. Yeah, that's true.
(PM06, 06/02/2024)

So, obviously, CIMS is the framework, CIMS is the guidance, but again, unless you're CIMS trained or have some experience operating within a CIMS structure, you're left unmoored, like you just, you don't have that framework. It's that if you're CIMS trained and if you've worked in this space for long enough, the structure is a very inherent part of your job. You just know it, and you just do it. But because, you know, even the council staff and whose job description says they might need to come and do this stuff, I would say 95% of them aren't trained in that they wouldn't understand that framework or structure and didn't know where to go and how to perform.
(PM06, 06/02/2024)

And definitely just getting our own sort of staff up to scratch with CIMS training and response and exercising the different types of scenarios that we might be in, whether it be flood or volcanic activity or an earthquake.
(PM03, 19/01/2024)

A key challenge in the disaster response was inadequate communication between emergency operations centres (responsible for coordinating response activities at the local or district level) and other agencies during the initial phase. About 80% of interviewees reported difficulties accessing information due to widespread technology failures including cellular network outages, unreliable radio systems and delayed updates from response agencies. These communication breakdowns significantly undermined the effectiveness of the overall response:

Certainly, there was communication gaps physically with cell phones being down. We operate a lot of our systems via a cell phone or via the cell phone network. Not our radios. We could use our radios, but they don't work terribly well in wet [conditions]. So, contacting staff on the ground was sometimes difficult. Not only that, but you can imagine the noise and the conditions they're working in. So, you know, there were probably equipment

failures or people were going into deep water with a radio that was then broken, you know and things like that. So, we had communication issues with our staff.
(PM08, 06/02/2024)

In instances where communication technologies failed, there was a lack of alternative or contingency communication options. Some participants suggested that solutions such as Starlink could be beneficial, as it remains operational during telecommunication breakdowns. Three-quarters of respondents from government organisations also noted that siloed communication flows made it difficult to assess needs and allocate resources efficiently:

It wasn't so much the information gap that was the problem. It was the use of the information that we did have. So, the decisions that were made based on the information that we had. Once the comms went down, we lost telecommunications, we lost power, we lost everything. Once that happened, we then didn't have any information. So, we were making poor decisions based on poor information.
(PM06, 06/02/2024)

Most participants mentioned the absence of regular communication among organisational leadership. This included a lack of routine meetings, incident boards and the absence of a unified system for information sharing, such as a Common Operating Picture and consistent documentation. Additionally, they highlighted the absence of a standardised process for coordinating updates, as interviewees noted:

So, I would say like in terms of receiving information, like the biggest challenge was just that like communication and sharing of data was a bit of a challenge during the whole event.
(PM13, 14/02/2024)

They were doing that as well during the response, I know that, and right at the start, but their tie-in to civil defence just wasn't that good, and how they could share that information and the intelligence and the coordination of that with civil defence wasn't there really. And that was just a critical issue with that system.
(PM04, 05/02/2024)

Poor communication led to the creation of numerous action plans, situational reports and communications, many of which were contradictory, overlapping or inconsistently shared among response teams. This lack of coordination caused confusion, misalignment in decision-making and delays in response times.

Critical role of building relationship with organisations

The final theme that emerged from the interviews was the need to build or strengthen relationships among response actors (both formal and informal). Cyclone Gabrielle posed significant challenges for those involved in the response including government agencies, non-government organisations and marae. These challenges contributed to strained relationships and some participants expressed resentment due to a perceived lack of support or feelings of neglect caused by bureaucratic processes during a period of severe distress. Three-quarters of the interviewees believed that an opportunity was missed in the early response phase to leverage regional networks and activate existing relationships more effectively:

The Ministry of Social Development Regional Commissioner, who leads government agencies in the region, was poorly connected to local Emergency Operations Centres and Group Emergency Coordination Centres. However, the ministry's 6 service centres, strong relationships with local marae, Waka Kotahi, the Ministry of Education, Te Whatu Ora and Te Puni Kokiri could have helped address challenges faced by the Group. These relationships could have aided in addressing public health issues.
(PM09, 06/02/2024)

Marae demonstrated their capacity to rapidly organise and accommodate large groups and serve as vital community hubs during Cyclone Gabrielle. They played a crucial role in supporting affected communities by providing shelter, food, hygiene facilities and by efficiently coordinating relief distribution. However, iwi, Māori organisations and marae were not systematically integrated into a formal disaster response framework. Many Māori organisations and marae felt that their well-established capabilities in delivering large-scale welfare services were overlooked or hampered by centralised bureaucratic processes:

In the early phases in the coordination centre, Iwi representatives were not included in an inclusive manner, because they should be the conduit to talk to their community. They felt they demonstrated, or they explained to me that they felt like they were put in a corner in an office out of the way and were not included in the response. So, Coordination Centres need to continuously work on how they engage with Iwi, and how they create a safe and inclusive environment. And Māori did not feel included or safe in those early phases.
(PM01, 12/01/2014)

Interviewees reflected on the critical importance of cultivating trust and strengthening relationships prior to emergencies and disasters. Several participants highlighted that proactive engagement, rooted in mutual respect and cultural understanding, was fundamental in improving the effectiveness of response efforts:

And trust comes through relationship. Relationship with emergencies is absolutely key. So, when I'm talking about breaking down those silos, we need to be breaking

Residential property damage following Cyclone Gabrielle, Eskdale, Hawke's Bay, February 2023.

Image: Unsplash, free to use under Unsplash License, https://unsplash.com/photos/jvPQqn_dsC4. Photo by Leonie Clough, February 2023.

down those silos now, not when the next cyclone occurs. And so, I think that that's something for us to learn. It's also something for NEMA to learn and CDEM groups and so on. We need to know our communities. Yeah, preparedness is key. And again, these are mantras of mine. But I believe that in emergencies, we can plan for. (PM02, 19/01/2024)

There needs to be a constant building and maintaining of relationships, which is a two-way street, I guess, because Civil Defence needs to be a better resource to have people out in the community identifying community leaders all the time, identifying Civil Defence centres all the time and then talking to those communities to make sure they know where to go from there. But that also requires the community to prioritise that too. (PM12, 07/02/2024)

Despite these challenges, interviewees emphasised the resilience and adaptability of most organisations involved in disaster response. Participants recognised the need to harness diverse capabilities through inclusive planning and community-driven approaches. Participants unanimously acknowledged that all actors possessed valuable capacities, however, the primary challenge lay in effectively mobilising these resources and skills during a response. There was broad consensus on the need to remain open to new ideas and the critical importance of community involvement in strengthening crisis response efforts.

Discussion

Rural communities are generally portrayed as both vulnerable and resilient in the face of disaster. They are characterised by weak infrastructure, limited access to information, reliance on natural resources for livelihood and food, lack of trust in government plans and decisions and limited access to essential services (Vasseur et al. 2017). On the other hand, they often rely on strong local and historical knowledge and social support systems to deal with daily needs and times of hardship. During Cyclone Gabrielle, rural communities in the Hawke's Bay region faced significant challenges due to loss of telecommunications, major infrastructure damage, destroyed housing, compromised power and water access and disruption to food and fuel that affected communities for an extended period. Despite such challenges, local communities were not passive but quickly organised to deal with the situation. Community hubs such as marae, schools and churches played a critical role in the response by facilitating resource distribution, disseminating information, hosting displaced people and providing emotional support.

This study confirmed a high level of local mobilisation and volunteering during response efforts. Local knowledge and relationships were invaluable for understanding and supporting communities both during and after the disaster. Māori wardens, iwi and marae were crucial

in connecting responding agencies and leaders (i.e. through logistic, communication, situational awareness, contextual knowledge), thereby strengthening community relationships.

The emergency and disaster literature has increasingly emphasised that local communities generally self-organise and volunteer during disasters (Gaillard et al. 2019). For example, in the aftermath of the 1931 earthquake in Hawke's Bay, 'spontaneous' volunteers were actively involved in search and rescue, debris clearance and reconstruction efforts (Hill and Gaillard 2013; MCDEM 2019c). Māori communities have historically employed a range of mechanisms and strategies to cope with emergencies and disasters. Recent examples include the 2010 Christchurch earthquake (Kenney and Phibbs 2015), the 2016 Kaikōura earthquakes (Carter and Kenney 2018) and the 2017 Edgecumbe flood (MCDEM 2019c). Marae opened their doors to both Māori and non-Māori, providing shelter, distributing food and offering emotional support to those affected.

Although communities rapidly self-organised and were active in the aftermath of Cyclone Gabrielle, there was a need for stronger system and support structures from external organisations. This study suggests that responding agencies generally mobilised quickly despite facing immense challenges of power outages, communication breakdown and infrastructure damage that hindered their ability to deliver aid and coordinate responses efficiently. Many responders highlighted high levels of stress, anxiety and a feeling of being overwhelmed by the scale of the situation. Results showed that a major challenge was the difficulty in accessing remote and isolated communities. The study found that, in some situations, there was a lack of understanding of rural needs, under-utilisation of RAGs, limited connections to rural assistance and health care systems and weak planning related to the establishment and operationalisation of distribution centres. Additionally, poor coordination between local authorities, community networks and marae hampered the effective delivery of aid. This led to delays, unequal access to essential resources and challenges in reaching vulnerable populations, particularly those in remote areas. Laking et al. (2024) pinpointed issues of resource allocation, stressing that, 'Some communities felt that Iwi-led initiatives, where available, were more responsive and could rally action and support that government agencies did not offer' (p.143).

The widespread telecommunications failure during Cyclone Gabrielle had profound effects on the coordination of response activities and the ability to maintain situational awareness across the region. While the Civil *Defence Emergency Management Act 2002* (CDEM Act)[2] requires Civil Defence Emergency Management (CDEM) groups to maintain communication and coordination during emergencies, the implementation of resilient communications infrastructure varied significantly. Within the Hawke's Bay CDEM Group, coordination centres were equipped with satellite communications, including Starlink, aligning with good practice and expectations. However, these capabilities were not consistently mirrored across partner agencies nor extended to community-level hubs such as marae and rural community points, many of which served as de facto coordination or welfare sites during the response. The disparity in access to satellite communication infrastructure contributed to an operational disconnect between central coordination points and community-led efforts. This limited the flow of critical information and delayed the identification of needs in isolated areas. This gap highlights the need for an inclusive and integrated approach to telecommunications preparedness that extends beyond CDEM facilities to encompass all key actors within the emergency response network. Ensuring interoperable and redundant communications systems that are available and functional across all levels of response is essential to meet the legal obligations of the CDEM framework and the operational realities of distributed, community-driven response environments (Danaher et al. 2023).

In the years preceding Cyclone Gabrielle, the Hawke's Bay region transitioned to a centralised and regionalised emergency management model under the Hawke's Bay CDEM Group. This shift, articulated in the 2014–2019 Group Plan, emphasised integrated planning and regional coordination and positioned the Group Emergency Management Office as the central hub for capability development, governance and operational oversight (Hawke's Bay Civil Defence Emergency Management Group 2014). However, this centralisation relied heavily on a small number of dedicated emergency management personnel, supplemented by multi-agency staff, volunteers and local authority staff whose primary responsibilities lay outside of emergency functions. While the plan identified workforce capability and interoperability as strategic priorities (e.g. BMC1-BMC5), evidence suggests that implementation was inconsistent across the region.

The independent review of Cyclone Gabrielle (Bush International Consulting 2024) highlighted the consequences of this structural shift, noting that Napier Council's ability to maintain basic functionality was compromised during the event. The review concluded that the council had not met its statutory obligation under Section 64 of the CDEM Act to fully function in an emergency, attributing this to a lack of investment in local capability and institutional knowledge. Although not formally described as a disestablishment, the progressive de-emphasis of local-level response capacity in favour of regional integration had a tangible effect.

2. *Civil Defence Emergency Management Act 2002,* at www.legislation.govt.nz/act/public/2002/0033/51.0/DLM149789.html.

These pre-existing structural conditions characterised by centralisation, under-resourcing at the local level and uneven capability development directly influenced the region's ability to respond cohesively and adaptively as Cyclone Gabrielle unfolded.

This study identified communication and coordination challenges between Māori wardens and iwi liaisons and response agencies. This led to a lack of recognition of Māori community service skills and the under-utilisation of their expertise in response efforts. Additionally, the lack of coordination with marae staff in response initiatives limited their ability to contribute effectively, despite their cultural knowledge and community leadership. Participants felt that this lack of inclusion may have weakened coordination efforts, reduced the effectiveness of culturally responsive strategies and overlooked valuable local resources essential for disaster response. These findings match with the post-Cyclone Gabrielle government report, which noted that marae capacities and Māori expertise were 'either ignored or hampered by bureaucratic decision-making' (Bush International Consulting 2024, p.6).

Researchers, practitioners and policymakers have increasingly emphasised that the systematic incorporation of Māori leadership and marae networks in emergency management frameworks is paramount to disaster resilience (Kenney et al. 2015; MCDEM 2019c). A key objective of the *National Disaster Resilience Strategy* is to 'Build the relationship between emergency management organisations and iwi/groups representing Māori, to ensure greater recognition, understanding, and integration of iwi/Māori perspectives and tikanga in emergency management' and to 'enable and empower community-level response, and ensure it is connected into wider coordinated responses' (MCDEM 2019c, p.3). However, this study indicates that, in practice, substantial gaps remain.

By 2023, most CDEM groups in Aotearoa New Zealand had formally included iwi partners in their respective group plans and governance arrangements, reflecting commitments articulated in the *Coordinated Incident Management System (CIMS)*, 3rd edition (MCDEM 2019b) that explicitly emphasises the need for iwi inclusion in emergency readiness and response. In the case of the Hawke's Bay CDEM Group, the operative 2014–19 Group Plan acknowledged the importance of building relationships with iwi and hapū [sub-tribes] as part of enhancing community resilience and capability. However, the practical implementation of this objective appeared limited. While formal mechanisms for iwi representation existed through the Coordinating Executive Group and advisory networks, this study did not find strong evidence of deep or sustained engagement with iwi in decision-making or planning processes prior to Cyclone Gabrielle. This lack of proactive integration may have constrained opportunities to fully harness the leadership, networks and cultural expertise of iwi. The absence of embedded iwi roles within coordination structures, despite policy guidance and national strategy, represents a critical contextual gap that shaped the character and effectiveness of the regional response effort.

Another significant challenge involved the inconsistent understanding of CIMS among emergency management personnel. Specifically, CDEM staff and volunteers from Volunteer Hawke's Bay demonstrated inconsistent training, limited operational experience and difficulty comprehending CIMS functions such as intelligence, logistics and welfare. Additionally, responders lacked clarity on the leadership responsibilities necessary for inter-agency coordination and often struggled to adapt to rapidly shifting operational demands. This gap was explicitly identified in the Government Inquiry into the North Island Severe Weather Events (New Zealand Government 2024, p.53), which called for comprehensive reform of the emergency management system and emphasised the need for staff to be 'appropriately trained and well-versed in the CIMS framework'. This study supports this recommendation, suggesting that all personnel likely to be involved in emergency response should receive regular training and participate in exercises to build operational confidence and develop proficiency within coordination centres, including iwi and marae.

The use of incident command systems such as AIIMS and CIMS reflects an effort to systematise the coordination of multiple organisations during emergencies and disasters. However, critics argue that these frameworks are often ill-suited to the complexity of contemporary disaster environments. Their reliance on rigid hierarchies and linear coordination processes can hinder adaptability in fast-evolving and unpredictable situations and they often lack the contextual flexibility required to respond effectively to diverse local conditions (Comfort 2006). Although CIMS has undergone revisions (2nd edition in 2015 and 3rd edition in 2019) in response to significant events such as the 2010 Pike River mine explosion, the 2011 Canterbury earthquakes and the 2017 Port Hills fires, it continues to rely on a centralised, command-and-control structure that struggles to accommodate emergent, decentralised decision-making in high-complexity contexts (Abbas and Miller 2025). Findings from this study suggest that CIMS may lack the necessary flexibility to respond effectively in dynamic disaster contexts. It appears to fall short in accommodating actors such as volunteers that often play crucial roles in response (Burke 2018). These insights point to the need for a re-evaluation of incident command frameworks to ensure they are sufficiently flexible and capable of adapting to complex, fast-evolving situations (Miller et al. 2025).

Nevertheless, it is important to recognise the considerable advances embodied in CIMS (3rd Edition), particularly the emphasis on flexibility and inclusivity. Compared

with earlier iterations, CIMS (3rd Edition) represents a significant evolution in design and intent including greater emphasis on flexibility, scalable coordination and inclusive engagement across national, regional and local actors. Its principles explicitly support devolved decision-making, context-specific adaptation and recognition of non-traditional response partners including iwi, community organisations and spontaneous volunteers. However, the findings from this study suggest a substantial gap between the framework's intent and its operationalisation in practice. Despite the structural improvements in CIMS (3rd Edition), response agencies appear to revert to hierarchical and rigid coordination mechanisms under pressure and struggle to adapt to the scale and complexity of the event. Limited prior engagement with communities and partners means that the necessary trust, understanding and pre-established roles on which CIMS flexibility relies are not in place. This disconnection between policy and practice illustrates a key learning: the effectiveness of progressive frameworks like CIMS depends not only on their structural content but also on the depth of institutional readiness, cross-agency familiarity and relational capacity developed before a disaster occurs.

Conclusion

This study assessed the effectiveness of the Cyclone Gabrielle response in Hawke's Bay, addressing the critical question of how coordination between government agencies, iwi and community actors influences disaster outcomes. The research revealed systemic challenges in communication, decision-making and inclusion of Māori and local leadership, while also demonstrating the strengths of community self-organisation, cultural networks and volunteer mobilisation.

To address these limitations, several measures are recommended. First, CIMS should incorporate flexible coordination models that promote decentralised decision-making and adaptability in complex and uncertain situations, such as when isolated rural communities must initiate and manage their own response efforts in the absence of timely external support due to communication outages or access constraints. Second, the formal inclusion of non-traditional responders such as iwi organisations, rural advocacy and support groups and volunteers should be operationalised through clear conventions and designated liaison roles within coordination centres. Third, relationship-building must occur well before disaster events. This includes joint training and preparedness exercises that foster trust and familiarity across the sector.

This study showed that Māori wardens and iwi liaison officers, despite their deep community connections and cultural authority, were often sidelined during response operations or brought in too late to influence decisions. A more proactive approach would involve establishing clearly defined roles for Māori wardens within CIMS, developing formal induction processes to support iwi leader participation in emergency coordination centre operations and sustaining relationship-building activities outside of disaster events.

References

Abbas R and Miller T (2025) 'Exploring communication inefficiencies in disaster response: Perspectives of emergency managers and health professionals', *International Journal of Disaster Risk Reduction,* 120:105393. https://doi.org/10.1016/j.ijdrr.2025.105393

Akter S and Wamba S (2019) 'Big data and disaster management: a systematic review and agenda for future research', *Annals of Operations Research,* 283(79):939–959. https://doi.org/10.1007/s10479-017-2584-2

Appleby-Arnold S, Brockdorff N, Jakovljev I and Zdravković S (2021) 'Disaster preparedness and cultural factors: a comparative study in Romania and Malta', *Disasters,* 45(3):664–690. https://doi.org/10.1111/disa.12457

Atkinson J, Salmond C, Crampton P, Viggers H and Lacey K (2024) 'NZDep2023 Index of Socioeconomic Deprivation: Research Report, 31 October 2024', *University of Otago, Department of Public Health.* www.otago.ac.nz/__data/assets/pdf_file/0026/593135/NZDep2023-Research-Report-31-October-2024.pdf

AFAC (Australasian Fire and Emergency Service Authorities Council) (2017) *Independent Operational Review: Port Hills Fire.* www.fireandemergency.nz/assets/Documents/Research-and-reports/Port-Hills-2024/F3914792-Worsley-Road-Fire-Report-FINAL-REDACTED.pdf

Beavan S (2023) 'Ethical Guidelines for Post-Disaster Research', *Resilience to Nature's Challenges National Science Challenge Information Sheet,* March 2023.

Bourk M and Holland K (2014) 'From silos to flows: Spatial metaphor and communication responses to the Christchurch earthquakes', *Australian Journal of Emergency Management,* 29:35–41. https://knowledge.aidr.org.au/media/2199/ajem-29-02-09.pdf

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

Brown D and Donini A (2014) *Rhetoric or Reality? Putting Affected People at the Centre of Humanitarian Action,* ALNAP Study, London: ALNAP/ODI.

Buck D and Aguirre B (2006) 'A Critical Evaluation of the Incident Command System and NIMS', *Journal of Homeland Security and Emergency Management,* 3(3):1–28. https://doi.org/10.2202/1547-7355.1277

Burke RP (2018) 'Command and Control: Challenging Fallacies of the 'Military Model' in Research and Practice', *International Journal of Mass Emergencies & Disasters,* 36(2):149–178. https://doi.org/10.1177/028072701803600204

Bush International Consulting (2024) Hawke's Bay Civil Defence and Emergency Management Group Response to Cyclone Gabrielle. Hawke's Bay: Hawke's Bay CDEM Group. www.hbemergency.govt.nz/assets/Uploads/HBCDEM-Response-to-Cyclone-Gabrielle-Final-Report.pdf

Bush M (2023) *Review of the National Emergency Management Response to Cyclone Gabrielle,* Wellington, New Zealand: National Emergency Management Agency.

Carter LH and Kenney CM (2018) 'A tale of two communities: B-race-ing disaster responses in the media following the Canterbury and Kaikōura earthquakes', *International Journal of Disaster Risk Reduction,* 28:731–738. https://doi.org/10.1016/j.ijdrr.2018.01.011

Comfort LK (2006) 'Cities at risk: Hurricane Katrina and the drowning of New Orleans', *Urban Affairs Review,* 41(4):501–516. https://doi.org/10.1177/1078087405284881

Comfort LK (2007) 'Crisis management in hindsight: Cognition, communication, coordination, and control', *Public Administration Review,* 67:189–197. https://doi.org/10.1111/j.1540-6210.2007.00823.x

Danaher LT, Wood E and Frazier T (2023) 'Rescue coordination common operating picture: Enhancement through satellite technology', *Journal of Emergency Management,* 20(8):73–90. https://doi.org/10.5055/jem.0682

Department of the Prime Minister and Cabinet (2018) *Ministerial Review: Better Responses to Natural Disasters and Other Emergencies in New Zealand.*

East Coast LAB (2018) 'Natural hazards: Tsunami'. East Coast LAB website www.eastcoastlab.org.nz/discover/learn/, accessed 15 February 2025.

Elvegård R, Andreassen N and Badu J (2024) 'Building collaboration and trust in emergency preparedness: a model for planning collaboration exercises', *Safety in Extreme Environments,* 6:319–331. https://doi.org/10.1007/s42797-024-00107-w

Gaillard JC, Rom DJ and Rampengan MF (2019) 'People's capacity in facing hazards and disasters: An overview', *Natural Hazards,* 95:863–876. https://doi.org/10.1007/s11069-018-3519-1

Gaillard JC and Peek L (2019) 'Disaster-zone research needs a code of conduct', *Nature,* 575(7783):440–442. https://doi.org/10.1038/d41586-019-03534-z

Goode L, Woodward S, Matthewman S and Simpson P (2025) ''Don't send us a cake, and then let us drown again': remembering and forgetting Cyclone Gabrielle', *Kōtuitui: New Zealand Journal of Social Sciences Online,* 20(2):177–205. https://doi.org/10.1080/1177083X.2025.2455184

Grant A and Langer ER (2019) 'Integrating volunteering cultures in New Zealand's multi-hazard environment', *Australian Journal of Emergency Management,* 34(3):52–59. https://knowledge.aidr.org.au/media/7009/ajem-201902-23-dr-andrea-grant-etal.pdf

Graveline M-H, Germain D, Boyer-Villemaire U and Guimond L (2024) 'Four core principles to reconcile sociocultural conditions and disaster risk reduction in pursuit of community resilience', *Environmental Hazards:* 1–29. https://doi.org/10.1080/17477891.2024.1930456

Hatton T (2023) *Napier City Council Response to Cyclone Gabrielle: Independent Review* (Version 4.0, 18 October 2023).

Hawke's Bay Civil Defence Emergency Management Group (2014) *Hawke's Bay Civil Defence Emergency Management Group Plan 2014–2019*, Napier, New Zealand: Hawke's Bay CDEM Group.

Hawke's Bay Civil Defence Emergency Management Group (2024) 'Community Emergency Hub'. HBEM website www.hbemergency.govt.nz/community/community-hubs, accessed 16 October 2025.

Haynes K, Bird DK and Whittaker J (2020) 'Working outside "the rules": Opportunities and challenges of community participation in risk reduction', *International Journal of Disaster Risk Reduction,* 44:101402. https://doi.org/10.1016/j.ijdrr.2019.101402

Hill RD and Gaillard JC (2013) *The 1931 Hawke's Bay earthquake and the role of spontaneous volunteers,* London, Elsevier.

IASC (Inter-Agency Standing Committee) (2005) *Guidance Note on Using the Cluster Approach to Strengthen Humanitarian Response,* Geneva.

Kay G and Johnson A (2012) 'Community-based disaster response: A case study of the 2010 Haiti earthquake', *Journal of Emergency Management,* 10(3):45–56. https://doi.org/10.5055/jem.2012.0112

Kenney C, Phibbs S, Paton D, Reid J and Johnston DM (2015) 'Community-led disaster risk management: a Māori response to Ōtautahi (Christchurch) earthquakes', *Australasian Journal of Disaster and Trauma Studies,* 19(1):9–20. http://trauma.massey.ac.nz/issues/2015-IRDR/AJDTS_19-IRDR_Kenny.pdf

Kenney CM and Phibbs S (2015) 'A Māori love story: Community-led disaster management in response to the Ōtautahi (Christchurch) earthquakes as a framework for action', *International Journal of Disaster Risk Reduction,* 14(1):46–55. https://doi.org/10.1016/j.ijdrr.2015.01.001

Knox-Clarke P and Campbell L (2018) 'Coordination in theory, coordination in practice: the case of the Clusters', *Disasters,* 42(4):655–673. https://doi.org/10.1111/disa.12252

Kristian I and Fajar Ikhsan OM (2024) 'Integrating Community-Based Approaches into National Disaster Management Policies: Lessons from Recent Natural Disasters', *The International Journal of Law Review and State Administration,* 2(4):15–125. https://doi.org/10.58818/ijlrsa.v2i4.150

Laking G, Caddie M, Thorpe H, McClutchie J, Chaffey D, Maxwell H, Philip-Barbara H, Bell J, Horgan-Heke E, Langridge F, Exeter D, Eggleton K, Sing F, Egli V, Ikiua O and McCool J (2024) *Te Weu me Te Wai: Research into health and wellbeing impacts of adverse weather conditions,* Auckland: Faculty of Medical and Health Sciences, Waipapa Taumata Rau – University of Auckland.

Le Dé L, Ronoh S, Kyu EMT and Rive B (2024) 'How Can Practitioners Support Citizen Volunteers in Disaster Risk Reduction? Insight from "Good and Ready" in Aotearoa New Zealand', *International Journal of Disaster Risk Science,* 15(3):374–387. https://doi.org/10.1007/s13753-024-00563-9

Le Dé L, Wairama K, Sath M and Petera A (2021) 'Measuring resilience: by whom and for whom? A case study of people-centred resilience indicators in New Zealand', *Disaster Prevention and Management: An International Journal,* ahead-of-print. https://doi.org/10.1108/DPM-07-2021-0225

Lie JHS (2020) 'The humanitarian-development nexus: humanitarian principles, practice, and pragmatics', *Journal of International Humanitarian Action,* 5(1):18. https://doi.org/10.1186/s41018-020-00080-1

Mathias J, Burns D, Piekalkiewicz E, Choi J and Feliciano G (2022) 'Roles of Nonprofits in Disaster Response and Recovery: Adaptations to Shifting Disaster Patterns in the Context of Climate Change', *Natural Hazards Review,* 23(4):04022035. https://doi.org/10.1061/(ASCE)NH.1527-6996.0000470

McLennan B, Whittaker J and Handmer J (2016) 'The changing landscape of disaster volunteering: opportunities, responses and gaps in Australia', *Natural Hazards,* 84:2031–2048. https://doi.org/10.1007/s11069-016-2374-2

Miller T, Le Dé L and Hore K (2025) 'The Adaptive Shift: Embracing Complexity in Disaster and Emergency Management', *International Journal of Disaster Risk Reduction,* 105323. https://doi.org/10.1016/j.ijdrr.2025.105323

MCDEM (Ministry of Civil Defence and Emergency Management) (2019a) National Disaster Resilience Strategy. MCDEM website www.civildefence.govt.nz/cdem-sector/plans-and-strategies/national-disaster-resilience-strategy, accessed 15 February 2025.

MCDEM (Ministry of Civil Defence and Emergency Management) (2019b) *Coordinated Incident Management System* (CIMS), 3rd Edition, Wellington, New Zealand: MCDEM website www.civildefence.govt.nz/resources/coordinated-incident-management-system-cims-3rd-edition/, accessed 15 February 2025.

MCDEM (Ministry of Civil Defence and Emergency Management) (2019c) Volunteer coordination in CDEM: Director's guideline for Civil Defence emergency management groups. MCDEM website www.civildefence.govt.nz/cdem-sector/guidelines/volunteer-coordination-in-cdem, accessed 15 February 2025.

MFAT (Ministry of Foreign Affairs and Trade) (2023) Cyclone Gabrielle's impact on the New Zealand economy and exports – March 2023. MFAT website www.mfat.govt.nz/en/trade/mfat-market-reports/cyclone-gabrielles-impact-on-the-new-zealand-economy-and-exports-march-2023, accessed 15 February 2025.

New Zealand Government (14 Feb 2023) State of National Emergency Declared for Cyclone Gabrielle (online). NZ Government www.beehive.govt.nz/release/state-national-emergency-declared, accessed 16 Match 2025.

Nyahunda L, Tirivangasi H and Mabila T (2022) 'Challenges faced by humanitarian organisations in rendering services in the aftermath of Cyclone Idai in Chimanimani, Zimbabwe', *Cogent Social Sciences,* 8(4):1–12. https://doi.org/10.1080/23311886.2022.2098025

Office of the Auditor-General (2022) *Co-ordination of the all-of-government response to the Covid-19 pandemic in 2020.* Office of the Auditor-General New Zealand website https://oag.parliament.nz/2022/covid-19, accessed 16 March 2025.

Ongesa TN, Ugwu OP, Ugwu CN, Alum EU, Eze VHU, Basajja M, Ugwu JN, Ogenyi FC, Okon MB and Ejemot-Nwadiaro RI (2025) 'Optimizing emergency response systems in urban health crises: A project management approach to public health preparedness and response', *Medicine (Baltimore),* 104(3):e41279. https://doi.org/10.1097/MD.0000000000041279

Parkash S (2015) *Cooperation, coordination and team issues in disaster management: the need for a holistic and integrated approach.*

Phibbs S, Good G, Severinsen C, Woodbury E and Williamson K (2012) 'Issues experienced by disabled people following the 2010-2011 Canterbury earthquake series: Evidence based analysis to inform future planning and best practice guidelines for better emergency preparedness', GNS Science Report, 2012/40. https://ndhadeliver.

natlib.govt.nz/delivery/DeliveryManagerServlet?dps_pid=IE18424878

Quarantelli EL (1988) 'Crisis Management: A Summary of Research Findings', *Journal of Management Studies,* 25(4):373–385. https://doi.org/10.1111/j.1467-6486.1988.tb00288.x

Rawsthorne M, Howard A and Levinson M (2023) 'Community-based disaster response: Lessons from the field', *Journal of Disaster Research,* 18(1):45–58. https://doi.org/10.20965/jdr.2023.p0045

Sarabia MM, Kägi A, Davison AC, Banwell N, Montes C, Aebischer C and Hostettler S (2020) 'The challenges of impact evaluation: Attempting to measure the effectiveness of community-based disaster risk management', *International Journal of Disaster Risk Reduction,* 49:101732. https://doi.org/10.1016/j.ijdrr.2020.101732

Simo G and Bies A (2007) 'The Role of Nonprofits in Disaster Response: An Expanded Model of Cross-Sector Collaboration', *Public Administration Review,* 67:125–142. https://doi.org/10.1111/j.1540-6210.2007.00759.x

Skar M, Sydnes M and Sydnes AK (2016) 'Integrating unorganized volunteers in emergency response management: A case study', *International Journal of Emergency Services,* 5(1):52–65. https://doi.org/10.1108/IJES-12-2015-0030

Smith M and Williams T (2013) 'The role of local knowledge in disaster response: Insights from the 2010 Haiti earthquake', International Journal of Disaster Risk Reduction, 5:68–75. https://doi.org/10.1016/j.ijdrr.2013.08.004

Sowden B (19 March 2023) 'Cyclone Gabrielle: The New Zealand flood victims too scared to go home', *BBC News* website www.bbc.com/news/world-asia-64940342, viewed 16 October 2025.

Sphere Association (2000) *Humanitarian Charter and Minimum Standards in Disaster Response (Sphere Standards),* Geneva.

Stats NZ (2024a) 2023 Census – Our region: Hawke's Bay. Stats website www.stats.govt.nz/infographics/detailed-regional-infographics-from-2023-census/our-region-hawkes-bay/, accessed 16 October 2025.

Stats NZ (2024b) 2023 Census data highlights: Napier and Hastings. *Scoop* website www.scoop.co.nz/stories/AK2405/S01010/2023-census-data-highlights-hawkes-bay-region.htm, accessed 16 October 2025.

Steets J and Meier C (2012) 'Coordination to Save Lives', www.unocha.org/attachments/62d7656a-3fff-3a32-9007-c5d82ee1dd20/Coordination%20to%20Save%20Lives%20History%20and%20Emerging%20Challenges.pdf

The Sphere Handbook (2018) *Humanitarian Charter and Minimum Standards in Humanitarian Response.* https://spherestandards.org/wp-content/uploads/Sphere-Handbook-2018-EN.pdf

UNHCR, Cluster Approach, UNHCR Emergency Handbook. UNHCR website https://emergency. unhcr.org/coordination-and-communication/cluster-system/cluster-approach, accessed 4 March 2025.

UNOCHA (United Nations Office for the Coordination of Humanitarian Affairs) (1998) 'United Nations; OCHA, UN. OCHA on Message: General Assembly resolution'. OCHA website www.unocha.org/publications/report/world/ocha-message-general-assembly-resolution-46182-enar, accessed 12 March 2025.

UNDRR (United Nations Office for Disaster Risk Reduction) (2015) *Sendai Framework for Disaster Risk Reduction 2015-2030.* www.unisdr.org/files/43291_sendaiframeworkfordrren.pdf

Vasseur L, Thornbush M and Plante S (2017) 'Climatic and Environmental Changes Affecting Communities in Atlantic Canada', *Sustainability,* 9:1293. https://doi.org/10.3390/su9071293

Versaillot P-D and Honda R (2024) 'Building social capital through Konbit for post-disaster recovery: A case study of rural areas in the Xaragua peninsula, Haiti', *International Journal of Disaster Risk Reduction,* 109:104604. https://doi.org/10.1016/j.ijdrr.2024.104604

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Professionalism: the Emergency Management T-Shaped Transdisciplinary Model

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Abstract

Emergency management in Australia continues along a path of professionalisation. To support that process, a range of activities must be completed and research into the human capacities of the emergency manager role in Australia was undertaken. Emerging from that research is the Emergency Management T-Shaped Transdisciplinary Model. The model provides a framework for the selection, development and recognition of the defined roles of Emergency Manager, Response Manager and Recovery Manager. By using the Emergency Management T-Shaped Transdisciplinary Model the key roles can be identified, discussed, evaluated and adopted. Thus, the development of these roles are described and provide a means to develop understanding of the roles and underlying human capacities requires training, education, certification and policy to be developed and applied in a consistent manner. This will support future emergency management practitioners as well as the professionalisation of emergency management in Australia.

Introduction

Emergencies and disasters affect communities on an ongoing basis. In Australia, the Major Incidents Report (AIDR 2017, p.3) documented 9 major incidents during 2016–17. However, the 2023–24 report showed the number of incidents had risen to 30 (AIDR 2024, p.1). This increase affects individuals, communities and the environment in disparate ways. Individuals may be injured or killed, communities can lose members and the contributions of those individuals to the fabric of the community and the environment may be affected for a short or a long time. There is a rising expectation that the people who have roles to prepare for, respond to or recover from emergencies and disasters have appropriate knowledge, skills and abilities so they can ameliorate the effects of these events.

Emergency management in Australia is undergoing a process of professionalisation (Dippy 2022, p.72). Professionalisation 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 have been previously explored by Dippy (2020, p.56; 2022, p.68) and forms part of the journey of professionalisation of emergency management in Australia. Exploration of the definitions that can be applied to emergency managers, response managers and recovery managers (Dippy 2025b, p.66) and the concept of disciplines and disciplinary models (Dippy 2025a, p.6) also underpin the development of personnel who lead the prevention of, preparedness for, response to and recovery from emergency events. This paper brings together this previous work on professionalisation into a model, the Emergency Management T-Shaped Transdisciplinary Model, that is a framework to develop future emergency management leaders.

Background

The research to determine the human capacities of the emergency manager in Australia was analysed and the concept of the Emergency Management T-Shaped Transdisciplinary Model was developed. The model incorporates the previously identified definitions of the Emergency Manager, Response Manager and Recovery Manager (Dippy 2025b, p.66). The model also incorporates the concept of emergency management disciplines and the Emergency Management Disciplinary Spectrum that emerged from this research (Dippy 2025a, p.6).

Leaders and managers have been described in the literature using several shape-based analogies for many years. The 'T-shaped' analogy was first used in 1991 by Professor David Guest in the description of an information technology professional (Guest 1991). Johannessen et al. (1999, p.128) expanded the understanding of the analogy in their exploration of knowledge management innovation to describe T-shaped people as those with combined theoretical and practical knowledge that was systemic in nature and spanned multiple 'branches of knowledge'. This understanding was used by Johannessen and colleagues to propose a typology of knowledge in the innovation sphere (Johannessen et al. 1999, p.128). While Johannessen et al. (1999) present the typology as a quadrant-style model, the concepts of depth and breadth of knowledge that underpin the T-shaped leader remain. Johannessen et al. (1999) state that the innovative concept supports improvement of company competitiveness, knowledge development and integration to generate new knowledge (p.134).

Hansen and von Oetinger (2001) furthered the understanding of T-shaped management with their exploration of the concept's application in the multi-national petroleum company, BP. The company was an early adopter of the concept of T-shaped managers and this has shown clear benefits of the practice (p.109). Hansen and von Oetinger (2001) examined the concept of T-shaped managers from the perspective of behaviours, unlike previous explorations that were about skills. The authors explicated the concept with the sharing of knowledge occurring across the horizontal part of the 'T' as separate from the manager's deep individual expertise of their area represented by the vertical part of the 'T' (p.108).

Lee and Choi (2003) examined knowledge management enablers and processes and hypothesised a positive relationship between the presence of members with T-shaped skills and knowledge creation. They examined major Korean companies and found that T-shaped skills did not affect knowledge creation per se (p.6), but that knowledge creation is associated with cultural factors of collaboration, trust and learning (p.210). Further, they found that the systematic management of T-shaped skills in a T-shaped management system is a crucial element of successful knowledge management (p.213).

Glushko (2008) examined the 2003 emergence of service science as a discipline that was developed in partnership between the University of California, Berkeley and IBM. Service science builds on concepts of multi-disciplinary or trans-disciplinary activities when moving towards a service-based economy (Glushko 2008, p.16). In this development, it was noted that T-shaped people were essential in service areas, but that the definition of the skills held by those people was still fluid and contentious. It was noted that descriptions of the T-shaped person that arose included being empathetic, having the ability to apply different perspectives (i.e. breadth of skills) and having deep business skills and technical understanding; that is, depth of skills (Glushko 2008, p.6).

At the same time as Glushko's work with IBM, a parallel exploration was occurring in universities in Finland as part of student development for strategic design management (Karjalainen and Salimäki 2008). Three universities worked to understand the application of both wide strategic skills and deep technical expertise while noting that the typical university education only addresses deep technical skill development (p.2). The universities separated the skills on the vertical and horizontal strokes of the 'T'. The vertical stroke represented discipline-specific information. The horizontal was the interactions of their specific discipline with the other disciplines required for the project (p.6). The T-shaped person was separated from the 'expert' who had strong knowledge and expertise in their own area only, and also from the 'generalist' (or wide professional) who had some non-expert knowledge across disciplines (p.7). In this analogy, the generalist would be represented by the horizontal bar of the 'T'; that is, the person with the breadth of skills and the expert by the 'I' for their depth of skills.

The use of vertical and horizontal descriptors has been applied in learning environments without the use of the T-shaped analogy. Postma and White (2017) and Snymam and Kroon (2005) used the terms in dental education where vertical training involves very specific topic-based knowledge (e.g. the exterior of a tooth) and horizontal training is about the holistic management of the patient. Dulloo et al. (2017) applied a similar methodology to medical students and Klein (2016) applied this to the education of teachers. By combining vertical (topic specific) and horizontal (broad disciplinary context) teaching it was found that a better overall training outcome was achieved for dentists, doctors and teachers.

In recent times, the use of the T-shaped analogy has expanded in the fields of marketing (Rust et al. 2010), engineering (Elmquist and Johansson 2011; Nesbit 2014), project management (Fisher 2011), water professionals and hydrologists (McIntosh and Taylor 2013a, 2013b; Ruddell

and Wagener 2015; Sanchez et al. 2016; Uhlenbrook and De Jong 2012), the service economy (Barile et al. 2015; Demirkan and Spohrer 2015), innovation (Jimenez-Eliaeson 2017) and, most recently, in higher education (Rippa et al. 2020; Saviano et al. 2017).

The T-shaped person has now been explored in US and European contexts. Its use has expanded from a concept to being applied in major multi-national companies. It is being applied in engineering-based industries, including in Australia (McIntosh and Taylor 2013a, 2013b) as well as in academia. This expansion of its use has occurred over a period of 30 years.

The concept of a T-shaped person has matured and was described by Uhlenbrook and De Jong (2012) as a person who is 'a top expert in one field, but he or she can build bridges to other disciplines and is able to think outside the box' (p.3478). Uhlenbrook et al. (2012) described the vertical bar as representing a deep understanding of a particular discipline with the horizontal bar representing knowledge, values, ethics, functional, personal and cognitive competence arising from other disciplines. Hansen and von Oetinger (2001) described the horizontal bar as one that represents collaboration; the giving and taking advice and connecting with others (p.111). Both Jimenez-Eliaeson (2017, p.51) and Guimarães et al. (2019) describe this horizontal set of skills as 'transdisciplinarity' or being 'interdisciplinary'. Chan et al. (2020, p.115) summarised all these descriptions to refer to someone who has a deep specialisation (vertical) and broad knowledge and skills (horizontal).

Research methodology

This study examined the question: 'What human capacity demands should inform the development and appointment of an emergency manager?'.

A 20-year period of emergency event inquiry reports were examined. The period between 1997 and 2017 was used because many contemporary emergency management concepts and principles have been in place since 1997. Before this period of practice, the response to emergencies was based on cold-war-era civil defence paradigms (Emergency Management Australia 1993, p.3). Since 1997, considerable change has occurred. The introduction of incident management systems by bodies such as the Australasian Fire and Emergency Services Council (AFAC) (2017), the Australian and New Zealand Policing Advisory Agency (ANZPAA) (2012) and biosecurity agencies (DAFF 2012) as well as the introduction of the *National Strategy for Disaster Resilience* (Commonwealth of Australia 2011) and the *National Emergency Risk Assessment Guidelines* (National Emergency Management Committee 2010) have led to major changes in the emergency management environment in Australia.

The 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 inquires, including royal commissions and formal legislated inquires, have a legally enforceable requirement to answer questions and provide information. Judicial and semi-judicial inquiries are conducted for emergency events and disasters that have significant effects on communities based, in part, on their complexity or consequences. The inquiry reports identified a range of human capacities of the emergency manager. Interviews were conducted with authors of 8 emergency event inquiry reports to identify further human capacities required in the management of emergency events.

The literature review incorporated broader management concepts in conjunction with the emergency event inquiry reports. The analysis of the practical and theoretical information sources led to the distillation of themes within the identified human capacities. The interviews provided further human capacities that deepened the thematic analysis of the human capacities applied by emergency managers.

A Gadamerian philosophical hermeneutic research methodology was applied (Gadamer 2004, 2013; van Manen 1997). The interviews of emergency event inquiry authors, examination of emergency event inquiry reports and the literature review generated over 15,000 pages of text. The Gadamerian methodology acknowledged the researcher's participation in the field and any potential effect to the analysis of the text. The application of the Gadamerian methodology allowed rigorous analysis to occur that included acknowledgment of the researchers world view (Gadamer 2004, p.xi; van Manen 1997, p.197) within the process of documentation, reflection, reconsideration and change in a manner that was captured and acknowledged. The application of Gadamer's analysis methodology allowed rigorous and replicable findings to emerge from the research.

This paper presents the Emergency Management T-Shaped Transdisciplinary Model that emerged from the analysis. The model brings together the range of concepts and definitions into a pictorial representation that can be used for future development of people who take on leadership roles for emergency events.

Ethics statement

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

Findings

The Emergency Management T-Shaped Transdisciplinary Model provides a developmental framework for current

and future emergency managers, response managers and recovery managers. The model consolidates the defined terms of Emergency Manager, Response Manager and Recovery Manager (Dippy 2025b) and the Emergency Management Disciplinary Spectrum (Dippy 2025a) with the analysis of the literature explored and human capacities that arose from this research.

Figure 1 illustrates the model and shows the application of disciplinary human capacities to the T-shaped leadership concept.

The Emergency Management T-Shaped Transdisciplinary Model was developed as a means to collate and apply identified human capacities. The model consists of a vertical component indicating the depth of human capacities and a horizontal component indicating breadth of human capacities.

Discussion

The development of the Emergency Management T-Shaped Transdisciplinary Model included analysis and theming of the human capacities identified in the research. The themed human capacities support the model. The themes identified from the human capacities also support the training and development of future emergency managers, response managers and recovery managers. Further, the themes provide a framework from which existing emergency managers, response managers and recovery managers can undertake additional personal development and from which public and private organisations can develop their programs and staff (including paid and unpaid staff).

T-shaped leaders were identified by Guest (1991) in relation to the work of information technology professionals (the use of the term 'professional' by Guest (1991) related to full time paid staff in information technology, not a recognised profession (as described earlier). This work was later expanded by Johannessen et al. (1999, p.128) who proposed a typology of knowledge for people applying T-shaped skills; people who have both theoretical and practical knowledge across multiple branches of knowledge. The term 'multiple branches of knowledge' is the same as the concept of trans-disciplinarity applied to the emergency manager role and described in the Emergency Management Transdisciplinary Spectrum (Dippy 2025a). In essence, the concept of trans-disciplinarity involves multiple disciplines being applied to the resolution of a problem. Trans-disciplinary skills arise from multiple disciplines or branches of learning being applied to the overall emergency event. The emergency manager applies trans-disciplinary skills and knowledge to the prevention of, preparedness for, response to and recovery from an emergency event.

Branches of knowledge also align with the concept of breadth of knowledge that arose in this research. It was identified that an emergency manager requires a broad range of knowledge, skills and abilities. This range or breadth of knowledge, skills and abilities includes developing plans, applying lessons identified, supporting and/or implementing plans, managing community recovery from an emergency event and undertaking lessons management processes. Each of these tasks are based on different areas of knowledge. For example, developing plans may require information relative to the hazards that may result in an emergency event. The hazards that the emergency manager develops plans for include weather-based events, fires, cyber-security events and biosecurity events. Recovery actions may require information arising from human behaviour knowledge bases. Each of these examples is supported by different disciplines or branches of knowledge.

Guimarães et al. (2019) discussed the development of inter- and trans-disciplinary research, noting the need for 'disciplinary depth, multidisciplinary breadth, interdisciplinary integration and transdisciplinary competencies (i.e. T-shaped training)' (p.112). This union of trans-disciplinarity and T-shaped learning was also described by Jimenez-Eliaeson (2017, p.51) who posited that a lack of T-shaped learning reduces trans-disciplinary skills and, thus, the number of innovators in the community. Rippa et al. (2020) showed that T-shaped PhD learning methods had positive effects on vertical skills and horizontal capabilities (i.e. transdisciplinarity) of students (p.13).

Connecting the concepts of disciplinarity and T-shaped leadership and learning produces a model that can be applied to emergency management and emergency managers. The model positions disciplinary skills in the vertical component of the T-shape. The vertical component includes the multi-disciplinary aspect of an emergency as it is the joint application of 2 distinct sets of disciplinary skill sets. The horizontal component of the T-shape consists of the inter-disciplinary skills (a small horizontal sub-component only) with the full horizontal component being the trans-disciplinary skills. When the 4 parts of disciplinarity and the overall T-shape are combined, the model emerges as shown in Figure 1.

Bierema (2019) examined T-shaped professionals (referring to engineers, teachers and artists) and identified a range of horizontal skills that included:

> *…inquiry, open mindedness, curiosity, compassion, teamwork, communication, listening, emotional intelligence, networking, critical thinking, holistic understanding, organisational skills, program management, perspective, global thinking, cultural competence, resilience.*
> (p.69)

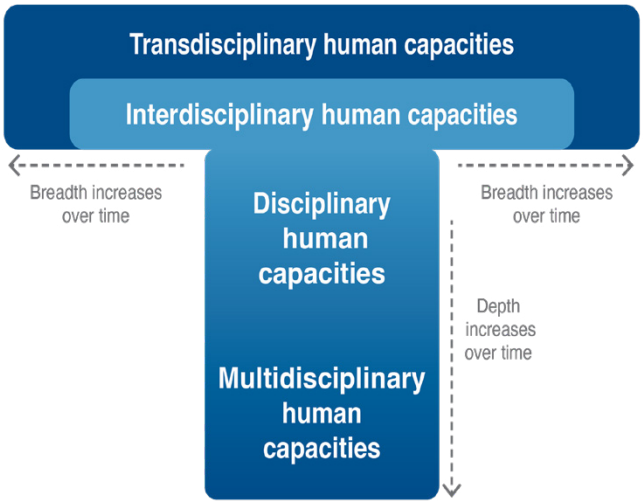

Figure 1: The Emergency Management T-Shaped Transdisciplinary Model.

Bierema (2019) also noted that the horizontal skills list is not common to all disciplines, but that each discipline's required knowledge, skills and attitudes (their human capacities) should be identified according to need (p.69). Augsburg's (2014) transdisciplinary researchers were noted to have qualities (human capacities) 'such as curiosity about, and willingness to learn from, other disciplines; flexibility; adaptability; openness in mind; creativity; good communication and listening skills; capacity to absorb information; and teamwork' (p.238).

The human capacities discussed by Bierema (2019) and Augsburg (2014) of teamwork, networking and holistic understanding have commonalities with emergency management (e.g. open mindedness, communication, listening and curiosity). These and other similar human capacities arose during the interviews in this research. The following comments from interviewees noted empathic listening, critical analysis, understanding society, team building, inquiring mind, courage and resilience support. The human capacities identified by the interviewees included human capacities that arise in both the transdisciplinary model and the horizontal aspect of a T-shaped person:

> *…an empathic listener. So that's 2 concepts of course, one is to be a listener and the other is to do it with empathy.*
> (Interview 3)

> *…you need to be critically analysing all the time, and therefore you need to adapt to the situation and be comfortable that, your change in strategy is going to meet the outcome.*
> (Interview 7)

> *…but they are the ones that understand what the fabric of society is, and that really to me are the people that come to the fore.*
> (Interview 5)

> *…where you will actually sit down as a team and you will decide the next steps, and it's not abrogating your leadership its actually engaging the team to get them, I guess, communicate to them what you are doing and how you're going to go about it.*
> (Interview 4)

> *…someone who has an inquiring mind, who is able to clearly articulate strategy, clearly articulate what his or her expectations might be, and to commence that dialogue.*
> (Interview 1)

> *…so, I think some of those people have displayed enormous courage and resilience.*
> (Interview 2)

Based on these interviews, the model of T-shaped leadership was applied in conjunction with the transdisciplinary model of the Emergency Manager, Response Manager and Recovery Manager (Dippy 2025a). Noting Bierema (2019), that the skills forming the horizontal aspect are not the same across disciplines, the human capacities identified during this research were used to form the horizontal and vertical aspects of the newly applied T-shaped model. The human capacities were analysed and applied to the concepts of breadth of skills and depth of skills.

For the purposes of this research, definitions were established for both breadth and depth. Depth was defined as a 'skill or behaviour that is developed over a period of time, education or experience within a particular discipline'. Breadth was defined to be a 'skill or behaviour that is applied when working across disciplines'. Applying Bierema's (2019) observation that the transdisciplinary skills should be identified for each discipline (p.69), the human capacities identified as breadth are the trans-disciplinary human capacities applied to the T-shaped emergency manager.

Further review of the human capacities listed as related to breadth led to the development of themes including:

- unbounded problem analysis and problem-solving skills including the application of hazard and community information
- understanding of the broad cardinal effects of an emergency event
- ability to communicate omnidirectionally in the management of the emergency
- ability to develop, integrate and lead multi-community teams
- high levels of emotional intelligence
- understanding of risks and the ability to avoid risk paralysis
- self-understanding of skills and abilities and the means of supplementing them with a team-based approach

- understanding and experience of leadership and management styles and the appropriate application of each.

The themes identified in the human capacities aligned with the concept of breadth contain similarities to those identified by Bierema (2019) and Augsburg (2014) but they also contain aspects that are unique to the Emergency Manager, Response Manager and Recovery Manager.

To complete the development of the T-shaped model, it is appropriate to examine the human capacities that form the basis of the disciplinary and multi-disciplinary vertical component of the T-shaped model. The human capacities identified as being aligned with the concept of depth are not discipline-specific but could apply to all disciplines that form the basis of the work of the Emergency Manager, Response Manager and Recovery Manager.

On reviewing the human capacities aligned to the concept of depth, the following themes emerged:

- knowledge and understanding of the tactical, operational and strategic aspects of the discipline and organisation
- identification and application of disciplinary and non-disciplinary resources while acknowledging the limitations of those resources
- exhibits a presence that includes leadership, command, openness, confidence, acceptance of responsibility and calmness
- judgement based on ongoing self-development, experience, education, qualification and certification
- ability to communicate omnidirectionally in the management of the emergency
- decision-making in the face of stressors of time and limited information.

The human capacity of communication is present in both the vertical (disciplinary) and horizontal (trans-disciplinary) aspects of the model. While being unable to separate this human capacity into a single category may be considered a fault in the analysis, it occurred because of the importance of communication in bringing together both aspects of the role of the emergency manager and the response or recovery manager. The transcending of communication between the disciplinary and transdisciplinary aspects joins the 2 parts of the model, forming the T-shape and not just a vertical box and a horizontal box placed alongside each other.

The logic of the T in the T-shape

The Emergency Management T-Shaped Transdisciplinary Model arose from the examination of the T-shaped leadership model, which also applies concepts of breadth and depth. While the use of a single letter-shaped model was appealing from a simplicity perspective, this research explored other shapes, descriptions and formats to determine if this was the most suitable way to represent the research outcomes.

The first consideration was the concepts of breadth and depth that emerged as a key means of categorising the identified human capacities. Examination of numerous 2-dimensional representations of thinking, using graph-type models, dynamic shapes and alphabetic characters was undertaken. In emergency management, other alphabetic models are used and accepted but they were not easily aligned with the outcomes of this study. The research sought an explanatory shape, model or diagram that was instinctively understandable and relatable. The T-shaped model was the model identified that met research aims.

The simplicity of the T-shaped model stands out. Existing T-shaped leadership models have successfully applied the concepts of breadth and depth. Application of the model to the discussion of emergency management is simple and logical. The T-shape shows the 2 key aspects of depth and breadth and allows explanation of the growth of both aspects of the model (i.e. depth and breadth) while retaining an outline of the research outcomes that is easy to understand and share.

The expanding non-static nature of the T-shape

A key aspect of the Emergency Management T-Shaped Transdisciplinary Model is the non-static nature of breadth and depth. When examining the concept of depth, no person enters a role, career or profession knowing all there is to know. Human capacities build and develop over time. The ability to apply human capacities to multiple, dynamic emergency events also builds with experience and developing knowledge. In the role of the Response Manager or Recovery Manager, the individual will commence as a practitioner, undertake training and deliver tasks or outcomes. Over a period, their human capacities build. The outcomes become complicated; experience is built. Applying the T-shaped model, the length of the vertical component grows. The quantum of knowledge, skills and abilities, combined with the experience gained in applying those human capacities, should not go backwards. Thus, the length of the vertical component should not shrink. The final length of the vertical component will never be known. Very few people ever profess to know everything about their role or function. Neither a practitioner nor an academic is likely to reach the end of a learning and experience journey.

The vertical component of the model can be said to be infinite. The vertical component is built from many unique building blocks; each may be a unique human capacity or set of human capacities. A building block could consist of a specific technical skill set or task. The total T-shaped vertical component could consist of many subsets of

skills or building blocks. The T-shaped model allows that growth to continue. The only criterion for a building block to be considered part of the vertical component is its applicability to the primary discipline of the individual; that is, their disciplinary skills. A practitioner may develop basic human capacities to do their job and those basic human capacities or skills could form one building block of the vertical component. The practitioner may undertake advanced training and add another block to the vertical component. The practitioner can complete disciplinary leadership or specialisation courses or any number of combinations of human capacities. In each case, the totality of their individual vertical component grows. A breakdown of the vertical component will have some common building blocks for similar practitioners while, at the same time, having a range of unique building blocks.

As a practitioner commences developing the depth of their knowledge (their vertical component), they are likely to start developing the breadth of human capacities (their horizontal component). These components form building blocks. The breadth may arise from the existing human capacities the practitioner brings to their role or from working with other practitioners or other agencies or in other roles at multi-agency emergency events or training exercises. The practitioner may undertake other training with an aim of building breadth of human capacities. The criterion for inclusion of a building block in the horizontal component is skills from other disciplines; that is, transdisciplinary skills or human capacities.

The nature of the continual movement in a practitioner's development will vary. A person may work initially on components of their vertical development as a practitioner until they reach a level that suits them personally or is required by their organisation (disciplinary human capacities). At this time, the practitioner may become recognised as a Response Manager or Recovery Manager if they have gained the required combination of human capacities and other building blocks in their own unique vertical component of development.

The practitioner's development across the breadth of skills may be a result of exposure and experience built over time or a deliberate and specific development pathway. The individual may seek to become an Emergency Manager. The person may seek to acquire transdisciplinary knowledge, skills or ability-based human capacities via training, tertiary education, experience or any combination of these. What is unique to everyone is the manner and timing of their vertical (disciplinary) and horizontal (transdisciplinary) development. The Emergency Management T-Shaped Transdisciplinary Model allows for the multiple pathways that may be considered by people in emergency manager, response manager and recovery manager roles.

The outcomes of everyone's journey through the Emergency Management T-Shaped Transdisciplinary Model is unique to that person. While some aspects will be mandated by an organisation or agency (e.g. completion of basic training in the vertical component), the final shape for each person will be different. The Emergency Management T-Shaped Transdisciplinary Model allows the unique aspects of each role to be demonstrated and shown in a consistent manner. Each person will have an individual and unique blend of vertical and horizontal building blocks that describe their knowledge, skills and abilities—their combined human capacities.

The joining of the horizontal and the vertical

This study identified communication as the human capacity that joins the horizontal and vertical components of the Emergency Management T-Shaped Transdisciplinary Model. This finding reinforces the work of Bierma (2019) who identified that a T-shaped practitioners applied communication skills in the horizontal aspect (p.69) and Augsburg's (2014) finding that communication was an 'ideal quality' of transdisciplinary researchers (p.238). Without communication the vertical and the horizontal aspects are not joined and the model fails. The Emergency Manager with their breadth of human capacities must be able to communicate clearly with personnel during the emergency event as well as with multiple other emergency managers, response managers and recovery managers. The complexity of contemporary emergency and disaster events brings the need for effective communication to the fore. This is reinforced in the human capacities identified in this research.

The need for a new model

Several reasons for the new model have arisen. First, this research identified that emergency management in Australia is not yet a profession. However, those who undertake the roles identified as a Response Manager, Recovery Manager and Emergency Manager are currently traversing a path to professionalisation (Dippy 2020, 2022). The path is not uniformly agreed. While the generic actions required for a recognised profession are described in the literature, the application of those generic actions to the field of emergency management is not settled. The Emergency Management T-Shaped Transdisciplinary Model describes a pathway that supports the progression to professionalisation and it can be debated, agreed and implemented by practitioners, employers, governments and stakeholders to achieve professionalisation. The Emergency Management T-Shaped Transdisciplinary Model provides a foundation for the continuing discourse of professionalisation currently occurring in the sector.

The research identified individual human capacities that emergency managers, response managers and recovery

managers require to undertake the respective roles. The human capacities are applied at different levels and times during the total management of the prevention of, preparedness for, response to and recovery from emergencies and disasters. The number of human capacities, exceeding 230, does not allow for them to be easily individually expressed when explaining or developing the roles, functions, training and tasks of the Emergency Manager, Response Manager and Recovery Manager. The theming of each human capacity led to identification of 6 themes for breadth and 8 themes for depth. Continually describing the themes does not support the instant application and understanding of the outcomes of this research to the Emergency Manager, Response Manager and Recovery Manager.

In developing the model, informal discussion occurred with practitioners and academics across Australia and internationally at several conferences and forums. Practitioners and academics ranged from those wishing to enter the field of emergency management to highly experienced practitioners and senior academics. This research found that describing each individual human capacity did not promote an overall understanding of the research outcomes. When describing the outcomes using the T-shaped model, even with its simplest description, an understanding of the research outcomes emerged. Understanding increased by using the themes of depth and breadth or discussing individual human capacities.

The Emergency Management T-Shaped Transdisciplinary Model provides a simple, easily understood starting point for discussions of the human capacities of the Emergency Manager, Response Manager and Recovery Manager. To expect others to start or join the discussions based on a list of over 230 individual human capacities is not likely to engender the level of engagement required to implement these findings in the future. Having emergency managers, response managers and recovery managers as well as employers, government and community stakeholders being able to join the discussion of the human capacities by applying a clear model in picture format should simplify adoption.

Implementation of the Emergency Management T-Shaped Transdisciplinary Model

Implementation of the Emergency Management T-Shaped Transdisciplinary Model requires a range of actions for practitioners and academics. Practitioner engagement will be required to share the model and develop understanding and acceptance in the sector. Academic engagement will include publication of journal articles, national and international conference presentations and ongoing feedback. Engagement with practitioners and academics will allow review, update and refinement of the model.

Once stakeholders have reviewed the model, changes can be made across recruitment, selection, training, education and development of practitioners. Training and education packages may need to be modified, selection and recruiting packages may need to be addressed and professional development systems and packages may need to be amended.

Disciplinary skills are developed by vocational training developing skills in the discipline itself. Incorporating the findings of this research in future reviews of the vocational units of competency and qualifications would improve development and depth of skills. Transdisciplinary skills are developed by tertiary education to extend the breadth of skills. This study identified that communication skills are key and communication skills development in vocational and tertiary environments will be required. There is opportunity to update work such as that done by FitzGerald et al. (2017) to produce contemporary standards for tertiary education of emergency managers.

The breadth of skills required is greater than what can be achieved in a tertiary qualification and additional methods to address this gap were identified. Those methods are not included in this paper. An issue that may arise is how to demonstrate that the required depth and breadth of skills acquisition has been achieved. This may be addressed applying an accreditation process that brings together disciplinary skills and abilities (human capacities) as well as transdisciplinary skills and abilities (human capacities). Two international based certification models—those provided by the International Association of Emergency Managers and the International Emergency Management Society—were examined by Dippy (2020). These models could be considered in Australia or an Australian-based model could be developed. The latter would require resources to develop and administer such a certification and ensure it remains fit-for-purpose.

The implementation of the model by practitioners must include consideration of existing professional development activities and programs. While a full implementation model is outside the scope of this paper, examples of activities could include the mapping of existing programs against the model to determine if the professional development activity contributes to the breadth or depth of skills held by an Emergency Manager, Response Manager or Recovery Manager. When the next professional development cycle commences the new activities could be undertaken based on any gaps in previous mappings.

Foreseeable issues and roadblocks

As emergency management is not yet considered a profession, there is no clear path or model implemented to develop people who undertake this important role in the community. This means that implementation of the

Emergency Management T-Shaped Transdisciplinary Model will face the same issues and roadblocks as other emerging changes in the field. Issues such as inertia and the lack of understanding of the model may arise. Some practitioners may not continue the path of professionalisation. Some academics may not support the changes to the tertiary education models that will be required. These roadblocks and issues are not unique to this potential model and have been described by Dippy and others when advocating change (Dippy 2025a, 2025b).

The role of champions will be a significant requirement to overcome these issues and roadblocks. Champions can identify potential issues and select appropriate options to address them. Champions can advocate for the model 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 identification of issues and overcoming of roadblocks in the implementation of the Emergency Management T-Shaped Transdisciplinary Model is not a separate function from the professionalisation of emergency management. The Emergency Management T-Shaped Transdisciplinary Model can be a catalyst to accelerate the work of professionalisation. The ability to 'sell' the model to practitioners, academics, policy makers and the community is key to both implementation of the model and the advancement to professionalisation.

Conclusion

This research establishes a model for the application of the human capacities of the Emergency Manager, Response Manager and Recovery Manager in Australia. The Emergency Management T-Shaped Transdisciplinary Model allows for the description of capabilities required in these defined roles. The development of the model is a contemporary means of describing the roles and functions undertaken by emergency managers, response managers and recovery managers. Proposed development activities supporting the model will require agreement by practitioners and academics and possible changes to vocational and tertiary education offerings. Consideration of the application of an existing certification scheme or development of a specific Australian scheme will support implementation. The Emergency Management T-Shaped Transdisciplinary Model supports professionalisation in Australia by providing a framework for action. The Emergency Management T-Shaped Transdisciplinary Model requires adoption by practitioners, policy makers, academia and the community. The implementation can be undertaken as a series of parallel actions. The implementation actions required are not insurmountable and are within the capacities of emergency management stakeholders, practitioners, policy makers, academics and the community.

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References

Augsburg T (2014) 'Becoming transdisciplinary: The emergence of the transdisciplinary individual', *World Futures,* 70(3-4):233–247. https://doi.org/10.1080/02604027.2014.934639

Australasian Fire Authorities Council (2017) *Australasian Inter-service Incident Management System (AIIMS) 2017.* Melbourne: Australasian Fire Authorities Council

Australia New Zealand Policing Advisory Agency (2012) *A common approach to incident management: ICCS Plus.* Australia New Zealand Policing Advisory Agency website www.anzpaa.org.au/products/products/a-common-approach-to-incident-management-iccs-plus-iccs-plus.

AIDR (Australian Institute for Disaster Resilience) (2017) *Major Incidents of the year 2016-2017.* https://knowledge.aidr.org.au/media/5929/major-incidents-report-1617.pdf

AIDR (Australian Institute for Disaster Resilience) (2024) *Major Incidents Report 2023-24.* www.aidr.org.au/media/11929/aidr_major-incidents-report_2023-24.pdf

Barile S, Saviano M and Simone C (2015) 'Service economy, knowledge, and the need for T-shaped innovators', *World Wide Web,* 18(4):1177–1197. https://doi.org/10.1007/s11280-014-0305-1

Bierema LL (2019) 'Enhancing employability through developing T-shaped professionals', *New Directions for Adult and Continuing Education,* 2019(163):67–81. https://doi.org/10.1002/ace.20342

Chan K-Y, Ho M-HR and Ramaya R (2020) 'A "T-shaped" metaphor for holistic development: Entrepreneurial, professional and leadership (EPL) efficacies predict self-perceived employability', in M-HR Ho, JC Kennedy, MA Uy and K-Y Chan (eds), *Entrepreneurship - Professionalism - Leadership,* pp.113–130. Springer Singapore. https://doi.org/10.1007/978-981-15-3121-7_7

Commonwealth of Australia (2011) *National Strategy for Disaster Resilience.* Department of Home Affairs. www.homeaffairs.gov.au/emergency/files/national-strategy-disaster-resilience.pdf

DAFF (Department of Agriculture, Fisheries and Forestry) (2012) Biosecurity Incident Management System. www.agriculture.gov.au/sites/default/files/

sitecollectiondocuments/animal-plant/pihc/bepwg/biosecurity-emergency-management-biosecurity-incident-management-system.pdf

Demirkan H and Spohrer J (2015) 'T-Shaped innovators: Identifying the right talent to support service innovation', *Research Technology Management,* 58(5):12–15. https://doi.org/10.5437/08956308X5805007

Dippy R (2020) 'Professionalism: Certification for emergency management leaders', *Australian Journal of Emergency Management,* 35(4):56–60. https://knowledge.aidr.org.au/media/8225/ajem_17_2020-10.pdf

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/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/10.47389/40.1.66

Dulloo P, Vedi N and Gandotra A (2017) 'Impact of horizontal and vertical integration: Learning and perception in first-year medical students', *National Journal of Physiology, Pharmacy and Pharmacology,* 7(11):1170–1176. https://doi.org/10.5455/njppp.2017.7.0519113062017

Elmquist L and Johansson G (20–23 June 2011,) 'An approach to foster integrative skills during the engineering studies', 7th International CDIO Conference, Copenhagen. https://cdio.org/files/document/file/74_paper.pdf

Emergency Management Australia (1993) Commonwealth Counter Disaster Concepts and Principles (2nd ed.). Emergency Management Australia.

Fisher E (2011) 'What practitioners consider to be the skills and behaviours of an effective people project manager', *International Journal of Project Management,* 29(8):994–1002. https://doi.org/10.1016/j.ijproman.2010.09.002

FitzGerald G, Rego J, Ingham V, Brooks B, Cottrell A, Manock I, Surjan A, Mayner L, Webb C, Maguire B, Crawley H, Mooney J, Toloo S and Archer F (2017) 'Teaching emergency and disaster management in Australia: Standards for higher education providers', *Australian Journal of Emergency Management,* Monograph No 1:14. https://knowledge.aidr.org.au/media/4333/ajem-32-03-14.pdf

Gadamer H-G (2004) *Philosophical Hermeneutics* (30th anniversary ed.). University of California Press.

Gadamer H-G (2013) *Truth and Method* (Bloomsbury Revelations) (JW Weinsheimer and DG Marshall, Trans.). Bloomsbury Academic.

Glushko RJ (2008) 'Designing a service science discipline with discipline', *IBM Systems Journal,* 47(1):15–27. https://doi.org/10.1147/sj.471.0015

Guest D (1991) 'The hunt is on for the Renaissance Man of computing', *The Independent,* 17(09).

Guimarães MH, Pohl C, Bina O and Varanda M (2019) 'Who is doing inter- and transdisciplinary research, and why? An empirical study of motivations, attitudes, skills, and behaviours', *Futures,* 112:102441. https://doi.org/10.1016/j.futures.2019.102441

Hansen MT and von Oetinger B (2001) 'Introducing T-shaped managers: Knowledge management's next generation', *Harvard Business Review,* 79(3):107.

Jimenez-Eliaeson T (2017) 'The Transdisciplinary Atelier: A spatiotemporal approach to learning for the innovation economy', *Planning for Higher Education,* 45(2):39–53.

Johannessen J-A, Olsen B and Olaisen J (1999) 'Aspects of innovation theory based on knowledge-management', *International Journal of Information Management,* 19(2):121–139. https://doi.org/10.1016/S0268-4012(99)00004-3

Karjalainen T-M and Salimäki M (2008) 'Do offerings meet expectations? Educating T-shaped professionals in strategic design management', Proceedings from International DMI Education Conference Design Thinking: New Challenges for Designers, Managers and Organizations, Cergy-Pointoise, France.

Klein J (2016) 'Teacher empowerment, horizontal and vertical organisational learning, and positional mobility in schools', *European Journal of Teacher Education,* 39(2):238–252. https://doi.org/10.1080/02619768.2015.1119118

Lee H and Choi B (2003) 'Knowledge management enablers, processes, and organizational performance: An integrative view and empirical examination', *Journal of Management Information Systems,* 20(1):179–228. https://doi.org/10.1080/07421222.2003.11045756

McIntosh BS and Taylor A (2013a) 'Developing T-shaped water professionals: Reflections on a framework for building capacity for innovation through collaboration, learning and leadership', *Water Policy,* 15(2):42–60. https://doi.org/10.2166/wp.2013.011

McIntosh BS and Taylor A (2013b) 'Developing T-shaped water professionals: Building capacity in collaboration, learning, and leadership to drive innovation', *Journal of Contemporary Water Research and Education,* 150(1):6–17.

National Emergency Management Committee (2010) *National Emergency Risk Assessment Guidelines.* Tasmania State Emergency Service. www.preventionweb.net/files/41033_nationalemergencyriskassessmentguid.pdf?startDownload=true.

Nesbit S (2014) '7th International Conference on Engineering Education for Sustainable Development (EESD15): Cultivating the T-Shaped Engineer, Vancouver Canada, June 9–12, 2015', *Journal of Cleaner Production,* 79:1–3. https://doi.org/10.1016/j.jclepro.2014.04.086

Peterson DR (1976) 'Is psychology a profession?', *American Psychologist,* 31(8):572–581. https://doi.org/10.1037/0003-066X.31.8.572

Postma TC and White JG (2017) 'Students' perceptions of vertical and horizontal integration in a discipline-based dental school', *European Journal of Dental Education,* 21(2):101–107. https://doi.org/10.1111/eje.12186

Rippa P, Landi G, Cosimato S, Turriziani L and Gheith M (2020) 'Embedding entrepreneurship in doctoral students: The impact of a T-shaped educational approach', *European Journal of Innovation Management,* 25(1):249–270. https://doi.org/10.1108/EJIM-07-2020-0289

Ruddell BL and Wagener T (2015) 'Grand challenges for hydrology education in the 21st century', *Journal of Hydrologic Engineering,* 20(1):A4014001

Rust RT, Moorman C and Bhalla G (2010) 'Rethinking marketing', *Harvard Business Review,* 88(1-2):94–101.

Sanchez CA, Ruddell BL, Schiesser R and Merwade V (2016) 'Enhancing the T-shaped learning profile when teaching hydrology using data, modeling, and visualization activities', *Hydrology and Earth System Sciences,* 20(3):1289–1299. https://doi.org/10.5194/hess-20-1289-2016

Saviano M, Polese F, Caputo F and Walletzký L (2017) 'The contribution of systems and service research to rethinking higher education programs: A T-shaped model', *Sinergie Italian Journal of Management,* 35(Sep-Dec):51–70. https://ojs.sijm.it/index.php/sinergie/article/download/150/25/

Snyman WD and Kroon J (2005) 'Vertical and horizontal integration of knowledge and skills - a working model', *European Journal of Dental Education,* 9(1):26–31. https://doi.org/10.1111/j.1600-0579.2004.00355.x

Uhlenbrook S and De Jong E (2012) 'T-shaped competency profile for water professionals of the future', *Hydrology and Earth System Sciences,* 16(10):3475–3483. https://doi.org/10.5194/hess-16-3475-2012

van Manen M (1997) 'From meaning to method', *Qualitative Health Research,* 7(3):345–369. https://doi.org/10.1177/104973239700700303

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

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Community-led approaches to bushfire fuel management in Victoria

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1. Formerly Yarra Ranges Council, Melbourne, Victoria.

Introduction

Within the bushfire fuel management practice, there is often a clear divide between what occurs on public land and what occurs on private land. Different words are used and different metrics of success are evaluated. In Victoria, Forest Fire Management Victoria compares results to the prescriptions set within the Overall Fuel Hazard Assessment Guide (Government of Victoria 2010) while private property owners look to visual cues on their property and, in unfortunate circumstances, from analysis in the aftermath of a bushfire. Generally speaking, community engagement within fuel management practice is led by fire agencies and local governments with communities receiving information on what they should do and how they should do it.

To flip this concept, the Monbulk Community Fuel Management Group created a fuel management plan that allocated fuel management zones specific to their township and incorporated both public and private land. This framework of allocating fuel management zones to public land was replicated and placed within and around the township. This created a common understanding and a shared language to discuss the community's exposures and actions to take. The approach was developed through the Dandenong Ranges Bushfire Landscape Project,[1] a community based, multi-agency project sponsored and coordinated by Emergency Management Victoria.

The Kalorama/Mt Dandenong community group also took the same approach and developed their own plan. The efforts of these community groups culminated in the Bushfire Fuel Management Guide for the protection of townships and settlements (Southern and Eastern Metropolitan Fuel Management Working Group 2018). This guide has since been used in the roll out of additional township bushfire fuel management plans in priority areas of the Yarra Ranges Council between November 2022 and March 2025.

Fuel management zones surrounding a township

The concept of community township fuel management planning is based on allocating fuel management zones around a township to mitigate the effects of a bushfire. This is a community-led initiative to enhance and develop local approaches and improve collaboration between government agencies and communities. The guide informs this practice and includes 4 fuel management zones, the same as those allocated on public land. The guide sets out objectives and performance measures for each of the zones.

Asset Protection Zone (APZ)

The APZ defines an area that is of most priority to the community. This typically includes the area of higher density housing and the main economic areas (such as a main street). This is typically the area where residents will seek refuge and information during a bushfire event. This also applies to residents of surrounding higher-risk localities who may come into these 'hub' townships.

The urban growth boundary can be provided by local councils and is a good starting point when defining this zone. The APZ has the most intensive fuel treatment prescription of the zones but, due to its location being typically within an area of higher density development, the prescription is generally already being met as properties in this area can be smaller with maintained back and front yards. The placement of this zone is a point of focus as all corresponding zones and fuel management activities have the main objective of providing protection to the APZ.

1. Dandenong Ranges Bushfire Landscape Project, www.vgls.vic.gov.au/client/en_AU/search/asset/1268277/0.

Bushfire Moderation Zone (BMZ)

The BMZ typically encircles the APZ with the aim of reducing speed and intensity of a bushfire approaching a township. The BMZ placement is informed by the landscape risk profile. The zone typically covers larger more densely vegetated properties outside of the central township area.

In the case of the Yarra Junction Community Bushfire Mitigation Group, they decided to exclude the south-eastern corner when defining their APZ as fire approach was less likely from this aspect. Unlike the APZ, properties generally do not meet the prescriptions as defined within the Bushfire Fuel Management Guide. Consequently, there is more opportunity for fuel management discussion and activities within this zone.

Landscape Management Zone (LMZ)

The aim of the LMZ is to protect biodiversity assets while still enabling fuel management activities. Community groups have generally allocated this zone in places such as council managed reserves and private property with high-quality vegetation where there is an option for sensitive fuel management such as hand weeding.

Fuel Management Exclusion Zone (FMEZ)

FMEZs are areas of high ecological value. Vegetation management may still be undertaken for ecological outcomes but not for fuel reduction. This zone is typically placed along waterways with high-quality riparian vegetation.

Council collaboration

To add a strategic lens to Yarra Ranges Council's Fire Hazard Inspection Program, and to embed local knowledge into existing legislated arrangements, the council aims to incorporate inspections of properties within the community-defined APZ and BMZ areas during each fire season. This is an encouraging process for community members as it gives added value to their work, knowing their community knowledge is informing strategic planning. In addition, as a mechanism to build continued connection between the council and fire agencies, the Municipal Fire Management Planning Committee (MFMPC) has a standing agenda item to include an update from each of the township fuel management groups.

Phoenix fire modelling: a collaborative tool

In collaboration with Forest Fire Management Victoria, township fuel management groups can access analysis of Phoenix Rapidfire modelling. Fire risk analyst staff from Forest Fire Management Victoria provide community members with modelled bushfire scenarios that demonstrate how a fire could approach their township and how it might behave locally. The modelling also informs the placement of fuel management zones. Once allocated, the prescriptions of the zones are fed into the model and community groups can visualise the bushfire mitigation effects of the zone placement. Zones can be adjusted according to what affords the best mitigation results. This is also expressed as a percentage reduction of residual risk. This process gives community members an in-depth understanding of Forest Fire Management Victoria fuel management practices as well as the process that informs it. The collaboration between agency and community strengthens relationships, which is important to the longevity of these projects.

The townships

After receiving funding through the Preparing Australian Communities grant, Yarra Ranges Council sought to extend the application of the fuel management zone model onto priority townships and to support the review of existing township fuel management plans for Monbulk and Kalorama/Mt Dandenong. The townships of Healesville and Yarra Junction were chosen due to their location acting as a local 'hub' for surrounding smaller towns that have less facilities. Historically, this has been the case during past bushfires, such as Black Saturday, where residents in nearby small townships such as Chum Creek sought refuge in Healesville. Similarly, during Ash Wednesday, residents within Powelltown and Reefton came into the town centre of Yarra Junction (Colverson and Hill 2012)

This report focuses on the approach of establishing community fuel management plans for the Yarra Junction and Healesville townships. The juxtaposition of the 2 localities highlights 2 unique approaches, demonstrating the complexities of township community fuel management planning and the importance of a place-based approach.

Yarra Junction

Unlike other townships referred to within this report, Yarra Junction did not have an existing community bushfire or emergency group and local environmental groups were relatively inactive. As an initial step to learn about the area and community, local leaders were approached through sporting clubs, local schools and community groups. From this, a contact list was established to maintain discussions. In June 2023, with support from Forest Fire Management Victoria and the Country Fire Authority, Yarra Ranges Council hosted a bushfire modelling event at a community centre in Yarra Junction. Over 30 attendees contributed to the exercise where fire modelling outputs were used to show potential fire scenarios and how they could impact on the town. This was coupled with nominating mock fuel management zones around the town to show the

potential differences in fire behaviour including with and without the application of the fuel management zones. The results showed a significant reduction in residual risk with the application of fire management zones. This provided a segue to introduce the township fuel plan concept to attendees.

Contact details were gathered from those who expressed interest in being a part of the project. In August 2023, an introductory meeting was conducted and, in the following months, a committee with a chair and co-chair was elected and work began on allocating the fuel management zones. As a starting point, the predetermined urban growth boundary was used to define the APZ. The group extended the boundary to the north to cover the Neighbourhood Safer Place and the Warburton Highway, which is the main road in and out of the town. This defined APZ encapsulated the town's higher density development areas and main facilities. The boundaries of the BMZ were a mix of natural features and township boundaries. The southwest corner was excluded as bushfire was deemed less likely to approach from this direction. Little Yarra River and Gordon Creek contain high-quality riparian vegetation so these were designated as LMZ (see Figure 1).

Forest Fire Management Victoria risk analysis staff tested the placement of the zones through Phoenix Rapidfire modelling. The results showed a 16% reduction in residual risk to Yarra Junction when combined with the treatment of the Joint Fuel Management Plan.

In January 2024, while defining these areas, the group held a 'ground truthing' day led by a consultant with expertise in ecology and fuel management. The group visited key areas including private property on Milner's Hill and within the APZ along Outlook Avenue, which was an identified area of concern. As a result of existing relationships that committee members had, property owners could be directly involved and discussed ways to manage their property.

The placement of the BMZ along Millner's Hill was contentious within the group due to the environmental values present. Some members felt that the area should be excluded entirely while others felt that it should be the priority as the area arguably poses the highest risk to the township. These discussions occurred in the early

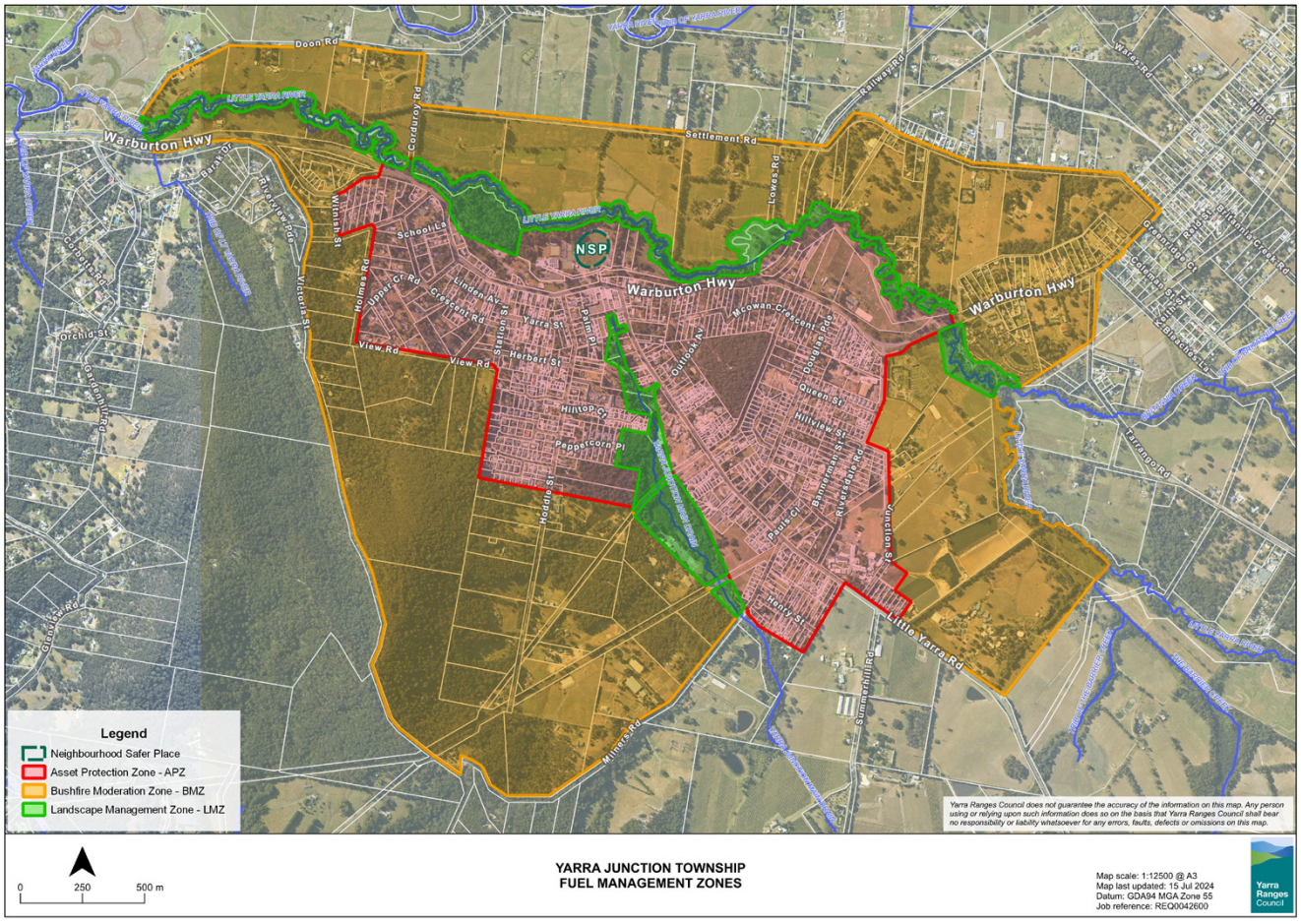


Figure 1: Yarra Junction township fuel management zone map.

Source: Yarra Junction Community Bushfire Mitigation Plan (unpublished), p.3.

Visiting a committee member's property during the 'ground truthing' process.

Image: Rebecca Walker

Community members locate their property on the Yarra Junction fuel management map during the community event.

Image: Cathy Ronalds

formation stages of the group so it was particularly important that conversations remained open to alternative views. The resolution came via continual and open discussion where each member was given the time to express their opinion. However, as the area is private property, the decision to act on the prescriptions of the BMZ was up to the landowner. The intention is to provide fuel management information that can be applied according to the context of the property, including its ecological value.

The first community event

A particular concern of the group was the lack of bushfire knowledge and awareness within the local community. Improving this awareness was a key objective of the project. In November 2024, in collaboration with Forest Fire Management Victoria and the Country Fire Authority, the group hosted a community event to raise bushfire awareness and to explain the work of the group, including fuel management planning and zone locations the plan. The event was well attended and allowed attendees to search for their property on the fuel management map and speak with committee members on what zone their property was covered by.

Approaching the Yarra Junction community with an existing model for fuel management planning was key to the success of the project. It provided the necessary direction and framework for the newly established group. The progression to defining each zone and having it supported by the results of the fire modelling gave reassurance and confidence that the work was meaningful and that their efforts at the strategic level could have a genuine effect on the township once implemented. Another factor was having a chair elected (by vote) after the group's inception. The role was allocated to represent and lead the committee. Having a community member lead the group during the formative stage quickly built trust as members felt reassured that the direction of the project was specific to the needs of Yarra Junction. Maintaining momentum from the beginning was important to the chair and to the committee. Action items were recorded, tasked and completed at each monthly meeting. This gave a sense of achievement and encouragement to continue with the process. Figure 2 illustrates the project milestones for the Yarra Junction Community Bushfire Mitigation Group from 2023 to 2025.

Into the future

A priority of the committee was to involve the local community and to provide information about bushfire risk and fuel management. The intention was to not necessarily meet the prescriptions of the fuel management zones, but to engage with the community to achieve a baseline of knowledge. However, the zones provided identified areas for engagement and properties within these areas may be specifically targeted in the future. The committee plans to hold a community event each November. This is planned to coincide with the local fire brigade annual open day.

In addition to the introductory community event, the committee created a publication that could be distributed to all properties throughout Yarra Junction. The 'What You Need to Know' pamphlet contains information on basic bushfire principles (weather, terrain, fuel) and gives tips to landowners on how to prepare their property. The pamphlet will be distributed prior to the bushfire season.

The committee will report to the Municipal Fire Management Planning Committee once prior to the bushfire season and again after. This is an opportunity for the committee to raise any concerns in the lead-up to each fire season.

Healesville

The pre-existing Healesville community emergency group was approached by Yarra Ranges Council in March 2023. Prior to this, the group had received support through a Safer Together facilitator. The continuum of placed-based work through a fuel management plan fast-tracked the process for the group, particularly as a bushfire focus group had already formed.

At the introductory meeting with the bushfire group, it was established that the group had already heard of the township fuel management model and were not interested in the approach for their community. A priority was to expand the group membership to include a broader variety of community representatives by advertising using flyers, newsletters and engaging with existing community groups. This led to a second introductory meeting attended by 15 residents from various facets of the community, which introduced a new energy and enthusiasm to the group. Eventually, this larger group reduced to what was the original group as new attendees were simply curious and not necessarily willing to commit to the workload required. However, having this broader input in the early stage established a framework for the plan. The concept of fuel management zones encircling the township was not supported by the group as they felt it placed too much emphasis on fuel reduction in bushland settings and not enough focus on useful measures in urban and rural landscapes. They also did not agree that an asset protection zone is the central area of a township and is the priority zone for protection.

The Healesville plan

The work spanned just under 2 years with meetings every 2 months throughout. A passionate and knowledgeable community member led the process and delegated sections to group members. The process included all information and recommendations appropriately referenced, which was an important aspect to uphold for the group. The plan consisted of a 3-pronged approach covering major land-use categories including built assets, rural assets and natural ecosystems. The latest bushfire behaviour and ecosystem response research was used to develop reduction strategies across each land-use category.

The plan enables a reader to determine which land-use categories are applicable to their property and provides reduction strategies. For example, a rural property owner may have multiple assets on their property including a home (built asset), a vineyard (rural asset) and a patch of remnant vegetation (natural ecosystems). Using the plan, they could determine what actions to take relevant to these categories. Of particular interest to the group were emerging mitigation measures applicable to rural assets that they felt were least considered in existing publications. These measures included green fire breaks and shelter belt/windbreaks that are detailed within the plan. Additional fact sheets on these measures are anticipated for plan updates.

Members of the Healesville group had a mature understanding of bushfire research and were involved in the environmental area in active community groups and through past and current careers. This pre-existing knowledge enabled a different approach to be confidently explored that they felt better aligned with the needs of the Healesville community. Staff from Forest Fire Management Victoria and the CFA attended initial community meetings as the concept was explored. Attendance changed to being on an as-needed basis as the group explored their own ideas and led the process. Both agencies reviewed the final draft and provided constructive feedback.

Guest speakers

During the process of compiling the plan, the group invited guest speakers with expertise relevant to the 3 land-use categories. Built assets had already been covered in past events with guest speakers including Justin Leonard, a lead researcher in bushfire adaptation at CSIRO. Rural assets expert speaker was David Holmgren, a permaculture and environmental designer who spoke about private property landscape mitigation measures. Workshop attendees also visited a property that had been fire-affected in the 2009 bushfires. In November 2024, Emeritus Professor Mike Clarke presented on his research within fire ecology and discussed the difficulties of using fire as an ecological land management tool. He emphasised the importance of a place-based approach whereby local knowledge is used to inform best practice.

A crucial piece of the plan was enabling the group to take the direction they deemed most appropriate. Having successfully used the fuel zone model in Monbulk and Kalorama, it was assumed that this same model could be used for consistency. However, every community group is unique, not just by locality but by their skill set and interests. It is critical that projects are able to adapt to community values. The Healesville group were only willing to put their energy towards a concept they could whole heartedly own and lead to ensure the community was not misrepresented to fit into a pre-existing model. The group was well-respected and interconnected within the Healesville community so having them lead the process raised the likelihood of community uptake.

Since finalising the mitigation plan, the group has created simplified fact sheets to expand on the measures detailed within the plan, including green fire walls and shelter belts. These will be distributed throughout the community and copies will be available at community locations. The group will report quarterly to the MFMPC.

Figure 2: Three land-use categories of the Healesville Bushfire Impact Mitigation Plan.
Source: George et al. 2025, p.7

Conclusion

The reality of meeting prescriptions of fuel management zones has generally not been a priority of community groups as these prescriptions can be quite difficult to adhere to particularly if the area is of higher ecological value. The Kalorama and Monbulk community groups that have been implementing their plans since 2017 have used the fuel management zones to inform their community engagement priorities. The stigma associated with fuel management zones was a point of contention in the Yarra Junction and Healesville groups, with Healesville deciding not to use the model. Committee members of the Yarra Junction group were concerned about the methodology of prescribed burning on public land, which uses the same zone structure as detailed within the Township Fuel Management Guide. The committee was able to move past this through informed conversations that reassured members of the difference when applied in the context of private property

A takeaway from this project is the incorporation of a facilitator to help community members lead and direct the process. Members who join and attend community groups are knowledgeable about their area, about the local plants and about how bushfires have behaved locally. These are the people who will carry a project long after a funded project tenure is complete. Thus, we need to act as the enabler for them to do the work, which means acting as a

Emeritus Professor Mike Clarke presented at the community forum hosted by the Healesville Bushfire Group.
Image: Cathy Ronalds

support mechanism. This requires deep listening that allows a group to work through their own ideas and processes.

The case studies of the Yarra Junction and Healesville community groups show how the application of the model varies and, in some instances, may not be appropriate. It depends entirely on the knowledge, interests and skills of the representative community group.

References

Colverson F and Hill P (2012) *Yarra Junction Fire Brigade, a story of community and comradeship.* Yarra Junction Urban Fire Brigade, Yarra Junction.

George G, Feller M, Williamson R, Feller E, Gaffney L and Richards P (2025) Healesville Bushfire Impact Mitigation Plan. www.yarraranges.vic.gov.au/files/assets/public/v/1/webdocuments/environment/em/healesville-bushfire-impact-mitigation-plan-dhdesign-feb2025-interactive-1.pdf

Government of Victoria (2010) *Overall fuel management guide 4th edition July 2010.* Fire and adaptive management report no. 82. www.ffm.vic.gov.au/__data/assets/pdf_file/0005/21110/Report-82-overall-fuel-assess-guide-4th-ed.pdf

Southern and Eastern Metropolitan Fuel Management Working Group (2018) Bushfire Fuel Management Guide For the protection of townships and settlements. www.safertogether.vic.gov.au/__data/assets/pdf_file/0016/409120/Bushfire-Fuel-Management-Guide-Final-10th-May-2018.pdf

Resilient Australia Awards 2025: Celebrating leaders in community resilience

April Hawksworth

Australian Institute for Disaster Resilience

The winners of the 2025 Resilient Australia Awards were announced in Melbourne on 24 November, recognising recent efforts and new ideas that strengthen community resilience to disasters.

The 2025 Resilient Australia National Awards, sponsored by the Australian Government in partnership with the Australian Institute for Disaster Resilience (AIDR), spanned 10 categories including national, collaboration, research, business, community, government, mental health and wellbeing, and photography.

The celebrated projects included initiatives that protect Aboriginal cultural heritage, support young people's wellbeing after floods, build local and tailored emergency plans, and get communities actively involved in flood preparedness and recovery.

John Richardson, AIDR Executive Director and event host, said the ceremony is a testament to the incredible work undertaken by organisations, individuals, and communities dedicated to making Australia more disaster resilient.

'These are the unsung heroes – people working quietly in the background, often against the backdrop of bigger profiles, bigger budgets, and bigger priorities,' he said.

'Quietly, all of you are making progress to stop hazards from becoming disasters, so people can get on with their lives: watching their kids grow, celebrating milestones with family, working towards their goals, participating in society, tending their gardens and land, and creating practices that change lives.'

Andrew Minack, First Assistant Coordinator-General, Policy and Government at the National Emergency Management Agency (NEMA) emphasised the importance of community-led disaster resilience and the contributions of those driving these initiatives during his opening address.

Congratulations to all the finalists and winners of the National Resilient Australia Awards.

Resilient Australia National Award

Winner: Traditional Owners involvement in emergency management at the Gariwerd Complex and Little Desert fires – Department of Energy, Environment and Climate Action, Victoria

The 2024–25 bushfire season in the Grampians (Gariwerd) and Little Desert National Parks highlighted the urgent need to protect Aboriginal cultural heritage. The Grampians Complex fires, ignited by dry lightning, burned over 230,000 hectares, threatening natural, built, and sacred cultural landscapes of the Wotjobaluk Nations, Eastern Maar, and Gunditjmara Peoples. In response, the Cultural Heritage Unit was established within the incident management team, ensuring cultural values were integrated into all phases of the emergency response.

Key innovations included exclusion zones, thermal protection for significant trees, and manual vegetation removal around rock art sites. The Department of Energy, Environment and Climate Action's submission emphasised the importance of Traditional Owner

leadership and the need for cultural heritage protection in emergency responses.

Mr Richardson said this project brings the important issues of cultural heritage to the forefront and is an impactful and culturally led initiative.

Resilient Australia National Collaboration and Partnership Award

Winner: The Maribyrnong Insurance Project: Empowering communities to navigate flood insurance – Maribyrnong City Council, GenWest and Maribyrnong Community Recovery Committee, Victoria

In 2022, the Maribyrnong River flood caused extensive damage, displacement, and psychosocial impacts, with lengthy insurance and building repair processes leaving some residents unable to return home nearly 3 years later.

The Maribyrnong Insurance Project was a community-led initiative that made complex insurance information accessible.

In presenting the award, Mr Minack said that while these collaborations might have seemed obvious to internal project members, they demonstrate externally how bringing together 2 or more organisations can strengthen Australia's resilience.

Resilient Australia National Research for Impact Award

Winner: Queering disasters: A new research, policy and practice paradigm – The University of Sydney and Western Sydney University, NSW

Since 2013, the 'queering disasters' program has delivered sustained, policy-focused research to address the previously overlooked risks and impacts of disasters on sexual and gender diverse people. This work has transformed global understanding, informed national queer-inclusive disaster risk reduction guidelines, influenced the United Nations' approach, and established a new sub-discipline of queer disaster studies.

Through collaboration with community organisations, emergency management agencies, non-government organisations, and queer communities, the program has identified key needs and opportunities for more inclusive practice in the disaster management sector.

Professor Cheryl Desha, Science and Innovation Director at Natural Hazards Research Australia, said the award nominees displayed innovative, research-driven projects that demonstrate strong collaboration, inclusivity, and clear impact on disaster resilience.

The Department of Energy, Environment and Climate Action, Victoria, was presented with the Resilient Australia National Award for their project, Traditional Owners involvement in Emergency Management at the Gariwerd Complex and Little Desert Fires.

Image: Emergency Management Victoria

Resilient Australia National Business Award

Winner: Building resilience from the ground up: Community emergency management planning – The Six C's, Victoria

The Six C's Community Emergency Management Planning program is a community-led model that helps local communities build practical and localised plans through a series of structure workshops, tailored to their needs, strengths and risks.

Since January 2023, it has been delivered across 10 Victorian communities who have now formed local disaster resilience groups and started identifying risks, assets, and actions. The program avoids a one-size-fits-all strategy while aligning with national disaster resilience frameworks. Its culturally aware co-design not only supports emergency management outcomes but also strengthens mental health, community cohesion, and long-term resilience.

Caitlin Zacharewicz, Manager of Workforce Volunteers and Community at Emergency Management Victoria, presented the award. She said the submissions showed a clear potential for scalability, sustainability, and creative engagement, making them valuable contributions to national resilience efforts.

Resilient Australia National Community Award

Winner: Community-led flood resilience on the Kurilpa Peninsula – Resilient Kurilpa, Queensland

Resilient Kurilpa (RK) is a community-led, volunteer-run disaster resilience network formed after the 2022 floods to strengthen flood preparedness, response, and recovery across Brisbane's Kurilpa Peninsula. With support from the Australian and Queensland Governments, RK delivered a place-based program in 2023–24 that directly engaged more than 500 residents and reached thousands more online.

The project developed practical tools including a community-run flood website, an apartment toolkit, information sessions, workshops, blog articles, and a community-created trigger film to encourage apartment communities to take preparedness action. In total, RK's activities reached 534 residents directly, alongside significant online engagement across its website, blog, webinars, and trigger film.

Faye Gibson, Senior Communications and Engagement Officer at Get Ready Queensland presented the award and said the finalists showcased exceptional creativity and inclusive, community-led approaches, delivering measurable impact and strong collaboration across sectors.

Resilient Kurilpa, was presented with the Resilient Australia Community Award for their project, Community-led Flood Resilience on the Kurilpa Pensinsula.

Image: Emergency Management Victoria

Resilient Australia National Government Award

The Resilient Australia National Government Award had 2 winners in 2025.

Winner: Australian first - Aboriginal Cultural Incident Management Exercise – NSW Department of Climate Change, Energy, the Environment and Water, Merrimans Local Aboriginal Land Council, NSW National Parks and Wildlife Service, NSW Crown Lands and NSW Rural Fire Service

The 2019–20 bushfires caused catastrophic damage across eastern Australia, including the loss of culturally significant Aboriginal sites. With most site knowledge held privately within Aboriginal communities, there has been no culturally safe way to share this information during emergency response.

To address this, the Applied Bushfire Science program, NSW Rural Fire Service, and NSW National Parks and Wildlife Service delivered a first-of-its-kind simulation exercise that brought Aboriginal rangers into the control room during a realistic bushfire scenario. This 2-way learning process showed how cultural knowledge can be safely integrated into real-time fire planning, establishing it as a vital component of emergency decision-making.

Winner: Traditional Owners involvement in emergency management at the Gariwerd Complex and Little Desert fires – Department of Energy, Environment and Climate Action, Victoria

The Department of Energy, Environment and Climate Action's project won multiple awards during the Resilient Australia National Awards Ceremony in 2025. The project description is featured in the Resilient Australia National Award category.

Bridget Tehan, Senior Advisor, Humanitarian Diplomacy at Australian Red Cross, presented the award and said many initiatives showed promising scalability and sector-wide impact, with frameworks and evaluations in plan to support long-term success.

Resilient Australian National Local Government Award

Winner: The Maribyrnong Insurance Project: Empowering communities to navigate flood insurance - Maribyrnong City Council, GenWest and Maribyrnong Community Recovery Committee, Victoria

Maribyrnong City Council, GenWest and Maribyrnong Community Recovery Committee won multiple awards for their project during the Resilient Australia National Awards Ceremony in 2025. The project description is featured in Resilient Australia National Collaboration and Partnership Award category.

In presenting the award, Nadia Osman, Director of Emergency Management at the Australian Local Government Association, said all projects displayed strong co-design, inclusive community engagement, and cross-sector collaboration to deliver tangible outcomes and improve disaster preparedness.

Resilient Australia National Mental Health and Wellbeing Award

Winner: Resilient Kids: Empowered young people can weather life's biggest storms – Social Futures, NSW.

Resilient Kids is a youth-centred mental health and wellbeing program created in response to the 2022 Northern NSW floods to support young people aged 8-18 in their recovery and build long-term disaster resilience. The program was co-designed with young people, families, and local services, and provides tailored therapeutic support, resilience tools, and creative engagement activities across the Northern Rivers.

Led by Social Futures with partner organisations, the 2-year program has already supported thousands of young people and caregivers through flexible Wellbeing Hubs and outreach to rural communities. It is described as an 'ecosystem of support', and offers a scalable, inclusive model for disaster recovery that is timely, youth-driven, and impactful.

Rob Webb, CEO of AFAC (the Australian and New Zealand National Council for Fire and Emergency Services), presented this award which was one of 7 submissions.

Resilient Australia National School Award

Winner: Our River – Richmond Agricultural Centre: Centre of Excellence in Agricultural Education, NSW

Our River is a school-based flood awareness and wellbeing program delivered across the Hawkesbury–Nepean Catchment since 2022. Initially run by the Centre and expanded in 2024 through a partnership with NSW Reconstruction, the program helps primary and secondary students understand the science and history of floods, build preparedness skills, and reconnect positively with the river after disaster events.

The 2024 expansion introduced a stronger focus on preparedness, student-led Hackathons, and an Indigenous communication program, with the initiative widely embraced by schools across the valley.

Laura Cooper, National Resilient Australia Awards Judge, presented the award and said it was 'truly inspirational' to see all the work that is being delivered.

Resilient Australia National Photography Award

Winner: Protecting Country Together – Department of Energy, Environment and Climate Action's Cultural Heritage Advisory Committee, Victoria

The winning photograph demonstrates disaster resilience through the proactive and culturally informed efforts to protect irreplaceable Aboriginal rock art from bushfire damage. It shows Traditional Owners and representatives from all 3 registered Aboriginal parties working alongside agencies on Country, applying cultural knowledge and rapid response strategies to reduce the impact of fire on significant heritage sites.

Rather than reacting after damage occurs, this coordinated effort represents resilience through preparation, collaboration, and cultural leadership, protecting not only the physical sites, but also the stories, identity, and connection they hold.

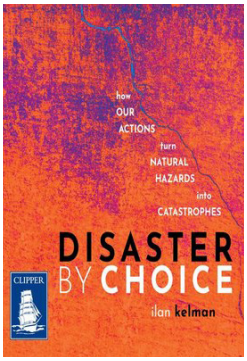
Joanna Wood Freeman, Communications Manager at Natural Hazards Research Australia, presented the award. There was a total of 23 photos submitted.

The Resilient Australia Awards program was launched in 2000, and AIDR has proudly run the program on behalf of the Australian Government since 2017. The Resilient Australia Awards are hosted by the AIDR and sponsored by the Australian Government in partnership with the states and territories. Submissions to the 2026 Resilient Australia Awards program will open in March 2026.

The winning photograph demonstrates disaster resilience through the proactive and culturally informed efforts to protect irreplaceable Aboriginal rock art from bushfire damage.

Image: Department of Energy, Environment and Climate Action's Cultural Heritage Advisory Committee

Disasters are not natural: review of Disasters By Choice: How our Actions turn Natural Hazards into Catastrophes



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'It's just semantics'. I hear this often when the topic comes up of disasters not being natural, so why do we persist calling them natural disasters? It is more than semantics. It is a nuanced way of looking at the root cause of disaster, which is now recognised by the United Nations Office of Disaster Risk Reduction, International Federation of Red Cross and Red Cresent Societies as well as being reflected in the Second National Action Plan for the National Disaster Risk Reduction Framework.[1]

Quarantelli's (1998)[2] classic definition of disaster is that it is the intersection of a hazard and a vulnerable population, which is the key to understanding this nuance. In a traditional linear risk approach to hazards, we start with the hazard and see that as the problem. What makes the population vulnerable is of a second order priority. We need to ask ourselves, how does the population become vulnerable?

On one level, using the term 'natural disaster' maybe be seen as not understanding vulnerability. At another level, it is actively used to abrogate responsibility. We have seen over the years that decision makers say' 'It was a natural disaster. There was nothing we could do about it'.

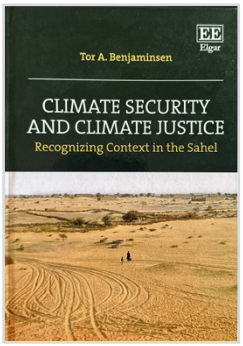
Ilan Kelman's short book, *Disaster by Choice,* helps us understand this challenge by placing the responsibility squarely at the feet of humans. He recognises that the processes that cause hazards may be natural, extreme weather or geological processes, but it is not necessarily what causes harm. Humans have made decisions to settle on flood plains, or change water courses, or increase concrete in urban areas, or not to build buildings to cyclone or earthquake building codes. These are the factors that expose populations to the risk and threat of the hazard. That is 'disaster by choice'.

Kelman starts the book by forensically analysing the Haitian earthquake in 2010. The collapse of buildings, the collapse of systems and infrastructure, the outbreak of disease and the long-term effects of the earthquake. The horror of that cataclysmic event sets the scene and asks the questions: what we are seeing here, can it be applied elsewhere? The answer is yes. Kelman proceeds to unpack the nature of hazards, vulnerabilities and poses to us what needs to be done. What choices can we make to make the changes needed to reduce disaster risk.

This is an easy-to-read book with excellent examples. I would highly recommend policy makers and journalists read this book so we can start to shift the narrative. It's only dropping one word from a sentence, but over time, could have significant influence on how we think about disaster risk. We could move away from being disasters being 'natural' and not being able to do anything about them, to being firmly in control of how we manage and mitigate disasters. The outcome is that people can live their lives with reduced risk and exposure to natural hazard events.

1. Second National Action Plan for the National Disaster Risk Reduction Framework, at https://knowledge.aidr.org.au/resources/second-national-action-plan-for-disaster-risk-reduction.
2. Quarantelli EL (ed.): (1998) 'What is a Disaster?', Natural Hazards, 18:87–88. https://doi.org/10.1023/A:1008061717921.

Climate Security and Climate Justice



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Benjaminsen explores the complex interplay between climate change, security and justice in the Sahel region of West Africa. He emphasises the importance of understanding historical, political and environmental contexts. There are 2 broad issues in the title of this book: climate justice, where climate change is ostensibly the primary agenda, and climate security. The issue of security is about the decline in security brought about by conflict, alongside international migration; both allegedly prompted by climate change. Injustice concerns the unfairness for people who may be the most affected by climate change; very often being the least responsible for causing it.

In terms of the security issue, climate change might be a tipping point for many communities and societies, but inequality between rich and poor is the underlying cause of conflict. The historical and political context goes further in explaining security and justice issues than a narrow focus on climate change as an explanation. The background context derives from colonialism, which drove inequality, oppression and dispossession of land that led to rebellion, secession and civil war with many rebel groups, especially those of Muslim societies, being labelled as terrorists. This spills over into migration, which is primarily driven by greater opportunities elsewhere in the world. On the political side, poor governance is a consequence of colonial regimes whereby precolonial social and political systems were dismantled resulting in a post-colonial legacy of poorly resourced and poorly prepared leaders who inherited alien regimes.

Although this book focuses on a very remote location, it is a striking example of climate change injustice that affects many parts of the developing world. The Sahelian crisis has been characterised by droughts, famines and violent conflicts; often exacerbated by climate change. Current interpretations blame these issues primarily on environmental factors, neglecting the political and historical dimensions of the crisis. Colonialism, state policies and land dispossession have shaped the current situation. The book goes into the history of the idea of desertification; the southward advance of the Sahara Desert. This view has persisted despite scientific evidence showing a greening of the Sahel in recent decades. Desertification was identified in colonial times when local populations were blamed for environmental degradation. Large-scale afforestation projects like the Great Green Wall (a line of trees planned to go across Africa from the Atlantic to the Red Sea) and similar schemes that target carbon sequestration result in land dispossession and increased conflicts that particularly affect pastoralists. Pastoralism is highly adaptable to climatic variability, but state policies have, historically, marginalised pastoralists, leading to land conflicts and grievances. This fuelled the rise of jihadist groups that attract support by addressing issues of social justice and poor governance.

Threats to subsistence drive uprisings that are often misinterpreted as purely religious or ethnic conflicts. The Tuaregs are desert pastoralists who interact with the Sahel, while the Fulani graze cattle across the dry lands throughout West Africa. Both cultures are deeply Islamic and marginal to mainstream settled societies. It is their traditional grazing land that has been targeted as marginal and degraded as an excuse to take it over for both commercial irrigated agriculture and for carbon trading schemes. Their consequent rebellions have been portrayed as fundamentalist Jihadist terrorism.

This case study is applicable to many parts of the less-developed world where understanding historical and political issues, especially the disruptions of European colonialism, more fully explain the background to conflict and environmental stress than a narrow attribution of climate change as the primary driver of crisis. This book warns against placing the burden of climate change mitigation on the poorer societies of the world.

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