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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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Contents

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

Foreword

Associate Professor Melissa Parsons

University of New England

AJEM Editor-in-Chief

The *Australian Journal of Emergency Management*, or AJEM, was first established in 1986 as part of the suite of education, research and training activities managed by the Australian Emergency Management Institute at Mt Macedon, Victoria. Over the intervening 38 years, AJEM has established itself as a premier source of knowledge, evidence and wisdom to advance the practice of emergency management, disaster resilience and disaster risk reduction in Australasia and worldwide.

AJEM is a hybrid scholarly and professional journal, arranged to provide peer-reviewed scholarly research alongside non-peer-reviewed articles that report on practices, projects, initiatives and incidents. Contemporary and significant issues are also explored critically through the Viewpoints forum, opinion pieces and special issues. As the emergency management sector faces increasingly complex, contingent and inter-connected natural hazard settings, transformative evidence-based practice is more important than ever.

At the core of AJEM is you, the readers. Subscriptions continue to grow and AJEM currently has an online subscription of approximately 4,500. Reader surveys conducted in 2007, 2015 and 2017 consistently show that readers from across the emergency management and disaster sector value AJEM as a reliable and rigorous source of knowledge, and many translate that knowledge into their practice.

The rigour of AJEM is predicated by the contributions of authors. Researchers, practitioners, experts, managers and others from a diverse range of sectors and disciplines have generously contributed their findings, views, news and observations in support of advancing the understanding and practice of emergency management.

The production of each issue of AJEM is also supported by peer-reviewers, the Managing Editor, the AJEM team at AIDR, the Editor-In-Chief, the Editorial Committee and the Editorial Advisory Board, with funding from the Australian Government National Emergency Management Agency.

AJEM would not persist without readers, authors, peer-reviewers, the support team and funding, and I sincerely thank all of these folk, past and present, for their valued contributions to AJEM.

AJEM is now accepting longer research papers

The word count for original research papers submitted to AJEM will increase to 8,000 words. Authors can continue to submit shorter 5,000 word articles.

Original, peer-reviewed research papers are a foundation of AJEM. The 2023 researcher survey found that many authors valued AJEM for the significant and unique reach that it has into the emergency management sector and the way that AJEM research evidence is used to inform practice. But the survey also highlighted limitations to publishing in AJEM, including article length and structure.

The expanded article length aligns with cognate scholarly journals in disaster science and improves capacity for authors to include the required markers of research scholarship including a justified knowledge gap, explanation of methodology, presentation of detailed findings, discussion of findings and the industry advances implied by the findings.

In response to other findings of the researcher survey, work is ongoing to influence journal metrics and review journal governance.

AJEM editorial policy and contributor guidelines have been revised

The editorial policy sets out the scope of the journal and includes revised policies on scope, permission to publish, authorship and reporting use of AI in research.

The contributor guidelines have also been revised to make it easier for authors to understand the types of articles published in AJEM and their different requirements.

Both policies are available at www.knowledge.aidr.org.au/resources/australian-journal-of-emergency-management-contributors-guidelines/.

I look forward to your continued interest in and support of AJEM. There is a mountain of activity and attention across diverse areas and AJEM would be pleased to help you disseminate your findings. Please reach out to the AJEM team if you have any questions about submitting to the journal.

GADMC 2023: a triumph of global collaboration in animal disaster management

Dr Steve Glassey

Committee Chair,
Global Animal Disaster Management Conference

The Global Animal Disaster Management Conference (GADMC) made a resounding return in July 2023, adopting a new multi-time zone format that garnered historical participation. A record 2,500 delegates, comprising of experts and thought leaders, virtually gathered, drawn by a comprehensive program of over 40 presentations delivered by global authorities in the field. Delegates came from 36 countries across various continents.

Against the backdrop of escalating environmental challenges and an imperative for proactive measures to safeguard both human and animal populations, GADMC 2023 was a pivotal event. The conference served as a nexus for professionals, policymakers and advocates from around the world. The conference was a success in innovation to promote animal-inclusive disaster-resilient communities.

GADMC has rapidly evolved into a truly international platform and has hosted speakers from 14 countries. The incorporation of closed captioning functionality for the online platform provided real-time translation into 16 languages. This underscores the level of accessibility delivered to allow true, real-time participation for people around the world in their own language.

In collaboration with sponsor Four Paws International, GADMC 2023 delivered an array of topics, including wildfires response in the USA, aquatic animal evacuation, the effects of the conflict in Ukraine on animals, the application of artificial intelligence in lessons management and the protection of search and rescue dogs. A candid discussion on the emerging trend of unofficial responses to animal disasters added depth to the discourse.

Spread across 8 sessions over 4 days, the conference accommodated the significant attendance of delegates from North America, which constituted 68% of the overall audience.

Post-conference feedback showed that GADMC maintained exceptionally high satisfaction rates with 97% of participants rating their experience as ‘good’ or ‘excellent’.

The conference was again hosted by the charitable organisation Animal Evac New Zealand. GADMC remains freely accessible to presenters, attendees and people interested in viewing recorded sessions. This accessibility is made possible through the dedicated efforts of the volunteer committee and the generous support of sponsors, including Four Paws, Humane Society International, International Fund for Animal Welfare and the American Veterinary Medical Foundation.

The next conference is slated for 2025 and the GADMC committee will leverage advances in real-time translation. This forward-thinking approach will enhance the conference's accessibility and broaden its global reach. GADMC continues to set the standard for global collaboration in animal disaster management and remains the leader in cooperation to promote animal-inclusive disaster-resilient communities.

Access to the wealth of knowledge presented at GADMC conferences is at www.gadmc.org.

Closing the planning gap: evacuating people and animals

James Sawyer

Consultant and former Global Director of Disaster Management, World Animal Protection

With the Emergency Management Bill for New Zealand[1] currently in consultation, an opportunity exists to reflect on existing planning gaps relating to the evacuation and sheltering of people and their animals.

Since Hurricane Katrina (2005) in the US, and despite learnings from incidents such as the earthquake in Christchurch in New Zealand (2010), it remains an imperative for the New Zealand Government (and many other countries) to take the topic much more seriously to avoid costs in the event of a disaster.

Despite the clear need to consider animals in evacuation and sheltering of people, only FEMA[2] in the US has taken concrete strides towards managing the situation through the *Pets Evacuation and Transportation Standards Act of 2006*[3] and the *Planning for Animal Wellness Act*[4] to create a mandate for the inclusion of animals into emergency planning. In doing so, they include direction on evacuation and sheltering, seeding a whole community of responders and coordination and resources tying in with the humanitarian effort. While far from perfect, the model is embedded and this is significant. Solutions simply don't work if they are bolted on the side of the humanitarian effort because owners of animals don't see their creatures as a 'bolt on'. Rather, they see them as an integrated part of their experience and they behave accordingly.

To assess the potential effects of not embedding animals into emergency evacuation and sheltering, we must first consider the scale, scope and consequence of the problem for legislators and planners. One could consider evacuation and sheltering of animals to simply involve people and their pets, but the scope is far broader. In certain parts of the world, people evacuate with livestock, moving stock out of harm's way before evacuating themselves. Draught-animal power is critical in certain communities, especially in post-disaster scenarios in poorer communities. Families evacuate pets, and not just cats and dogs, but everything from lizards to spiders and snakes. People keep peri-urban livestock, either as a hobby or as a backup livelihood and people can also use animals for sport or past-times. Thus, depending on the country and the socio-economic conditions, the scope can be huge.

Outcomes are wide ranging too. Economic cost from loss or degradation of livestock is a significant post-disaster reality for farmers. The psychological effects of the loss (temporary or otherwise) of an animal is well established and can have be akin to a loss of a family member. Experience has shown that people who arrive at refugee camps in sub-Saharan Africa to find protection from insecure environments, often turn around and head back into danger if there is no provision to care for their animals. Permanent and temporary shelters have become the target of criminality for theft of dogs for resale or dogfighting and livestock rustling is not uncommon when the watchful eye of the law is otherwise occupied. We know that if the provision is not made for sheltering of animals with, or alongside people, then they will regularly re-enter danger and exclusion zones to care for their animals. Animals left behind can hinder search and rescue and pose a risk to rescuers.

What happens during a disaster event is driven by behaviours and we know that people can often exhibit extreme, irrational or unexpected behaviour when it comes to their animals. Both Glassey (2010)[5] and Hothersall (2012)[6] note that most animal owners would ignore official warnings and return to danger zones. This shows that irrational behaviours are consistent over geographies and disaster types. But is this behaviour really that irrational or extreme? If we were considering a child or a family member, we would act the same. This points towards the

lines being blurred between how animal owners view their animals compared to planners and legislators. Evidence shows that farmers have closer relationships with their animals than is commonly thought; yet emergency planners simply categorise livestock as an 'asset'. How we define a companion animal is tricky. It may be simple with cats and dogs but what about horses or breeds of rare sheep? It is these connections driving the behaviour. What we do know is that people's behaviour with animals in evacuations is influenced by socio-economic status, education level, the number of animals they own, their wider support network and whether the family contains children. Beyond this knowledge, there remains a large research gap in understanding how such factors truly influence behaviour.

When we consider scale as a multiplier of scope and impact, we begin to see the size of the planning gap. Modern industrialised countries average between 60–70% pet ownership and the geography of urban areas means that these animals are not spread evenly. Hesterberg (2012)[7] estimated the sheltering need for animals in a disaster to be approximately 20% of the total sheltered human population. Accounting for losses, abandonment or owners placing animals in support networks, this estimate could be too low and more research is required. However, Hesterberg (2012) also noted that up to 70% of animal owners considered their pets as part of the family and would attempt to take their animals with them when they evacuated. Somewhere between those percentages is a lot of animals for emergency planners to consider. Even at the lower end of the scale, this means an evacuation of 10,000 people could create a sheltering need for 2,000 animals or more; far beyond what pre-existing animal shelters cater for. When we consider that urban evacuations are often much larger than planned, the lack of attention to this issue looks even more concerning. The current conflict in Ukraine saw the movement of an estimated 2.5 million people across borders and responders reported companion animals moving with people at-scale. If we are to believe the figures for the predicted migration caused by the climate crisis in the future, we need to grapple with this issue now.

Generally, what we find are governments and municipalities being, at best, unprepared and basing plans on dangerous assumptions or, at worst, burying their heads in the sand. Many planners I have spoken to in different locations around the world, simply haven't even considered the risk, or assume that local animal shelters will carry the burden, despite a lack of discussion around capacity, resourcing, liability or contracting. The scale and effects of this issue means that, while shelter workers and non-government organisations have a role to play, their expertise needs to be integrated into part of a much wider planning and coordination landscape.

What is required is a framework to generate action in circumstances where the planning gap exists. This must start with legislation but we must become better at communicating experiences from other disasters to legislators, planners and decision-makers, and that requires us to close the research gaps and to deliver powerful case studies to learn from.

Laying the foundations

Good policy and legislation are critical to create the mandate and framework to resource, coordinate, plan and establish cross-border agreements. Without legislation, actions tend to be informally coordinated, resources are often voluntary, plans informal and authority largely non-existent. As soon as legislation and policy can activate the planners, the answers to the who, when, where, what and how can be answered. This can combine with policy to create the mandate for resourcing, which provides the tools for the job.

Coordination is critical to the success of any crisis and, historically, animals have been subject to the same management structures as disease control or have found their needs and that of their owners tacked on the side of emergency planning. This must change. Disease management models see animals often as the vector or the 'problem' and management models deal with animals accordingly. Successive disasters have shown this model to be ineffective and harmful. The whole concept of humanitarianism is to be focused on the needs of the human. Thus, if the human is an animal owner and they see their evacuation and sheltering needs as intrinsically related to their pets and see their animals as a family member, then integrating animals into the mainstream of humanitarian action is an imperative. Practice is critical to ensure animal stakeholders are present at drills and that their standards align with those of the humanitarian response to ensure coordination systems are ready for the influx of animals.

Motivating and informing

We know that behaviour can be significantly influenced if animal owners are better informed and motivated to follow guidance and if this information is aligned with their interests. It is important that animal owners are provided with risk information as early as possible and in a format that allows them to make the right decisions. Trust of information is key to owners making any decision and uniformity of information and advice across multiple media channels is critical. People are more likely to believe the information and react if they have received it from more than one trusted channel. Owners can, however, still make poor decisions and a huge influencer in preventing this is the capacity they can access and knowledge of the plans in place. This means that providing information and advice during a disaster is only half of the solution. To influence orderly, rational behaviour during a disaster, we must educate and inform owners in advance of the disaster. Providing preparatory information for owners at times and from people who they trust (e.g. at veterinary clinics) is effective.

Capacity

In the aftermath of a disaster, the correct management and resources must be in place so that animals and their owners are adequately considered. A key point is to break the pervading view that animals are an asset and move to a consideration of the sentience of animals and how their needs influence their

behaviour and that of their owners. As such, provisions for animals are largely the same as for people and based around 5 established freedoms of feed, water, shelter, medical care and the ability to express normal behaviour.

The disaster rescue phase currently poses many challenges for practitioners when in contact with animals that are often stressed and being placed in unusual circumstances. Accordingly, responders should be trained and equipped in animal handling and dealing with aggressive or difficult animals and they should have access to specialists who can assist when situations extend beyond their own skillset. Specific equipment may be required depending on the species.

Animals, once rescued, need to be sheltered to be cared for. It is unlikely that permanent animal shelters will have much additional capacity, indeed they may be damaged or staffing levels compromised. Thus, identifying available existing capacity and contracting for the costs of this is critical; beyond this, temporary sheltering and the means to build them to a range of flexible designs need to be in place. As much as possible (and especially for companion animals), it is recommended that temporary shelters be as close to human sheltering as possible so owners can care for their animals. This was achieved successfully in the aftermath of the Tohoku earthquake and tsunami in 2011.

Planners need also to consider the control of zoonosis in the aftermath of disasters. Increased stray populations alongside media scares of animal-related disease outbreaks (such as rabies) can often lead to pressure by municipalities to undertake mass culling of animals, often inhumanely. While prevalent, studies show that these culls are unnecessary and ineffective (as well as costly), and a better approach is engagement with animal health professionals to assist in the correct vaccination and control programs.

Animals separated from their owners create issues in post-disaster and many animals found free roaming have been abandoned or were pre-existing strays, but many may be owned and simply separated. Often the pressure to allow groups to remove animals from the disaster zone and rehome in other areas, or even countries, is present. Harnessing the enthusiasm of local and international animal groups with the help of social media to reunite owners is far more effective. Considerations must be given to potential litigation if authorities haven't made enough effort to reunite people with their animals before undertaking rehoming activities. Planners should also consider security of animals during movement and shelter.

Coordination is a critical component of post-disaster activities and one that should involve animal practitioners and experts from the local area but that accommodate the influx of other organisations and volunteer help that will appear, especially following large disasters. Significant risks occur where these organisations or individuals are not part of the coordination mechanisms. Ensuring frameworks include animal advocates at all levels of coordination who have clear roles and responsibilities will help achieve harmony, safety and effectiveness.

Conclusion

The planning and resourcing gap for the evacuation and sheltering of animals with people is huge. Significant knowledge and research gaps exist that hinder the ability of emergency planners to establish the right provisions. Most thinking currently occurs from learnings and experimentation in the aftermath of disasters. The risk of inaction is significant. The potential scale and effects of a mass evacuation of people and their animals ought to be keeping planners awake at night based on the anecdotal evidence provided by responders to disasters such as the Christchurch earthquake, Hurricane Katrina, the Tohoku earthquake and similar events. With the forthcoming Emergency Management Bill in New Zealand, there is an opportunity for the New Zealand Government to put in place world-leading legislation that would position the country as a leader in animal care and safety.

Endnotes

1. New Zealand Emergency Management Bill, at *www.civildefence.govt.nz/cdem-sector/legislation/emergency-management-bill*.

2. FEMA, at *www.fema.gov*.

3. USA PETS Act, at www.congress.gov/bill/109th-congress/house-bill/3858#:~:text=Authorizes%20federal%20agencies%20to%20provide,to%20such%20pets%20and%20animals.

4. USA PAW Act, at *www.congress.gov/bill/117th-congress/senate-bill/4205/text*.

5. Glassey S (2010) *Pet owner emergency preparedness and perceptions survey report: Taranaki and Wellington regions. Wellington: Mercali Disaster Management Consulting.*

6. Hothersall B (2012) *Perceptions and Practices of Emergency Preparedness amongst Animal Owners. Bristol, UK: University of Bristol.*

7. Hesterberg UW, Huertas G and Appelby MC (2012) *Perceptions of pet owners in urban Latin America on protection of their animals in disasters. Disaster Prevention and Management, 21:37–50. https://doi.org/10.1108/09653561211202692*

THIS PAPER WAS PRESENTED AT THE GLOBAL ANIMALS IN DISASTER MANAGEMENT CONFERENCE IN JULY 2023.

The role of vulnerability assessments in USA agricultural animal operations

Peer reviewed

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Abstract

Major disaster events such as hurricanes, floods, fires, earthquakes and tornadoes pose significant challenges to agricultural production every year. Commercial livestock and poultry operations are highly dependent on favourable environment, weather conditions and infrastructure to thrive. Adverse conditions during extreme weather events and other emergencies can result in significant loss of animals and commodities due to disruptions in utilities and critical services, facility damage, contamination of feed and water supplies, environmental extremes and biosecurity lapses. The effects on production can be long lasting and cumulative. Being able to identify, assess and mitigate potential vulnerabilities that lower risk helps organisations to prepare for and recover from these events. This paper provides an overview of the vulnerability assessment process in the United States that focuses on general and better practices that should be considered when applying these principles to commercial livestock and poultry operations. This approach has broad advantages for all countries where livestock and agriculture are exposed to these risks.

Introduction

'Vulnerability' is a term that generally means any part of an asset, system or organisation that is susceptible to damage, harm, disruption, or casualties when it is exposed to a hazard or threat (see OECD 1994). To understand this concept it is necessary to define some closely related terms that are frequently used to characterise or describe vulnerability. The Federal Emergency Management Agency (FEMA) (2004) determines 'hazard' as 'a source of potential danger or adverse condition'. This differs from a threat, which FEMA defines as a 'natural or man made occurrence, individual, entity, or action that has or indicates the potential to harm life, information, operations, the environment, and/or property' or a 'natural or man-made source or cause of harm or difficulty'. The distinction is that a threat is directed at a specific target or asset, such as an operation or geographic area, whereas a hazard is less categorical or focused (United States (USA) Department of Homeland Security 2010). In either case, the resulting damage can be in the form of property loss, injuries, mortalities, business interruptions and added economic costs that are incurred during recovery efforts (Deyle and May 1998; ISO/IEC 2018).

Risk, on the other hand, represents the likelihood or measure of probability that damage or harm will occur and is an integral component of every vulnerability or security analysis. Formally defined by the United States Department of Homeland Security (2010), risk is the 'potential for an adverse outcome assessed as a function of threats, vulnerabilities and consequences associated with an incident, event, or occurrence'. The level of risk can be influenced (and is often elevated) by vulnerabilities inherent to an organisation or system. Because of this relationship, completing a vulnerability assessment is a critical step in developing appropriate mitigations that minimise or eliminate risks due to different types of hazards.

In general, vulnerabilities can be categorised as physical or social factors. Physical factors are tangible, objective features that influence a specific organisation or system, while social factors tend to be subjective and conceptual.

Examples of each are provided in Table 1. Some of these factors are difficult to control and cannot be effectively managed or changed to a degree that will significantly raise or lower vulnerability. As such, the primary emphasis of a vulnerability assessment should be directed at measures that successfully enhance an organisation's resilience (e.g. ensuring the integrity of facilities and structures, maintaining stockpiles of essential supplies, developing options for emergency power and training and preparing staff).

Table 1: The physical and social factors that can categorise vulnerabilities.

Physical factors	Social factors
Geographic location	Population demographics
Topographical features	Prior experience(s) (incidents, drills, near misses)
Environmental factors (climate, wind patterns, etc.)	Economic variables
Seasons and weather	Business processes
Vegetation and wildlife	Legal frameworks
Facilities, structures and roadways	Political factors
Critical Infrastructure (utilities, resources, etc.)	Competition for resources
Enzootic pests and pathogens	High-risk behaviours and conditions
	Workforce and personnel

A formal vulnerability assessment process entails characterising perceived weaknesses or deficiencies that are unique to a particular enterprise and then estimating their cumulative effects on risk (or the likelihood and effect of potential hazards). Assessments can be quantitative by assigning estimated or actual numerical values to potential hazards according to their likelihood and magnitude of damage. However, precise quantitative analysis may not always be possible and it may be necessary to categorise hazards qualitatively by assigning a descriptor or some other subjective measure to estimate their influence. Assessment results offer an organised comparison of how vulnerabilities affect risk and help to prioritise or rank response actions according to the anticipated level of harm (National Research Council 1983). By understanding and proactively assessing potential vulnerabilities, emergency managers and authorities can address apparent gaps that can be exploited to intensify the level of damage.

Agricultural animal production units are susceptible to a wide range of hazards, which include naturally occurring events like extreme weather, geological disturbances, pestilence and disease outbreaks. Hazards can also be associated with critical technology failures like hazardous materials spills, structural fires, utility disruptions, equipment breakdowns, security breaches and major infrastructure failures. The overall diversity of livestock and poultry operations, coupled with their vast size, scale, and complexity, introduces unique vulnerabilities that can drastically amplify the damage and destruction associated with these events and put agricultural businesses at disproportionately higher risks when disasters occur (Harper 2020).

Vulnerabilities can be assessed for an individual farm; group of farms; a discrete industry; a specific community; or at the state, national or international level. Within each sector, the level of vulnerability can vary between different work units, phases of the production cycle, animal populations and among various animals within a group. The integrity of the assessment process is highly dependent on accurately defining the critical processes needed to sustain a type of operation, commodity or population of interest. Increased vertical integration of some of these functions within agricultural sectors has intensified the vulnerabilities specific to these industries. The increasing rate of cross-dependence on common commodities and services (e.g. feed suppliers, transportation services, slaughter and processing facilities) creates bottlenecks within supply chains that can cause a relatively uncomplicated emergency to escalate into a major crisis. This was experienced during the COVID-19 pandemic when prolonged workforce disruptions in slaughter and processing plants in the USA triggered mass depopulations of swine and poultry (Hayes *et al.* 2021).

Vulnerability assessment process

The vulnerability assessment process begins by assigning a team of qualified individuals to conduct an in depth evaluation. The goal is to assemble a group of professionals from various backgrounds and disciplines who collectively represent the broad spectrum of skills and expertise needed to accurately analyse the condition and performance of the organisation. Examples include farmers and producers, veterinarians, university faculty representatives, agricultural extension staff, safety practitioners, information technology experts, security experts, animal transportation service providers, feed mill operators and processing plant managers. Local and regional law enforcement agencies, fire departments and emergency management officials should also be included to ensure they understand each animal program's needs and capabilities and any limitations of local emergency response service providers to meet these expectations.

Emergency and disaster planning is a critical mission element of several USA government agencies (e.g. Department of Homeland Security, Federal Emergency Management Agency; Department of Agriculture, Animal and Plant Inspection Service; Department of Health and Human Services, Centers for Disease Control and Prevention and the Administration for Strategic Preparedness and Response; and Department of Commerce, National Oceanic and Atmospheric Administration). These agencies, in partnership with local, regional and tribal governments; professional societies (e.g. American Veterinary Medical Association, state veterinary medical associations); industry stakeholders and producer groups (e.g. American Dairy Association, American Egg Board, National Pork Producers Council, National Cattlemen's Beef Association, American Poultry Association); humanitarian organisations (e.g. American Red Cross, animal shelters, animal rescue groups) and academia (e.g. land-grant universities, Agricultural Extension Service) have developed tools and resources to assist farmers and producers who are preparing for different types of

emergency situations. Those participating in the vulnerability assessment often use these resources to develop customised templates or checklists that can be used during evaluations of properties, facilities, equipment, work practices and personnel.

Assessments should be repeated regularly at defined intervals and after every incident or 'near miss' experience to determine potential vulnerabilities associated with that event. Specific attention should be given to:

- the construction and integrity of physical structures (barns, fence lines, storage systems)
- the location and condition of vegetation and landscaping features (trees, brush, organic debris)
- potable water sources (rivers, ponds, streams, storage tanks, water treatment systems)
- the access to transportation routes (highways, railroads, waterways, unpaved roads, etc.)
- the status of critical equipment (vehicles, ventilation systems, generators, pumps)
- essential utilities and services (electrical power, communication systems, internet services)
- standard operating procedures (feeding schedules, daily animal observations, veterinary care)
- staffing logistics (personnel training, scheduling and availability).

The condition of all critical facility infrastructure systems (water, power, communications networks), including primary units and availability of ancillary backup systems, should be noted as part of the inventory.

Inevitably, new and previously unidentified vulnerabilities often surface as the result of external or internal influences over time.

Therefore, it is essential that emergency response plans are exercised and updated regularly, given that new vulnerabilities can emerge each time a plan is activated, new vulnerabilities can emerge. It is preferable that this occurs during an exercise phase rather than during an actual event to maintain operations integrity. In addition to large-scale emergency response exercises, table-top exercises and drills used as practice sessions to train staff and test the effectiveness of plans can also serve to highlight vulnerabilities. Independent third-party observers should be assigned to watch and critique staff as they implement delegated response actions. The feedback they provide can be used to update plans and reinforce training efforts. Uniformly, a debriefing should be conducted every time the plan is deployed to explore all factors that contributed to the outcome and to identify any actions that need to be taken to lower future risk.

Data analysis

After completing a comprehensive inventory of potential vulnerabilities, the organisation under evaluation needs to analyse the individual and collective effect of each on essential business functions. A quantitative approach can be used, by creating a vulnerability assessment checklist that lists an organisation's assets (e.g. buildings, site, systems, functions) and then estimates the potential loss or damage that each could incur during a hazard or threat event. The vulnerabilities for each asset can be ranked on a low-to-high scale, based on the degree of susceptibility or weakness assigned to that asset under various conditions (FEMA n.d.1). Such an analysis helps to stratify vulnerabilities and enables down selection to focus mitigation efforts on a subset of higher-consequence vulnerabilities that warrant further consideration. The analysis can be expanded to inform all aspects of an organisation's emergency preparations. For example, risk may be assessed and quantitatively compared as it relates to asset value, threat rating and/or vulnerability rating (FEMA n.d.2). A risk matrix (see Figure 1) is useful to prioritise mitigation activities. The matrix depicts the likelihood of a vulnerability being exploited against the outcome of exploiting the vulnerability (Federal Aviation Administration 2018). The results are shown using a visual (e.g. colour) scale that qualitatively demonstrates the various outcomes.

Effects should be assessed under a variety of conditions, ranging from minimal damage to 'worst case' scenario. Results should be used to develop and prioritise tactical control measures that can be implemented to reduce or manage vulnerability. Precedence should be given to efforts that maintain critical infrastructure and services necessary to continue fundamental operations and core business functions. Ideally, plans should be scalable, flexible and adaptable to respond appropriately to a full spectrum of hazards (or combination of hazards) ranging from minor, isolated incidents to major, comprehensive disasters.

Elimination of hazards whenever possible is always the preferred option. Examples include locating buildings and storage tanks

Likelihood of a vulnerability being exploited	Severity/Impact of exploiting the vulnerability				
	Minimal	Minor	Major	Serious	Catastrophic
Near certainty					
Highly likely					
Likely					
Low likelihood					
Extremely improbable					

Figure 1. Example risk matrix showing high-, medium- and low-level risks depicted as red, yellow and green, respectively.

Source: Adapted from Federal Aviation Administration (2018)

away from flood or seismically active zones, removing dried brush and excessive vegetation that obstructs visibility or increases fire hazards around property perimeters and buildings and securing structural elements (e.g. shingles, fence panels, hinged gates) and other loose debris (e.g. tree limbs, building materials, feed troughs) that can become airborne during high winds. However, elimination may not always be an option for some hazards that are outside the organisation's sphere of influence. In these cases, plans should include opportunities to minimise the likelihood and/or effect of hazards through mitigation procedures. Vulnerability can be significantly reduced through simple measures such as maintaining property fence lines; installing lightning suppression systems on buildings and tall metal structures and making sure buildings, barns and vehicles have a working fire extinguisher or fire suppression system.

Analysis should consider mitigation activities that might fail by adding redundancy and alternate control measures that can be substituted during extreme circumstances. Extended loss of some critical systems can amplify damage and loss over time, so installing early warning systems and alarms that give advance notice that a system may be compromised is critical to provide a timely response. Having access to fuel-powered generators during extended utility or service disruptions can provide power to life support systems for animals raised in confinement (e.g. ventilation systems, pumps, feed conveyors). Vehicles and trailers needed to transport animals, supplies and personnel should be accessible and maintained in good working condition with adequate fuel supplies available for extended operation. Secondary containment systems (e.g. earth dikes, sumps, berms, retaining walls, drip trays) should be installed around systems used to store hazardous materials to minimise the effects of leaks or spills. In addition, communication systems (e.g. line-based systems, mobile phones, mass media, email) may not function because of network failures due to peak use or damage. Multiple alternative communications (e.g. short-wave radio, two-way radio, internet-based communication, sirens) should be available and the line of decision-making authority should be clearly defined to provide timely and continuous exchange of information.

The size, unpredictable temperament and relatively large group sizes of agricultural animals maintained in a production unit represent major vulnerabilities that significantly limit emergency response options. Some livestock may be raised in free-ranging herds or flocks on open fields that impede efforts to secure these animals in a timely and efficient manner. Attempts to physically move animals to another location are often not successful because of the demands on skilled workers, vehicles, trailers and other equipment, combined with challenges identifying an adequately equipped relocation site capable of receiving and caring for transported animals. Consequently, sheltering-in-place until the emergency subsides may be the only practical option available to many establishments.

Maintaining biosecurity is another challenge due to the increased and unplanned movement of animals, people and equipment during emergency conditions. Significant environmental and public health concerns can ensue due to indiscriminate pathogen release, carcass disposal, nutrient runoff and groundwater contamination, often progressing into secondary emergencies that complicate response efforts. Vulnerable resources (e.g. drinking water, feed components, pastures for grazing) should be managed in a way that prevents spoilage and inadvertent contamination by pathogens, chemicals or other foreign materials. Developing plans to manage animal carcasses that accumulate during periods of increased mortality should include options for safely burying, composting or incinerating them onsite until conditions return to normal.

Applying results

Agricultural animal producers should establish 'good faith' agreements with local authorities and response agencies in the understanding that these organisations can become overwhelmed by humanitarian concerns that may exhaust available resources during large-scale disasters. Circumstances may quickly deteriorate, leaving agricultural-based businesses to manage response efforts autonomously. Workload and essential skill requirements should be assessed to determine minimum staffing levels required to maintain basic operations, immediately and over an extended timeframe. Some workers may have competing concerns (e.g. pre-existing health conditions, family care responsibilities, financial obligations) or logistics challenges (e.g. limited transportation options, scheduling constraints, language barriers) that interfere with their ability to contribute to the response effort. Remaining personnel may be required to cover for those who are absent and are likely to become physically and mentally fatigued during prolonged emergency operations. This emphasises the importance of managing work assignments that also considers the vulnerability of individual workers.

After plans are implemented, regular review sessions should be convened to evaluate the effectiveness of local policies and procedures. All written standard operating procedures, checklists, and inventory records (e.g. animals, supplies, equipment, personnel, supplies) will inform the review process. The results of inspections (e.g. premises, facilities, equipment, storage areas), training exercises, incident reports and near misses should be compared to the content of plans to identify new or previously unidentified hazards and vulnerabilities that affect location preparation or the competency of personnel. All practices should be aligned with relevant regulations and policies related to emergency response.

An effective response effort reflects the collective skills and abilities of individual team members whose actions can have profound consequences on the outcome. Providing training to individuals assigned to be part of the response effort helps to minimise vulnerabilities due to staff error and inexperience. The process should be part of the introduction program for new personnel and repeated at regular intervals as refresher training for veteran staff. A variety of training methods that appeal to the different strengths, styles and learning preferences of students should be used. Options include self directed (or self-paced) online modules, live lectures, videos, webinars, podcasts and hands on training for individuals or groups. Table-top exercises and

simulated drills are an excellent way to review plans and evaluate the team's ability to take action and make decisions under pressure. FEMA developed a Homeland Security Exercise and Evaluation Program that 'provides a set of guiding principles for exercise and evaluation programs as well as a common approach for exercise program management, design and development, conduct, evaluation, and improvement planning' (FEMA 2020).

Near misses or actual events that require a response plan to be activated provide opportunities to learn about vulnerabilities relative to design or implementation. An informal 'hotwash' should be performed immediately after planned or unplanned incidents to capture the feedback of every person involved. The session should be brief and focus on immediate concerns such as the health and safety of participants, conditions of animals and other assets and safety or security concerns. Later, this should be followed by an in-depth analysis organised as a structured debriefing or after action review to compare participants' experiences during the incident and what happened. The process should involve a neutral facilitator who maintains a non-threatening environment. This is appropriate for personal self-reflection and constructive dialogue that will enhance team performance.

Lessons learnt through formal and informal self-assessments should be used to guide the revision of plans and to address perceived vulnerabilities. Continuous evaluation that is informed by training exercises, drills, near misses and actual incident reviews provide avenues to expose deficiencies that might go undetected. Comparing plans across organisations that face similar vulnerabilities promotes timely adoption of practices and technologies that can enhance the effectiveness of response plans and activities.

Conclusion

Vulnerability describes the intrinsic flaws or weaknesses in an organisation or system that make it susceptible to harm or damage when challenged. Identifying vulnerabilities and estimating their effect helps to guide actions that can be taken to minimise or negate the potential hazards on farms, in communities or at the national level. Many vulnerabilities that apply to farms and agriculture are difficult to control. The most common management options include maintaining disaster-ready facilities and structures, developing alternatives for critical services, implementing lessons though experience and continuously assessing worker performance and behaviours. A multi disciplinary vulnerability assessment team serves as a constructive feedback mechanism to inform these processes and should be employed to analyse the susceptibility of an organisation or system to various hazards and threats.

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Social resilient networks for improving animal evacuation in emergencies: rural/ isolated community perspectives

Abstract

Effective animal evacuation strategies are imperative for comprehensive emergency management in rural and isolated communities. Community resilience significantly influences the success of these strategies. This research examined the critical role of social resilience networks to improve evacuation of livestock and community resilience in rural and isolated communities. The study took a qualitative approach to studied community members and animal emergency management stakeholders during 3 focus group discussions and workshops. These workshops were conducted in Moorland, Whittingham and the MidCoast Council area of the Hunter Region in New South Wales. The research confirmed that communities with existing strong and cohesive networks and relationships often create a safe and supportive environment when emergencies arise and evacuation is required. The themes from community-led initiatives encompass social connections, communication management, preparedness, sensitisation and situational awareness. Establishing networks for mutual aid, involving the community in planning, promoting animal welfare and improving preparedness through education are recommended. These recommendations facilitate smooth animal evacuation and safeguard animals and the community. Creating an inclusive, participatory evacuation plan that takes into consideration community networks enhances emergency preparedness and evacuation.

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Introduction

Emergencies and disasters have affected human and animal populations and often reshaped ecosystems and disrupted societal structures. During 2019 and 2020, the world experienced extreme bushfires, particularly in Australia, where over 3 billion animals were estimated to have perished or been displaced due to the ferocious blaze (Trigg *et al.* 2020). Subsequent years have been marked by severe floods that attributed to the deaths of hundreds of thousands of animals, according to Haque *et al.* (2021). In Australia, particularly in New South Wales, the loss had significant economic and environmental implications, including damage to farm buildings and equipment, loss of income, reduction in farmland values (estimated at $2 billion to $3 billion), loss of crops and more than 100,000 livestock deaths (about $2 billion) and health effects from smoke inhalation by farmers and other food workers (at least $279 million). As documented by Commonwealth of Australia (2020), nearly 3 billion animals were lost to bushfires, resulting in substantial economic hardships for farmers and affecting the overall agricultural sector while raising concerns about land degradation and environmental recovery efforts.

While disaster management strategies prioritise human safety, animals, particularly livestock, introduce challenges such as the lack of designated shelters or sanctuaries for evacuation as well as the logistical requirements and availability of transport to initiate evacuation. Unlike companion animals (pets), which can be evacuated along with their owners, large livestock animals present challenges due to their size, transportation requirements and care needs (Gurtner and Parison 2021). Consequently, farmers, especially those who manage large livestock operations, require a different approach to manage their stock safely and efficiently.

Community networks are important to faciliate evacuation management, especially for evacuating large livestock animals. This includes the ability to prepare for, respond, withstand and recover from adverse events while maintaining essential functions and social structures. In addition, it extends to livestock emergency evacuation, where the success hinges on the community's overall resilience. A community's capacity to coordinate, communicate and respond effectively influences the safety of human and animal populations (Adamson 2021). Understanding the interplay between livestock evacuation and community resilience is essential to develop evacuation management plans that safeguard the wellbeing of animals.

The vulnerability of farmers and challenges surrounding the evacuation of their animals has is growing in the academic discourse (Ogunmakinde, Egbelakin and Henderson 2023; Trigg *et al.* 2020). One aspect that exacerbates the predicament of livestock during disasters is the lack of safe places suited to evacuated animals and the predicted vulnerability to flooding and bushfires has been an issue (Ogunmakinde, Egbelakin and Henderson 2023). The Royal Commission into National Natural Disaster Arrangements recommended that evacuation plans be reviewed periodically and updated to account for the existence and standard of evacuation centres and safer places (Commonwealth of Australia 2020). Despite the growing recognition of the challenges associated with livestock evacuation, a paucity of research addresses this issue. While studies have examined specific components such as animal behaviour during evacuations and logistical challenges in moving livestock (Ogunmakinde, Egbelakin and Henderson 2023), few have explored the intricate relationship between livestock evacuation and community resilience. Understanding this connection will help to design evacuation plans that consider the needs of animals and communities.

Community networks in rural and isolated communities

Rural and isolated communities face events like flooding and bushfires that usually necessitate livestock evacuation. The impracticality of swiftly evacuating large animals exposes vulnerabilities of logistics, including transportation limitations and the specialised care required for animals during emergencies (Green 2019). The primary focus of farmers during emergencies is often to safeguard their animals and facilities before that of their homes. The emphasis on this can be traced to economic factors and cultural beliefs that prioritise safeguarding one's means of living and legacy (Green 2019; Ogunmakinde, Egbelakin and Henderson 2023). Further compounding these challenges is the lack of preparedness planning that could assist farmers navigate the complexities of evacuation (Heath and Linnabary 2015). Inadequate provisions for essentials such as livestock feed, water and access to emergency contact information all hinder timely and efficient response. The absence of support mechanisms that address farmers' mental health and fatigue also amplifies the dynamics of livestock evacuation.

Effective communication is crucial in disaster situations, particularly during livestock evacuation (Heath and Linnabary 2015). This is tied to community networks that are pivotal in remote communities to enhance preparedness, response and recovery efforts. These networks are vital channels to disseminate information, raise awareness and coordinate responses (Sufri *et al.* 2020). Community networks facilitate information dissemination and early warning systems, providing timely access to accurate data (Ahsan and Khatun 2020). Also, community networks can effectively identify local hazards, develop tailored mitigation strategies and nurture resilience

People and pets share a makeshift evacuation space during wild weather.

Image: Allison Thomson

(Kwok *et al.* 2019). Challenges such as social exclusion, resource disparities and communication barriers persist despite their importance (Lombardi *et al.* 2020). Addressing these challenges is imperative to harness the potential of community networks to safeguard isolated communities during disasters.

Social capital, encompassing resources within community relationships (Fraser, Aldrich and Small 2021), is a component of community networks. In addition, community connections and effective communication play important roles in preparedness and response (Johnston, Taylor and Ryan 2020). Community connections rooted in social capital foster cooperation and mutual assistance among community members. According to Fraser, Aldrich and Small (2021), when effectively interlinked, these elements enhance a community's capacity to withstand and recover from disasters. This integrated approach, supported by empirical research and practical experiences (Taylor, Johnston and Ryan 2022), strengthens the resilience of community networks and promotes effective risk reduction.

In isolated communities, the influence of prior disaster experience, severity and frequency on community connections and the priority of preparedness planning is evident. These communities, sharing similar socio-economic backgrounds, draw resilience from their historical exposure to hazards. Influenced by income levels and resource access, they foster grassroots initiatives and collaborative responses to address disaster challenges. Research shows that the recurrence and severity of past disasters influence community resilience (Tennakoon *et al.* 2023). The recentness of the event, coupled with a remote community's size and geographical distribution, significantly shapes the adaptive capacity for future events (Dhar *et al.* 2023).

Rural and isolated areas often have limited communication connectivity and have poor infrastructure that can hinder information dissemination and coordination in emergencies. This emphasises the need for tailored disaster management planning. This study explored the contributions of community networks to the successful evacuation of animals in emergencies and the role of community-led initiatives to achieve this goal.

Methods

This study used a qualitative research methodology to explore the perspectives of people in rural and isolated areas in New South Wales. Participants were invited via community Facebook pages, LinkedIn and by community leaders using their networks. Workshops, facilitated by the Lead Investigator from the University of Newcastle, lasted 2.5 hours and followed a semi-structured format based on pre-drafted questions. A purposive sampling approach provided diversity by incorporating livestock farmers, community members and emergency management stakeholders from 3 rural communities in the Hunter Region of New South Wales. The workshops were held at the Moorland Cottage, Whittingham Public Hall and in the MidCoast Council area. There were 79 participants in total who were involved in guided discussions and participatory activities to explore community resilience, communication strategies and evacuation approaches.

Data collection involved obtaining consent for audio recordings, with subsequent transcription essential for accuracy. Thematic analysis revealed recurring patterns and emerging themes, with a triangulation approach ensuring credibility. Member

Table 1: Community-led initiatives that enhances animal evacuation.

Themes	Workshop 1	Workshop 2	Workshop 3
Improving Social Capital/ Community Connections	Develop hubs with 10 households/ farmers each. Create alternative milking stations/ evacuation places.	Designate contact persons to communicate with emergency services.	Appoint caretakers within hubs to ensure safety, food, feeds and water.
Communication Management	Understand situation awareness of events, including high grounds, monitoring river water levels, rising river basins.	Direct/designate contact persons for emergency services. Hold daily briefings to keep the community informed.	Use alternative communication methods such as satellite radio and UHF radios.
Community Preparedness	Plan ahead by strengthening community networks.	Conduct community audits and plan for preparedness resources.	Undertake adaptation measures, including local grassing/burning systems for livestock. Empower landowners with information and tools.
Sensitisation Program	Raise awareness of the benefits of risk reduction. Provide training for farm emergency planning, development and implementation.	Increase awareness among new entrants to the areas.	Conduct outreach programs to continually educate residents about disaster preparedness.

checking was employed to allow participants to provide input on preliminary findings and improve alignment with their lived experiences. Informed consent was obtained from all participants. Measures were employed to uphold anonymity and confidentiality so that the collected data was used exclusively for research purposes and in adherence to ethical guidelines.

There were limitations in this study. The sample size does not fully capture rural community diversity, however, the purposive sampling provided representation across demographics to enrich insights. The self-reported data reliance may introduce bias, but the workshops fostered openness and members checking improved alignment with reality. The 2.5-hour workshops limited topic exploration. As such, extending or conducting follow-up interviews could enhance data depth. While a diverse group of participants was involved, including other groups would add to a comprehensive understanding of resilience and response efforts.

The study received ethics approval from the Human Research Ethics Committee of the University of Newcastle (H-2023-0323).

Findings and discussions

This discourse examines the outcomes of the workshops into animal evacuation strategies during emergencies to foster social capital development, fortify community connections and implement effective communication. The findings show the methods derived from community engagement approach in relation to community networks. Table 1 shows the community-led initiatives discussed at the workshops that enhanced livestock evacuation.

The participants identified initiatives that address rural and isolated community challenges in emergency planning for pets and livestock. The initiatives include social capital/community connections, communication management, community preparedness and sensitisation as well as situation awareness. The workshop participants indicated that maintaining infrastructure, relying on oneself and working together, effective communication methods, community consultation and education, proactive hazard control and having a plan were highly important. The participants also recognised that specific approaches, such as reliance on authorities or technology, may not be effective during emergencies.

Social capital/community connections

The workshop's outcomes call for harnessing the potential of social capital and community connections as fundamental elements in effective animal evacuation. Central to these findings is establishing localised hubs encompassing 10 households or farmers, wherein a designated contact person coordinates emergency services and information dissemination. One of the participants in the workshop, from Whittingham community, said:

> *… the team or the commander of Singleton SES will get in touch with Whittingham Coordinator, then the Whittingham Coordinator will then send bulk SMS or email out to all our residents that have opted into the system…* WP11.

This approach capitalises on existing social networks and fosters communication and collaboration during crises. This finding aligns with the theoretical underpinnings of collective efficacy, wherein communities with strong social ties are more likely to collaborate and mobilise resources during adverse situations (Wilkin, Biggs and Tatem 2019).

Communication management

Insights from the workshops underscore the pivotal role of communication and highlight that email and SMS are regarded as the most efficient tools to send timely, accurate information. However, it is crucial to acknowledge that this reliance on email and SMS communication hinges entirely on individuals having access to the internet, suitable devices and reliable connectivity. These factors are prone to failure and can significantly reduce the effectiveness of communication strategies. While this technology can deliver a sense of unity for residents and can provide people with access to the latest real-time updates, it relies on people's access to communication infrastructure and that infrastructure being available. This is not always assured in disaster events. However, one participant said:

> *We have found that during this time, email and SMS is the most efficient and effective form of communication, residents all receiving information at exactly the same time. And it also allows us to keep the phone lines open in case there's an emergency or something else we need to realise, will also send out notifications on flood level warnings that have not been advised yet. So, the residents know that they're all accessing the same information and they know that it's the most recent update as well. We're covering a sphere with the phone tree with all the time before the information passed down the chain. The new information was filtering through and will give you the right information at the right time.* WP2.

Apart from designating specific individuals as points of contact, using alternative communication methods such as satellite radio and UHF radios were recommended to ensure information flow in case of loss of landline and mobile phone service. Daily briefings were also considered essential to keep people updated of the evolving situation.

These findings align with Sharma *et al.* (2021) and emphasise that community engagement, fortified by social networks and effective communication, is pivotal to improve animal evacuation planning and to foster resilience. Integrating local knowledge and preparedness measures also enhances the community's capacity to respond.

Community preparedness

The workshop's outcomes show the importance of proactive community preparedness activities. Strengthening community networks and providing landowners with knowledge and tools were strong recommendations. Community audits to assess resources and capacities and implement adaptation measures, such as introducing controlled burning systems for managing

vegetation in livestock grazing areas, were suggested to mitigate hazards and enhance preparedness. One workshop participant said:

> *… as a farmer and landholder, I've come to realise the true value of being proactive in safeguarding our community and our livelihoods. We didn't wait for emergencies to strike; we planned ahead by strengthening our community networks, conducting thorough community audits to assess our resources, and meticulously planning for the worst.* WP3.

To acknowledge the relevance of community preparedness, another participant from the perspective of their rural/isolated community said:

> *…we knew we had to take concrete action to protect our livestock and our land. So, we undertook adaptation measures, including implementing local grassing and burning systems tailored to our specific needs. These measures weren't just about mitigating hazards; they were about preserving our way of life.* WP6.

These findings resonate with the concept of resilience theory, which underscores the significance of adaptive capacities within communities (Cafer, Green and Goreham 2022). The implications highlight that proactive community preparedness is crucial and involves network strengthening and empowerment. Community audits and adaptation measures identify local risks and hazards so they can be mitigated. This approach aligns with fostering the adaptive capacities of communities to address vulnerabilities and risks.

Sensitisation program

Raising awareness was a critical aspect of the workshop's outcomes. Participants stressed that sensitising long-term residents and newcomers about risk reduction activities would help prepare communities for (hopefully) rare disaster events. Using consultations and specialised training programs for farm emergency planning was considered vital to integrate local knowledge into response and recovery planning (Government of New South Wales 2021; Shmueli, Ozawa and Kaufman 2021). One participant said:

> *… as a dedicated landholder in our community, I have witnessed firsthand the transformative power of raising awareness about the benefits of risk reduction. We did not just keep this knowledge to ourselves; we shared it far and wide. We further trained fellow landholders on the intricacies of farm emergency planning, from development to implementation. It was gratifying to see how this training increased awareness, especially among newcomers to our area. We welcomed them with open arms and ensured they were well-prepared for whatever challenges lay ahead.* WP12

This resonates with participatory approaches to risk reduction and emphasises the local perspectives in decision-making processes (Islam, Abd Wahab and Benson 2020).

Conclusion

This study provided insights into the role of community-centric strategies that can help improve outcomes for animal evacuation. Communities can fortify their resilience and response capacities by leveraging social capital, refining communication management, bolstering community preparedness and increasing awareness. This contributes to the ongoing discourse on community engagement and participatory approaches in disaster management and serves as a bridge between theory and practical implementation. The study revealed that community-led initiatives have demonstrated their potential to enhance animal evacuation. Effective response strategies, communication management, community preparedness and sensitisation efforts are vital to this success. These findings reinforce the need for integrated approaches that combine community resilience with effective animal evacuation planning.

There are some practical recommendations from the analysis of data collected in this study. These include establishing social networks to identify and mitigate vulnerabilities and to foster mutual assistance. Community participation in resilience planning and recovery processes is also essential and builds a collaborative environment. Prioritising animal-related awareness campaigns, effective engagement methods and education can enhance preparedness. In addition, effort should focus on protecting animal health and welfare in rural contexts to align with broader resilience goals. Lastly, strengthening information dissemination and awareness is recommended to bolster overall preparedness to help communities manage livestock evacuation and disaster response.

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Pets are family, keep them safe: a review of emergency animal management in remote First Nations communities

Abstract

Planning for and considering animals is a growing area within emergency and disaster planning. As people adapt to the changing risks of disaster events that are increasing in magnitude and frequency, communities, particularly those in regional and remote areas of Australia, face challenges that are very different from other more populated areas. These communities are often home to pets, which pose unique challenges during evacuation, response and recovery phases of emergency management. Australian state and territory government emergency management plans give varied considerations to animal management. In the Northern Territory, the *Territory Emergency Plan* (Northern Territory Government 2022) serves as a base for animal management in disasters. However, significant reform is required to fill gaps in considerations of animals in remote communities, especially First Nations communities, given the strong socio-cultural connections within family structures and contributions to wellbeing under First Nations health worldviews and the human-animal bond. Such reform requires consultation and collaboration with First Nations Australians to promote 'right-way' science, build local capacity and support community resilience. Considerations of the interplay between people and their pets in disaster planning, response and recovery contributes to ongoing advances in the 'One Health' and 'One Welfare' paradigms.

In this paper, Aboriginal and Torres Strait Islander peoples and the rural and remote communities in which many reside are respectfully referred to as 'First Nations Australians' and 'First Nations communities', respectively.

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Introduction

Animals are noted as a significant decision-making influencing factor for animal and human welfare considerations, and pets commonly have implications for community evacuation compliance (Chadwin 2017, Glassey 2018, Thompson 2013, Westcott 2021). Hurricane Katrina response efforts were widely criticised for the lack of consideration for animal welfare and prompted emergency animal management reform in the US (Babcock and Smith 2020, Chadwin 2017, Glassey 2018). According to Wu *et al.* (2023), there are knowledge gaps surrounding the practical integration of animals in disaster planning and response despite a growing understanding of the importance of pets within One Health models.

The One Health concept encompasses a multi-disciplinary approach to health across and within facets of human, animal and environmental health (Kahn 2021, Squance 2021). One Welfare expands on the One Health model to consider general optimisations of animal welfare, human wellbeing, environmental conservation and sustainability (Pinillos *et al.* 2016). One Welfare can be conceptually applied alongside the paradigm of the human-animal bond and its place within human mental health and wellbeing in the current context during extreme life events such as disasters and technological hazards (Squance *et al.* 2021). Thus, effective response and recovery should consider the interconnectedness of human and animal welfare especially considering the human-animal bond (Vroegindewey 2014).

The One Rescue paradigm supports coordination of emergency services to include animal management to improve collaborative effort and capitalise on response training and expertise (Glassey 2022). Therefore, establishing connection and interoperability between human- and animal-centric emergency response within planning, response and recovery is imperative to meet objectives of human, animal and environmental protection (Pinillos *et al.* 2016, Wu *et al.* 2023, Glassey 2022, Vroegindewey 2014).

Cats and dogs are common pets in Western societies, although atypical pets are increasingly common, including fish, birds, reptiles, livestock and wildlife (Chur-Hansen 2010; Chur-Hansen, Winefield and Beckwith 2008). Broadly, pets are termed as companion animals within the broader literature describing the human-animal bond (Chur-Hansen 2010). Overgaauw *et al.* (2020) define a companion animal as one that 'lives in or around the house and is fed and cared for by humans'. This definition is useful to describe companion animals and, by extension, pet ownership, in the context of First Nations communities. Pets in these communities are common although their management differs in that these animals may be free-roaming and have multi-household ownership (Brookes *et al.* 2020, Ma *et al.* 2020). The responsibility for decision-making regarding a pet can be held by one person of any age and may be confounded by trust in the animal's free will or choices (Brookes *et al.* 2020, Kennedy *et al.* 2020, Ma *et al.* 2020).

Pets can provide companionship in the form of comfort, security, pleasure and emotional attachment (Chur-Hansen 2010), a sentiment that is enhanced as cultural, social and spiritual ties among First Nations Australians (Brookes *et al.* 2020, Kennedy *et al.* 2020). Dogs especially are often highly regarded as important in First Nations communities with some having skin names, indicating a place within a kinship system that defines familial relationships, totem status and valued spiritual figures (Chenhall *et al.* 2006, Smith and Litchfield 2015, Ma *et al.* 2020).

Climate change and associated disasters are expected to increase and the communities most identified at risk include isolated groups that are vulnerable to complex socio-cultural, environmental and ecological effects of climate change such as remote First Nations communities in Australia (Voss 2018; Cresswell, Janke and Johnston 2022). Animal groups, particularly livestock and wildlife, are often excluded from existing emergency management plans (Taylor *et al.* 2015). While pets in First Nations communities are culturally and socially important (Brookes *et al.* 2020, Kennedy *et al.* 2020), their common free-roaming nature presents difficulties in the practicalities of emergency management, especially considering sheltering and evacuation.

Some jurisdictions in Australia have specific emergency animal management plans, but none exist in the Northern Territory outside of the *Territory Emergency Plan* (Northern Territory Government 2022). There are no known examples of emergency management plans in Australia that consider specific First Nations communities to lead recovery efforts and to promote disaster risk reduction and community resilience (Russell-Smith *et al.* 2022, Sithole *et al.* 2021, Van Niekerk *et al.* 2018, Williamson and Weir 2021).

Aims

This paper identifies challenges of emergency animal management in First Nations communities to answer the following questions: *How to empower Australian remote First Nations communities in emergency animal management? How to strategically embed animal emergency management and application in the Territory Emergency Plan?*

The paper offers a framework for emergency animal management that can be used to analyse animal management within the Territory Emergency Plan with recommendations for identified knowledge gaps.

Literature review

A literature review on the incorporation of companion animals in emergency management was undertaken in March 2023. The scope of the review included Australian and international literature with a focus on Australian academic literature and emergency plans for companion animals as well as emergency management in remote First Nations communities. The literature review was confined to emergency management planning documents and peer reviewed research papers published in English.

Pioneering animal disaster management: lessons from Hurricane Katrina

Hurricane Katrina affected the United States Gulf Coast in 2005 and resulted in 1,245 human deaths (Glassey 2018). Evacuation efforts attracted extensive criticism given the general exclusion of planning for pets and the resulting widespread evacuation noncompliance of people (Babcock and Smith 2020, Chadwin 2017, Glassey 2018). Large numbers of New Orleans residents sheltered in place with their animals and put their lives at further risk (Chadwin 2017). Following evaluation of Hurricane Katrina evacuation and other disaster response failures, the role of pets as contributors to loss of human life was considered so great that the *Pets Evacuation and Transportation Standards (PETS) Act of 2006*[1] was implemented (Babcock and Smith 2020, Glassey 2018). The PETS Act ensures that US state and local emergency plans include operations for evacuating people and their pets (Babcock and Smith 2020, Chadwin 2017, Glassey 2018).

The PETS Act was enacted during Hurricane Gustav in 2008 and Hurricane Harvey in 2017 (Babcock and Smith 2020). The Hurricane Gustav response appeared largely effective in implementing the PETS Act as the plan was functional, there was widespread notice and compliance from the public, resourcing was adequate and few pets and human lives were lost (Babcock and Smith 2020). Pet owners were active during evacuations by bringing pets with them or transporting pets to appropriate drop-off locations. This reduced the load on first responders (Babcock and Smith 2020). A key success was the use of barcoded wristbands for people and their animals in conjunction with close sheltering of humans and animals, which provided ease of reuniting evacuated parties (Babcock and Smith 2020).

In contrast, Hurricane Harvey emergency management efforts have been criticised for lacking commitment to on-ground action, despite PETS-compliant plans being in place (Glassey 2018). Failures and challenges related to a lack of centralised database systems for connecting and reuniting people with their pets, lack of training in animal emergency management for service workers implementing PETS Act plans, confusion due

1. *Pets Evacuation and Transportation Standards (PETS) Act of 2006*, at *www.congress.gov/bill/109th-congress/house-bill/3858*

to large-scale involvement of rescue groups and the public in unregulated animal relocations and oversupply of donations that required diversion of logistical attention and resources (Glassey 2018). Following analysis of the pitfalls of the Hurricane Harvey response, the City of New Orleans revised plans in conjunction with lessons learnt from Hurricane Katrina and in compliance with the PETS Act. This provided a sound guide for communities to develop animal management plans as part of disaster and emergency management (Babcock and Smith 2020). Key to these plans was inclusion of a pet registry with provisions for service animals (Babcock and Smith 2020). Protocols for staff, volunteer and public involvement are available and regular training is carried out in conjunction with veterinary teams to enable streamlined animal triage, tracking and movement during a response (Babcock and Smith 2020). The US National Fire Protection Association[2] has since implemented an appendix for *Service Animals and Pets* within the *Standard for Mass Evacuation and Sheltering* (Heath and Linnabary 2015). These plans reinforce the strength of the human-animal bond and highlight the risks to human life if animal inclusion in evacuation is ignored. It supports the joint evacuation of people and pets as the norm in emergency and disaster management standards (Babcock and Smith 2020, Chadwin 2017).

Existing plans: emergency animal management within First Nations communities

Emergency management planning in Australia generally falls to state and territory governments and, in the Northern Territory, the lead agency is the Department of Industry Tourism and Trade (Northern Territory Government 2022). Across jurisdictions, there are varied emergency management plans for remote First Nations communities, some of which contain references to management of animals (Table 1). Specific animal emergency management plans exist in South Australia, Victoria and Western Australia (Table 1). The South Australian plan provides a framework of roles and responsibilities of government agencies, not-for-profit organisations, businesses, animal owners and the community to manage animal welfare through emergency phases of preparedness, response and recovery (PIRSA 2018). Within this, local knowledge, especially considering cultural sites of significance, is referenced as important in response planning and implementation (PIRSA 2018). The Western Australian plan names local governments as having key roles in supporting animal welfare activities in emergencies while making animal owners responsible for animal evacuation and ongoing

2. National Fire Protection Association, at *www.nfpa.org*.

Table 1: Summary of emergency management plans by Australian jurisdiction considering specific indicators.

Jurisdiction	Are there formal emergency management frameworks specifically for remote First Nations communities?	Are there specific emergency animal management plans?	Are there specific recommendations for animals in remote communities?
Australian Capital Territory	No	No	No
New South Wales	No	No – advice only: 'Animal Emergency Plan' template available for pet owners.	No
Northern Territory	No Embedded within local area plans.	No – advice included in other plans: • pets not to accompany owners in mass community evacuations.	No
Queensland	Yes	No – advice included in other plans: • pets listed as at risk by hazards • pets given thought within preparedness community education.	No
South Australia	No State Emergency Management Plan includes a 'People at Risk in Emergencies' section that includes consideration of Aboriginal and Torres Strait Islander peoples.	Yes 'Managing Animals in Emergencies: A Framework for South Australia 2018'.	No
Tasmania	No	No	No
Victoria	No	Yes 'Victorian Emergency Animal Welfare Plan 2019'.	No
Western Australia	No Remote communities are included as part of state level plan.	Yes 'Animal Welfare in Emergencies: State Support Plan 2021'.	No

Table 2: Membership of the Biosecurity and Animal Welfare Group within the *Territory Emergency Plan.*

Participating Northern Territory organisations	Supporting organisations
Department of the Chief Minister and Cabinet	Interstate and Australian Government primary industry departments
Department of Health	Primary industry peak bodies (e.g. Northern Territory Cattlemen's Association, Northern Territory Farmers Association, Northern Territory Seafood Council)
Department of Environment, Parks and Water Security	Animal welfare and not-for-profit organisations (e.g. RSPCA, PAWS Darwin, Animal Management in Rural and Remote Indigenous Communities)
Department of Infrastructure, Planning and Logistics	Private veterinary clinics
Local governments	Wildlife care groups
Northern Territory Police, Fire and Emergency Services	Nil
Department of Treasury and Finance	Nil

management during the event (DPIRD 2021). The Victorian plan includes a key difference to other plans in that it describes the relocation of animals to emergency evacuation centres and includes provisions for animal registration, treatment and short-term housing (Department of Jobs, Precincts and Regions 2019). The Victorian plan also highlights local governments and municipal services as being responsible for many animal welfare and management outputs.

Within the Northern Territory, many local governments have emergency management plans, however, remoteness and associated challenges influence the practicality of such plans. Northern Territory local governments do not hold legislative powers within management and control of emergency events and emergency management plans are held by local police (Northern Territory Government 2022). No Australian animal emergency management plans contain specific recommendations for animals in remote First Nations communities (Table 1).

In the Northern Territory, the Department of Industry, Tourism and Trade is the lead agency for management of animal welfare in disasters (Northern Territory Government 2022). Within the *Territory Emergency Plan* a functional group is responsible for advising animal welfare operations; the Biosecurity and Animal Welfare Group (BAWG) (Table 2). The BAWG must consider potential disaster implications for companion animals, livestock and wildlife and coordinate evacuation, veterinary treatment and other care of animals, as appropriate (Northern Territory Government 2022). BAWG membership is comprised of government and non-government organisations as well as local veterinary centres and rescue groups.

Findings

First Nations communities and emergency animal management

First Nations communities are commonly home to large populations of pet dogs and growing populations of pet cats (Kennedy *et al.* 2020). Dogs and cats have been given strong cultural and social connections such as family and skin names and totem status, despite their free-roaming nature, which is in contrast to Western animal management practices (Brookes *et al.* 2020; Kennedy *et al.* 2020, Ma *et al.* 2020). First Nations Australians worldviews for health and wellbeing can include kinship, spirituality and Country (Butler *et al.* 2019). Often key to these paradigms are pets, especially dogs historically, which means that they are held tightly within family and community structures and are contributors to mental health and overall wellbeing (Butler *et al.* 2019, Chenhall *et al.* 2006). Recent Northern Territory emergency response operation efforts have included mass community evacuations of residents with pets being left behind. The pets were supplied food, water and veterinary treatment as appropriate during initial response actions, through there was no known reunification procedure.

There have been studies published in the literature highlighting the importance of empowerment of indigenous peoples globally to increase community resilience. There is evidence that environmental disasters as direct and indirect results of climate change will disproportionately affect minority peoples, particularly indigenous peoples (Russell-Smith *et al.* 2022). Petheram *et al.* (2010) recorded the frustrations of the Yolngu people in North-East Arnhem Land surrounding forecasted effects of climate change such as a lack of transparency by driving powers and a lack of communication and First Nations knowledges input. Similar sentiments are echoed in the literature considering emergency management in indigenous communities, where themes of working in partnership (in contrast to working 'for' or 'on') are paramount to build local response capacity and overall resilience (Ellemor 2005; Howitt, Havnen and Veland 2012; Knight and Price-Robertson 2012).

Globally, respect for indigenous land-use practices, language, leadership and institutions, in conjunction with culturally appropriate incentives and appropriate and ethical data collection, make up the essential pillars of disaster risk reduction (Lambert and Scott 2019, Rahman *et al.* 2018, Thomassin *et al.* 2019). Specifically, emergency management organisations should use local knowledge to reprioritise vulnerabilities and risks as

part of collaborative decision-making (Thomassin *et al.* 2019). A multi-sphere framework for disaster risk reduction proposed by Niekerk (2005) included indigenous knowledges as a key component to indicative risk profiles in minority communities in South Africa. The sharing of Smong Indigenous knowledge in Aceh, Indonesia was shown to enhance community resilience and reduce future tsunami risk (Rahman *et al.* 2018). Integration of Māori insights and mainstream approaches in New Zealand/Aotearoa proved beneficial to disaster risk mitigation as well as community recovery and social resilience (Kenney and Phibbs 2014). The Coordinated Incident Management System[3] prioritises Iwi/Māori representation within its local incident control response and states that Iwi/Māori 'traditional knowledge, values and practices' as 'indispensable to effective disaster response and recovery' (New Zealand Government 2019).

In Australia, historical colonisation and the imposition of a Western culture has infiltrated indigenous governance structures using top-down government systems that undermine local capabilities (Ali *et al.* 2021). Hazard assessment, preparation and response should be collectively and equitably managed to maximise emergency management outcomes, noting that specific actions will likely be unique to locations (Sithole *et al.* 2021). Common chain-of-command processes, language and other cultural barriers held within existing plans can reduce collaboration with local communities and detract from incorporation of indigenous knowledge (Russell-Smith *et al.* 2022, Williamson and Weir 2021). Optimising outcomes at community levels requires the review of leadership structures and emergency management processes (Williamson and Weir 2021). Further, equitable analysis of indigenous methods of management requires reimagining of performance monitoring, process evaluation and reporting outside of a Western worldview (Williamson and Weir 2021). Considering on-ground capacity, Russell-Smith *et al.* (2022) argue that First Nations communities are already well-resourced to deliver contracted emergency management services via existing ranger groups. Use of these groups can enhance local capacity, enterprise and employment and build community leadership and decision-making to reduce any vulnerabilities and improve resilience (Russell-Smith *et al.* 2022, Van Niekerk 2005, Williamson and Weir 2021).

Framework for animal emergency management and application to the Territory Emergency Plan

Heath and Linnabary (2015) proposed an animal-specific risk management procedure through phases of planning, preparedness, mitigation, response and recovery. An understanding of each of phase is important to design an animal emergency management strategy (Heath and Linnabary 2015). These phases are used as a framework for analysis of current emergency animal management in the Northern Territory with suggestions for improvements.

Heath and Linnabary (2015) identify components to the planning stage that relate to effective disaster mitigation, preparedness and response and recovery. These cover mobilising legislative actions (especially through a specialised group) that designs and promotes protocols, develops and oversees training exercises to build response capabilities and plans for disaster recovery and ongoing community development (Heath and Linnabary 2015). Next, is a focus on disaster preparedness, which can be hindered by groups outside of the central response team, that is, animal rescue groups and volunteers. Drawbacks of the involvement of untrained people, especially when ad hoc and uncoordinated, is an obstacle to emergency animal management (Babcock and Smith 2020, Chadwin 2017, Glassey 2018, Heath and Linnabary 2015, Thompson 2013).

Heath and Linnabary (2015) describe mitigation actions related to animal control regulations to mainstream health and care of pets and also to reduce the burdens of lost animals on communities. They highlight specific component operations of commands and directions during the response, evacuating animals with their owners, short and long-term accommodation for lost animals and dealing with fundraising and media campaigns. The recovery phase is considered, whereby Heath and Linnabary (2015) point to improving animal health infrastructure as the foundation for overall community development and disaster resilience. The framework, brief analysis, gaps and recommendations for applications in Northern Territory First Nations communities are summarised in Table 3.

3. Coordinated Incident Management System, at *www.civildefence.govt.nz/resources/coordinated-incident-management-system-cims-third-edition.*

Table 3: Summary of approach to emergency animal management within the *Territory Emergency Plan.*

Emergency management phase	Heath and Linnabary (2015) review as a suggested framework	*Territory Emergency Plan* approach to emergency animal management	Gaps in First Nations communities	Recommendations
Planning	Legislative action group	Exists as BAWG.	Lack of First Nations consultation and representation.	Incorporate First Nations advisory groups.
	Protocols for animal evacuation and care	No protocols.	Limited data available (e.g. animal numbers).	• Upscale data collection efforts such as regular animal census. • Develop protocols with expert input including that of local veterinary service providers.

	Education and training	• Coordinated by NTES[4] Emergency Management Training Unit and overseen by BAWG. • Veterinarians have been invited to participate in exercising. • Overseen by BAWG. • Included as part of NTES Emergency Management Training Unit.	• Limited knowledge of community-specific needs for animal management. • Limited specific animal management training for emergency workers.	• Develop specific animal management and care training within NTES. • Coordinate with local veterinary service providers. • Consider input from industry groups such as Australian Veterinary Association.
	Resources	Overseen by BAWG.	Limited knowledge of community-specific needs.	Develop register of resources for mobilisation in disaster event.
	Community Development	Nil	Opportunities for community engagement in planning not identified.	Empower communities to contribute to design and implementation of management plans.
Preparedness	Public awareness	BAWG create and distribute media campaigns for public awareness.	Limited knowledge of community-specific needs.	Consult with local communities for contextually appropriate engagement.
	Volunteers	Nil	Limited local and existing veterinary workforce.	Take lead from local and existing community veterinary service providers to: • consider practicalities and training needs. • consider scope to mobilise interstate veterinary and/or paraveterinary workforce.
Mitigation	Legislation – regulated pet ownership (animal control)	Nil	Inadequate local government power and resourcing.	Lobby for increased local government animal management power and support.
			Sporadic veterinary service programs with varied funding structures.	Lobby for regular data collection as part of veterinary service programs to improve disaster planning and resource allocation.
			Scope of available veterinary service programs likely inadequate for optimal community animal health.	Continue to upscale with regular performance monitoring and consideration of community input in program design, implementation and evaluation.
Response	Clear command and direction	Conducted by NTES in consultation with BAWG.	Limited knowledge of community-specific needs.	• Continue to upscale power of BAWG in partnership with NTES. • Develop BAWG protocols for initial response incorporating First Nations advisory and local community voice.
	Evacuation compliance	Mass community evacuations.	Consider implications.[5]	Empower communities to contribute to planning and implementation of evacuation protocols.
	Animals stranded in place	Nil	Limited suitable infrastructure and provisions for animals left behind.	Consider design of purpose-built holding areas and provision of food, water and veterinary services.

4. NTES is Northern Territory Emergency Services.

5. Evidence of enforced evacuation leading to community disempowerment and associated negative effects on resilience (Mercer and Kelman 2010).

	Animal rescues	Nil	Difficulties for practicalities (risks) considering remoteness, general free-roaming nature, reduced handleability (safety) and reduced veterinary care (health, safety and zoonoses).	Prioritise management of animals stranded in place over animal rescues.
	Stray animals	Nil	Free-roaming animals in First Nations communities rarely considered strays.	Consult with local communities for plans relating to animals considered as stray.
	Fostering animals	Nil	Largely inappropriate in First Nations communities.	Consult with local communities for plans relating to fostering animals.
	Fundraising	Nil	Often poor coordination of fundraising efforts. Potential of misalignment of donated goods with community wants and needs.	Develop protocols for receiving and distribution donated goods and services in consultation with BAWG First Nations advisory. Include communication strategy with stakeholders and general public.
	Media and social media	Some coordination by BAWG.	Limited knowledge of community-specific challenges among the public.	Develop culturally appropriate and strengths-based media and photo protocols that empower communities.
Recovery	Animal health infrastructure	Limited	Limited community-specific infrastructure and animal management programs.	Advocate for increased animal management power at local government level and increased veterinary services in remote areas.
	Community development	Limited	Limited knowledge of community-specific needs.	Empower communities to contribute to design and implementation of recovery plans.

Recommendations

The *Territory Emergency Plan* is a comprehensive framework for emergency and disaster preparedness, response and recovery in the Northern Territory. The plan excels in its detailed list of hazards with allocated responsibilities and inclusion of perspectives in the form of advisory committees and working groups that is in line with multi- and inter-disciplinary collaborative agency necessary for animal emergency management plans (Austin 2013, Taylor *et al.* 2015, Pinillos *et al.* 2016). However, development of protocols and procedures is required under the functions of animal/livestock management, either within the plan or as an accompanying guide authored and maintained by the BAWG. Considering emergency management of companion animals in remote First Nations communities, it is recommended that BAWG recruit an advisory committee made up of First Nations people representatives to develop culturally appropriate animal management protocols and supporting documents. Protocols for animal evacuation and care should be developed with input from appropriate stakeholders and analysis of animal management and welfare outcomes of previous disaster incidents, particularly cyclones Lam and Trevor in the Northern Territory. Preparedness plans and response actions should be data-driven (Austin 2013) via regular animal census data collection coordinated by local governments and relevant local organisations.

Specific animal care training in a disaster management context should be developed with input from key stakeholders such as local and existing community veterinary service providers and representatives from Animal Management in Rural and Remote Indigenous Communities.[6] Provision of such training across jurisdictions should be considered in the interest of collaborative knowledge sharing and beneficence but also as a means for potential skilled volunteer recruitment for assistance in disaster events. Care and consideration must be given in the training of veterinary personnel to prioritise and manage health and safety during response activities (Vroegindewey and Kertis 2020).

Evacuation of animals during disaster events is controversial (Chadwin 2017, Mercer and Kelman 2010) and has been trialled in the Northern Territory with varied anecdotal success. Remote communities do not usually have designated evacuation centres. Instead, mass community evacuation of residents, with transport and temporary housing facilitated by government, is common and return to communities rigidly managed. There is evidence that enforced evacuation of indigenous peoples from their communities is detrimental to community resilience (Mercer and Kelman 2010). Enforced evacuation without provision for concurrent evacuation of pets, as is common in the Northern Territory, contributes to the debate of responsibility of animal management in disaster response (Travers, Degeling and Rock 2017) in both disempowering community members and inter-agency buck-passing. While debate of the discourse of enforced evacuation is outside the scope of this paper, it is worth noting

6. Animal Management in Rural and Remote Indigenous Communities, at *www.amrric.org*.

as a precursor to disempowerment of First Nations peoples in developing and implementing animal management in their communities. Knowledge sharing with an advisory committee in response plans and actions has great importance in building community resilience (Russell-Smith *et al.* 2022, Thomassin *et al.* 2019, Van Niekerk 2005, Williamson and Weir 2021). This is an example of 'right-way science', a significant emerging component in research methodology for First Nations peoples that encourages collaboration, counters colonialism and challenges the deficit discourse common to science and health research of communities (McKemey *et al.* 2022). Close coordination of emergency management (human and animal) during disaster events could be improved by construction of purposely designed evacuation centres and improving integration of services in alignment with the One Rescue model (Glassey 2022).

Considering practical responses to animals in remote First Nations communities, there are many differences to current approaches. Firstly, the cultural and social differences in animal housing and husbandry are prominent, whereby animal overcrowding and free-roaming are common, despite strong human-animal bonds prevailing (Brookes *et al.* 2020, Kennedy *et al.* 2020). This is likely to impede existing evacuation and sheltering protocols. Similarly, free-roaming animals are not likely to be used to being handled or restrained for transport or treatment. Thus, specialised protocols for safety are required and may include distance examinations (whereby experienced veterinarians make assessments of health and treatment needs by sight from a distance in place of physical examination) and chemical restraint by darts to reduce risks of dog bites and other injuries (Chadwin 2017). Potential health implications must be considered both for communicable disease spread between animals and zoonotic disease spread to responders and the public (Chadwin 2017). Animals sheltering in place is likely the safest and most practical solution and procedures to supporting this will need to include provisions for clean food and water and other welfare concerns during the response through to the recovery phase. Integration of procedures within purpose-built evacuation facilities is highly recommended. In addition, local community veterinary service providers must be able to return to communities for rapid veterinary assessment and treatment and this should be upscaled through response and recovery phases. Practicalities of human-pet reunification in First Nations communities needs to be further explored.

Remoteness in the Northern Territory, levels of funding and other resourcing issues regularly hinder veterinary services to remote First Nations communities. This is a significant limitation to emergency animal response. Veterinarians and support staff should be recruited and adequately trained for a disaster response, in collaboration with local and existing veterinary services where possible. Long-term support for animal health infrastructure in communities must be prioritised as part of resilience and disaster risk reduction. Further support for local government and communities in partnership, in enacting and maintaining animal management legislated powers is needed as part of disaster preparedness and mitigation.

Conclusion

This paper highlighted improvements to the *Territory Emergency Plan* to consider animals in remote communities. It also identified gaps in similar plans in other jurisdictions in Australia. Evaluations of the response failures during Hurricane Katrina and other disasters were used to inform future emergency management planning, especially considering emergency animal management as a growing area for inclusion. In Australia, emergency management for companion animals in remote First Nations communities presents challenges, especially considering their family and social importance. The *Territory Response Plan* is a useful base to build such plans, however, requires rethinking and extra work to address operational practicalities related to health and safety, zoonoses and skilled responder capacities. It is imperative that right-way science and other collaborative methodologies are adopted to give remote First Nations communities ownership of their disaster risk reduction priorities and activities. Research and workplans within One Health, One Welfare and One Rescue models of care that are specific to disaster planning and resilience would greatly assist the progress of resilience in all communities, particular remote areas of Australia.

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Rescuing responsibly or the 'art' of dealing with unauthorised responders

Adam Parascandola

Humane Society International

Abstract

During every disaster, unaffiliated but well-meaning and often inexperienced individuals show up to help. It is the responsibility of emergency managers, law enforcement and like authorities to do the best we can to ensure that this help does not exacerbate problems caused by the disaster.

Introduction

In 2005, I was part of the US government response to Hurricane Katrina. I arrived outside New Orleans shortly after the storm had abated and, initially, there was a small group of responders from a handful of agencies. However, given the evacuation of most of the city of New Orleans and the fact that rescuers were not allowing pets into rescue boats, the scope of the disaster quickly outgrew the small number of responders.

Animal control agencies and humane societies in the US ultimately sent teams in to assist. However, of the teams that responded, some became frustrated and broke away from the official response. Also, well-meaning individuals started showing up to help. Access to the city was controlled by law enforcement agencies that had shown up to assist. Because there were so many agencies, the Louisiana SPCA[1] (the agency in charge of animal rescue) instructed us to write 'LASPCA' across the windshield of our vehicles to gain access to the city. The unofficial rescuers quickly caught on to this and wrote on their own vehicles to gain access to the city. The result of this caused confusion and mayhem. Within the city, animals were taken without investigation as to whether or not the people living in the location had been evacuated (there was a list of addresses called in by owners that the official response was working from). I also met a resident who went to the store and came back and his dogs had been 'rescued'. Residents erected signs in their yards saying their animals were not abandoned. For the animals rescued by these independent responders, there was often no information left at the address to advise the owner how to find or reclaim their animal. Hundreds of animals were transported out of Louisiana without being registered in any way that would enable their owners to reclaim them. Interactions with many of these independent rescuers indicated that they judged the people who left their animals behind and decided they did not deserve to keep their animals. It took months for people to track down their animals and, in some cases, they never saw their animal again. These independent rescuers were also moving throughout the city without keeping any record and this presented a safety risk for them and responders.

After Hurricane Katrina, subsequent responses in the US made varying degrees of effort to establish better controls over access to disaster-affected areas. However, controlling access to cities with hundreds of ways in and out is an impossible task. Since Hurricane Katrina, I have responded to many disasters all around the globe. Unfortunately, dealing with unauthorised rescuers has become an increasing and common problem. People have also started to raise money on social media platforms to help fund their own 'response'. While well-meaning people can play important roles in response, their activities must be undertaken responsibly and preferably in conjunction with any official response.

After Hurricane Dorian on Abaco Island in 2019, I saw groups of people with access to planes fly in from the US, gather up dogs, load them onto the plane and fly them back to the US. This was often done with no investigation as to whether or not there was a caretaker for the animal. This was despite the fact that there was an official response and teams were sending animals to Nassau where

1. Louisiana SPCA, at *https://www.louisianaspca.org/#/*.

they were housed in the hopes of owners reclaiming them. I found, in responding on the island, that dogs were being cared for by one individual who lived in that location who had stayed back in the residential area and who had agreed to care for the animals until the owners could return. Also, on Abaco as in many places around the world, companion animals are free to roam and are not locked up in a home or yard. So, in this case, many dogs caught as 'stray' because they were roaming were likely not stray at all.

What happens after 'rescue'

Another issue that can result from unauthorised and inexperienced rescuers is the fate of the animals after rescue. Emotions can drive people to help and to rescue animals without putting plans in place as to who will care for the rescued animals and where. I have seen this result in 'rescued' animals being left in already overburdened local shelters or makeshift shelters where the conditions are questionable. 'Rescuing' animals in the traditional sense of pulling them out of the affected area is, in my opinion, the easy part of the rescue. Providing for their care, returning them to owners or rehoming animals is a much more labour and resource intensive part of the process. No one should engage in the first part without a plan for the latter part.

This issue is compounded with wildlife. During the wildfires on Kangaroo Island in South Australia, the initial response was quite small. As the media's attention turned to the response, many people came to volunteer. There was a lot of great work done by these volunteers, particularly the vets who helped at the makeshift animal hospital. However, other well-meaning individuals entered forested areas to rescue koalas. With little experience with wildlife, many people began gathering up every koala they could find, even climbing high into the trees to pull them out. There was no assessment of whether or not those koalas had access to feed and were in good condition or not. Fortunately, koalas seem to weather the stress of capture fairly well, however, this is not always the case with wildlife and can lead to the death of the animal.

Trying to shut down unauthorised response activities is unlikely to be successful. These responders are well-meaning and want to contribute in a positive way. Directing their energy to other productive avenues of assistance can provide much-need people power and allow them to have a fulfilling experience. There will always be people who insist on continuing their activities and because of this, it is important for jurisdictions to secure response areas and limit 'unofficial' responders. This helps those who are responsible for recovery efforts and curtails irresponsible activities. It is difficult to control the actions of others, but we can determine who we partner with and whose activities are prioritised. Unfortunately, unofficial responders can get the most social media attention and public support because they are seemingly actively rescuing animals. But no matter how popular they are and how much linking up with them could widen the audience for responder work, it would be unwise to legitimise activities that are irresponsible.

We have seen in situations like conflict and disaster that there are people willing to help bring supplies and food to animal shelters and pet owners. For example, in Ukraine, informal distribution networks were set up and these provided a lifeline for people who did not have access to food for their animals. There has been a push to move animals out of Ukraine especially once the European Union relaxed entry requirements. This relaxation was done to allow families to flee Ukraine with their pets. However, there was concern that animals with unknown vaccine histories were being moved out of Ukraine (a high-risk rabies country) into other countries. Although shelters in the European Union absorbed many of these animals, many went to overcrowded shelters in Romania and Poland or were left in hastily constructed shelters without proper resources to care for them.

I believe that a core tenet should be to make every effort to keep animals in-place (with the exception of animals evacuating with their owners). There are always exceptions such a flooded areas with no safe place for animals. But animals should remain as close to their communities as possible. Even street animals are often cared for and valued by their communities and would be missed if removed. It is important to understand the relationship people have with their animals. It may not be what we are used to seeing, but it needs to be respected.

Directing effort

If people want to help, they could be directed to known areas where help is needed. This could be restocking food and water stations for animals or delivering food to communities. Many times, these people have particular skills or equipment such as drone operators and can work with official responding agencies to provide a service that would not exist without them.

An example is the Cajun Navy that started out as a group of boat owners who would take their boats out in flooded areas to rescue people. They did this outside of the official response. However, this caused concern among official rescuers as they recognised a safety risk to the boat owners and that they may not know the area they are trying to navigate. However, when flood waters are high and people are trapped on rooftops, having a ready fleet of boats is helpful. So, over time, local jurisdictions worked with the Cajun Navy to incorporate them into the official response. Teams were established and given areas to search, thus reducing duplication of effort. They were also registered so if someone didn't report back, there was a record of where to look for them. They were also paired with official responders or locals with knowledge of the area. While such partnerships are not present in all disaster responses, they have helped to rescue thousands of people.

Animal response is still an afterthought, and this has left the door open for people to mount their own responses. If animals are to be humanely treated, their communities respected and animal response treated as the specialist field, we need everyone who comes to help to act responsibly. In the end, it benefits all efforts to have animals and animal response considered a part of any official response so that humans and animals are safe.

Global Animals in Disaster Management Conference Awards

The Global Animals in Disaster Management Conference (GADMC), hosted by Animal Evac New Zealand and sponsored in 2023 by VIER PFOTEN (Four Paws) International, is one of the most important events for disaster management experts from all over the world.

The GADMC conference is a platform for emergency management practitioners at all levels to discuss new ways to protect animals during disasters. The conference awards showcase the very best and brightest in this field over the previous 2 years.

This year, category winners were:

Most Engaging Presentation – awarded to Dr Jennifer Betz from the US for her work on 'Dogs of Chernobyl: beyond the Russian invasion' that is about the impact the Russian occupation of the Chernobyl Nuclear Power Plant had on the dogs of Chernobyl (see https://gadmc.org/speakers/profile/?smid=848).

Most Popular Presentation – awarded to Dave Pauli from the US for his work on Wildlife Disaster Response that provided an insight into the challenges faced in wildlife disaster response and how the USA is leading the way in protecting precious creatures during emergencies.

Both these presentations captured the hearts and minds of attendees and were voted most highly to achieve these awards.

Most Thought Provoking Presentation – awarded to Christine Parker-Graham from the US for her work on 'A Case for Aquatic Animal Evacuation'. This work challenges traditional thinking and introduces new approaches to disaster management when dealing with animals (see https://gadmc.org/speakers/profile/?smid=824).

Emerging Researcher was awarded to Fredred Valdiva and his team in Nicaragua in recognition of the important work being done in animal welfare, especially where working with horses is a challenging task (see https://gadmc.org/speakers/profile/?smid=858).

Best Overall Presentation – awarded to the international panel that discussed the important issue of unofficial responses to animals during disasters. The panel consisted of international experts Gerardo Huertas (Costa Rica), Jen Gardner (USA), Adam Parascandola (USA) and Dr Steve Glassey (Australia). See the presentation at www.youtube.com/watch?v=hrSXCo0xAvc.

As a **Special Merit**, the awards recognised the incredible work being done by Azzedine Downes and Shannon Walajtys from the US on 'Meeting conflict with compassion'. There was also inspiring stories by Tarusha Mishra from India on 'The Drowning Community Dogs of Mumbai' (see https://gadmc.org/speakers/profile/?smid=821) and Valentyna Vozna from Ukraine on 'What could the EU do better to protect animals in disasters: lessons learnt from Ukraine' (see https://gadmc.org/speakers/profile/?smid=850).

The GADMC Awards are a testament to the dedication, innovation and passion of disaster management professionals around the world.

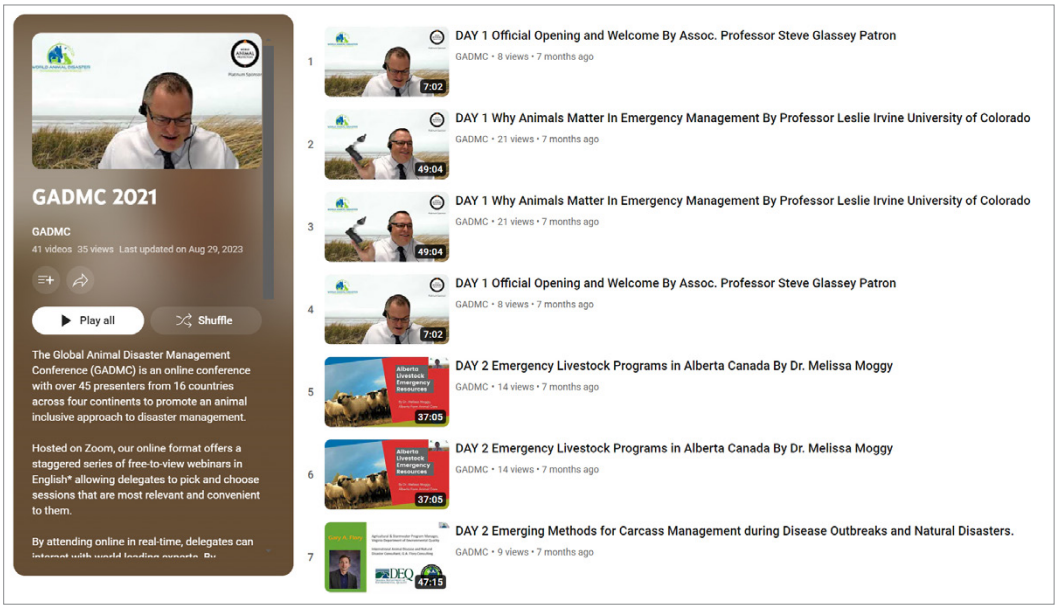
All GADMC presentations, including this year's award winners, are online free and accessible via https://gadmc.org/recordings/.

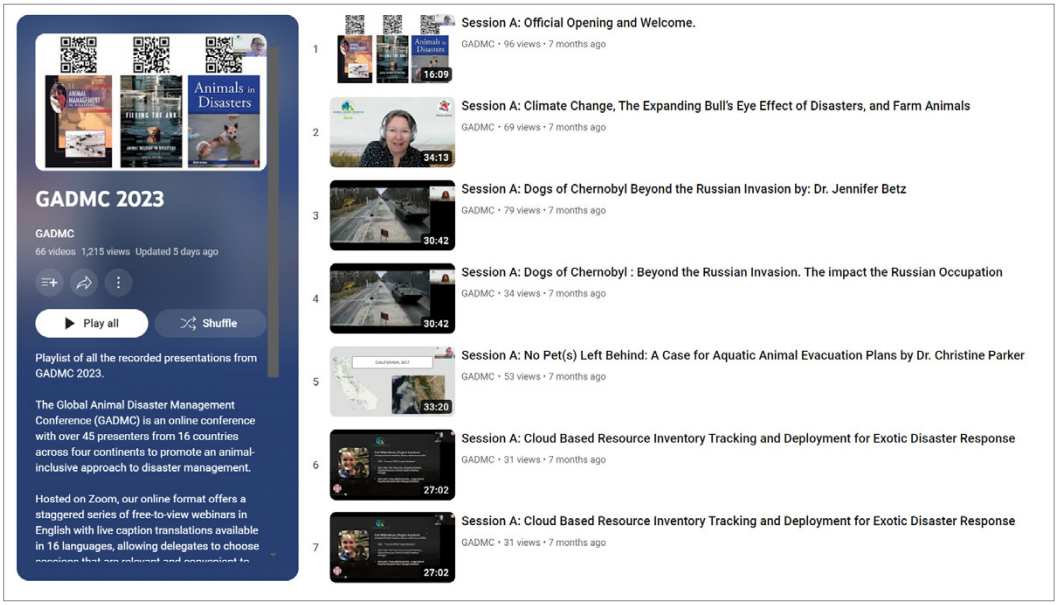
Full conference presentations and recordings online, free and truly global

The Global Animal Disaster Management Conference (GADMC®) connects leading animal emergency and disaster researchers with practitioners and fellow academics. GADMC is the world's largest emergency management conference that focuses on promoting animal-inclusive resilient communities.

Presentations and recordings from its conferences of 2021 and 2023 are available online and are free to access.

All about the conferences, the organisations and its interactive content is on the GADMC website, at https://gadmc.org.





Abstract

Bushfires account for 40% of fatalities associated with declared disasters in Australia. A significant proportion of these fatalities occur closer to forested areas because over 90% of the recorded locations for the deaths were within 100 metres of bushland areas. Despite this, there has been an increase in people relocating to now-considered high-risk bushfire areas. This paper considers why people live in bushfire-prone areas particularly following Australia's 2019–20 catastrophic summer bushfires. The study used a qualitative approach and conducted 30 semi-structured interviews with people living in the southeast part of New South Wales; a region hardest hit during the 2019–20 summer bushfire season. The interviews identified 7 reasons, as given by the participants, concerning why they thought people continued to move near bushland. The reasons were a quest for a 'tree change', proximity to family, location beauty, place attachment, work-related needs, property affordability and partner-related factors. These reasons were categorised into internal and external factors. This study serves as a useful reference when creating ways to encourage early self-evacuation and, ultimately, to reduce injuries and fatalities. These findings are not exhaustive and do not represent the entirety of New South Wales nor Australia or other countries. However, they represent a sample of lived experience by participants. Future studies might cover wider areas and include great numbers of participants and so garner diverse opinions about locations where people live and the hazard experienced.

Why do people relocate to bushfire-prone areas in Australia

Peer reviewed

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Introduction

Bushfire is an annually reoccurring hazard that causes significant damage to property and life, arable land, ecosystems and infrastructure worldwide (Goswami *et al.* 2018; Labossière and McGee 2017). In Australia, millions of hectares of land are burnt; homes and properties are destroyed; infrastructure is damaged and wildlife suffer death, injury and habitat destruction (Booth 2020). High numbers of deaths are recorded due to bushfires in relation to other disasters (Venn and Quiggin 2015). The 2019–20 bushfire season in Australia led to 35 fatalities, the economic costs of mental health issues amounted to $1.95 billion (Kohlbacher 2020) and insurance losses amounted to $1.7 billion (Wittwer and Waschik 2021).

Australia is among the most bushfire-prone places in the world (NSW Rural Fire Service 2019). Successive bushfires have affected the communities living within or near fire-prone forests and rangelands in terms of loss of lives, homes and infrastructure destroyed (Labossière and McGee 2017). In bushfires, people are susceptible to smoke inhalation and, over 2019 and 2020, there were 429 smoke-related deaths in addition to the 35 people directly killed by bushfires (Kohlbacher 2020). According to Venn and Quiggin (2015), 40% of deaths associated with bushfires in Australia occurred due to the increased per capita fatality rate and mental health consequences. People are at risk of bushfire because they tend to live in urban-bush interfaces (Kruize *et al.* 2019). In addition, people move to urban bushland regions because it offers affordable housing and less population congestion (Anton and Lawrence 2016). However, the risk is increasing as research indicates increased occurrences of bushfire is due to the rise in extreme temperature, increasing wind speed, low humidity and decreased rainfall (Booth 2020, Neale 2016, van Oldenborgh *et al.* 2021). The changes in climate implies an increased likelihood of bushfire severity, fatalities and damage to infrastructure along with health-related issues (McLennan *et al.* 2018). However, despite these risks, it appears people may not realise or may not pay adequate attention to the risks inherent in bushfire-prone areas. These people usually underestimate the risks of living in these regions and may also be inadequately prepared for a bushfire event (Koksal, McLennan and Bearman 2020). The aim of this study was to investigate why people elect to live in bushfire-prone locations.

Materials and methods

An inductive research approach was used that involved collecting qualitative data through semi-structured interviews. While the research aimed to identify why people live in bushfire-prone areas despite the prediction of more frequent and more severe bushfires, the interview method was chosen because it allows researchers to gain insights into participant views.

Participants were recruited from southeast New South Wales, which was severely affected by bushfires between December 2019 and January 2020. The recruitment process involved sending flyers about the research through local council newsletters, community Facebook groups and notice boards. Potential participants responded and were selected purposively from 3 local councils of Bega Valley Shire (population=33,253), Eurobodalla Shire (population=37,232) and Goulburn Mulwaree (population=29,609)[1] councils as they indicated an interest and willingness to participate in the study. Figure 1 shows the council areas within New South Wales that were selected for the study. A total of 30 respondents participated in the study.

Participants were referred to using alphanumeric codes rather than their names to provide confidentiality. The interviews were conducted using a structured interview guide and were conducted face-to-face, online via Zoom and by phone. Interviews lasted between 40 and 90 minutes. They were recorded, transcribed using Otter.AI and analysed using thematic content analysis via NVivo 12 Pro©. This method involved identifying, analysing and reporting patterns or themes within the data. The data were used to examine perspectives of how people's decisions were formed using a decision-making framework (Adedokun *et al.* 2023) as well as what factors influence respondents to live in high-hazard areas. All participants provided written informed consent before the interviews.

Ethics approval was provided by the University of Newcastle Human Research Ethics Committee (Protocol Number H-2021-0284).

Results

Demographic information about interviewees

Figure 2 shows the percentage of participants by age. Most participants were aged 55–74, making up 80% of the total sample. There was a drop to 17% of participants who were aged 35–54 and the remaining 3% were aged 18–34. The average age was 60 years.

Participants had been residing in their current location for an average of 13 years. Given this long-term residency, they were considered suitable to provide accounts of their bushfire experiences. Of the sample, 33% had been living in at-risk bushfire areas for over 20 years and 33% had been living in these areas for 5–10 years (Figure 3). A smaller proportion of participants, 13% and 10%, had been living in bushfire at-risk communities for 16–20 years and 5–10 years, respectively (Figure 3).

1. The population figures presented are based on 2016 Census data (IPWEA 2022; Owens and O'Kane 2020).

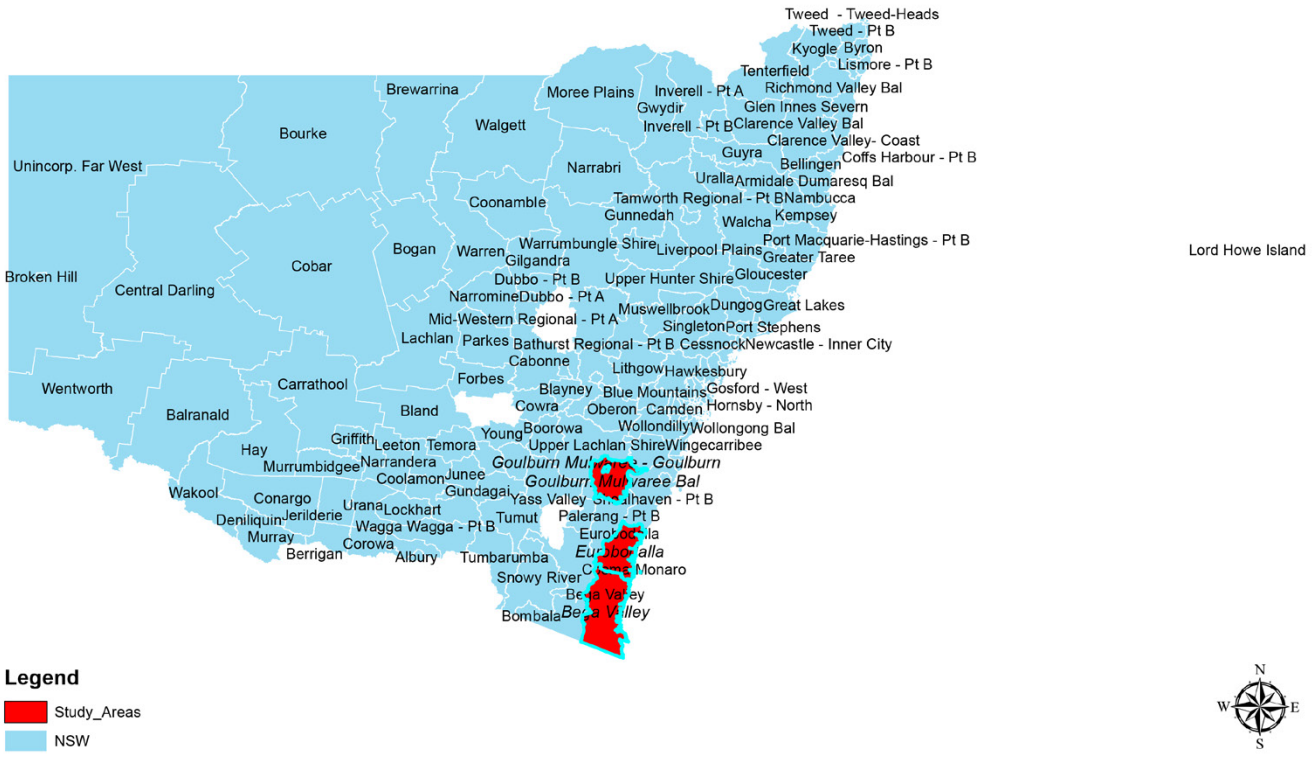

Figure 1: Map showing the study areas in New South Wales of Bega Valley Shire, Eurobodalla Shire and Goulburn Mulwaree.

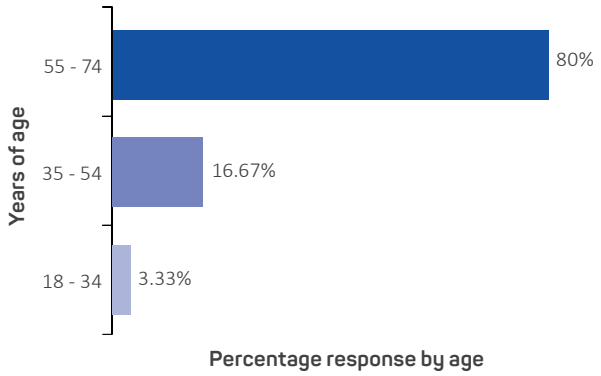

Figure 2: Percentage of participants by years of age.

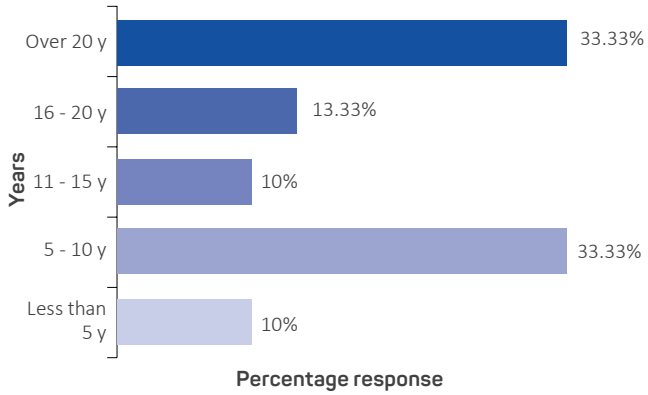

Figure 3: Number of years participants had lived in the location.

Figure 4 shows information about home and contents insurance status of participants. The majority (77%) had full home and contents insurance coverage. However, 17% had no insurance and 7% were underinsured for property and contents. While 93% of participants were homeowners, the remaining 7% were renters or leaseholders (Figure 5).

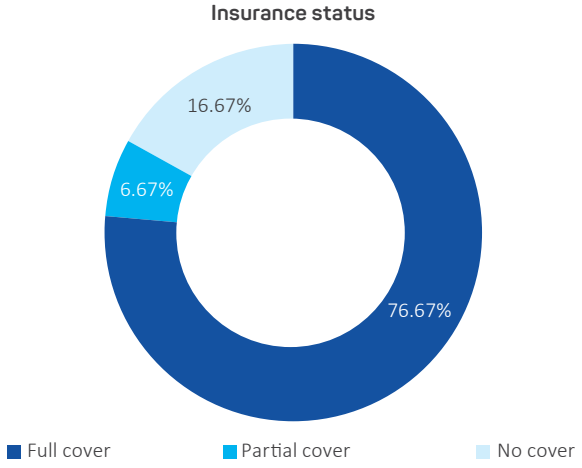

Figure 4: Percentage of properties covered by insurance.

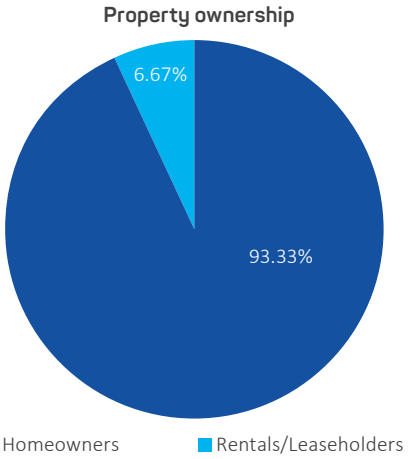

Figure 5: Percentage of participants owning or renting the property.

Figure 6 shows that 80% of the participants had pets or animals and 20% did not. On average, the interviewees lived within 59 metres of bushland (Figure 7).

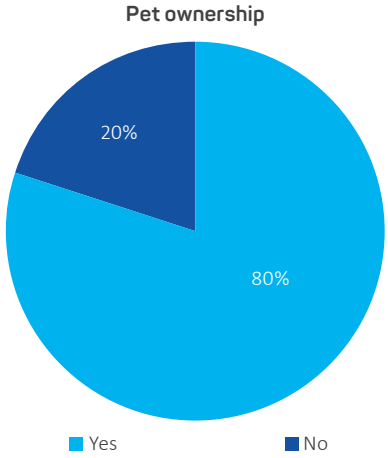

Figure 6: Percentage of participants having a pet.

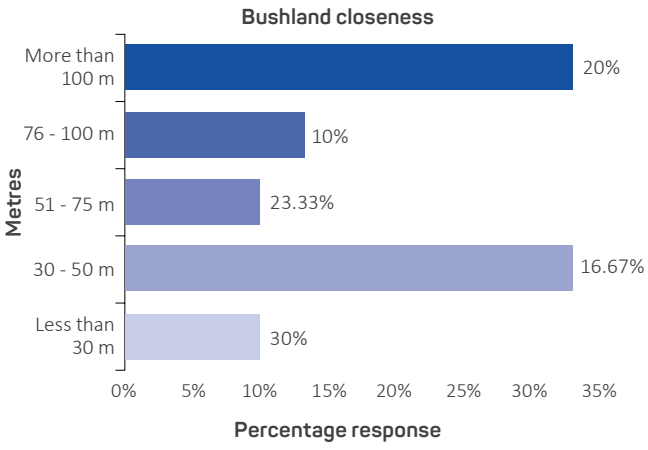

Figure 7: Percentage of participants and their distance from bushland.

Why householders live in bushfire-prone communities

Generally, participants lived in a wildland urban interface or a bushfire-prone area, an area identified and mapped as red zone under the building system. Participants were asked 'how did you come to live in this location?'. The responses revealed various factors that had led to their choice of where to live. The reasons included wanting a tree change (moving inland to live in a country area), closeness to family, beauty of the location, having an attachment to that place, convenient for work, property was affordable and relationship related (emotional connection between people). Table 1 lists these factors that are categorised into internal and external factors.

Quest for a tree change

Most of the participants indicated a desire for a tree change. These participants had moved to the country because they wanted to leave city life and enjoy a comfortable and natural environment. Some of the participants shared their views:

> *I moved down from Sydney and come down to the peace and quiet you get out of the rat race, quite comfortable most of the time at (sic) all right.* (MHIE-INTER6_9_14052022)

> *My wife came from a farm property in the far west and so she wanted to return. I lived in the city, she wanted to return to the country. So, we are doing tree change.* (MHIE-INTER1_8_05052022)

The desire of participants for a tree change to a bushfire-prone area reveals a nuanced risk perception. Of these participants who indicated tree change as a reason, males accounted for 55% (n=6) and 45% (n=5) were female. In addition, 72% of these participants had pets they kept on their properties and 18% were without pets. This high percentage pet ownership suggests the role of companionship in fostering resilience (Foenander 2022) and underscores the complexity of decision-making in such conditions.

Proximity to family

Participants indicated that a desire to move closer to their family attracted them to the area. This was evident as proximity to family was mentioned 9 times out of 30. This implies that the presence of relatives and family or the wanting to be with loved ones influences participants to live in the area. Some participants said:

> *Oh, my family are from this area. They are piney fishermen and farmers from the area for generations. Fishing is fourth generation and the farm is fifth generation. But we did move when I left school. I moved to Canberra and then came back later. I suppose I was about 40.* (FHIE-INTER1_16_21062022)

> *Well, when I retired, I had the choice of where I could live and I found a suitable block of land in the small town I am in… was not too far from relatives. So that is what influenced me in the choice.* (FHIE-INTER3_18_22062022)

Some of the participants were deliberate in their choice of living in a bushfire-prone area and were willing to bear some level of risks associated with it. Of these participants, 38% (n=3) were male and 62% (n=5) were female. Also, 75% (n=6) of the participants who indicated proximity to family as a factor also had pets they kept on their properties. This shows the varied motivations that shape the decisions of why people live in bushfire-risk communities.

Beauty of the location

Among the places where people could live, participants preferred bushland areas because these appealed to them based on previous experiences. This suggests that some participants considered the location's beauty when looking for land to build. The beauty of the location occurred 7 times (23%) out of 30 (see Table 1). Some participants stated:

> *Well, this valley is a very special place. And I think anyone who visited the valley remembers it. And my partner Peter went there as a child and it stuck in his mind. So, when the opportunity came to get a house there, of course, it seemed like a good thing to do. It is a beautiful, beautiful valley.* (FHIE_INTER1_30_02082022)

> *So yeah, so I think the vulnerability is very high with this place. You know, it is just, I choose to live in a beautiful place and I understand the risks of living here. So I am okay with that.* (FHIS-INTER2_6_03052022)

Table 1: Why participants live in bushfire-risk communities.

Child nodes	Sources	References	Parent node
Quests for a tree change	6	10	Internal factors
Proximity to family	8	9	
Location beauty	6	7	
Place attachment	4	4	
Work related	7	7	External factors
Property affordability	5	5	
Relationship related	2	2	

People living in bushfire-prone areas can improve their preparedness by clearing vegetation from structures and maintaining access roads. Image: Gary Hooker (ACTESA)

The participants were deliberate about living in a bushfire-prone area and claimed they understood the risks involved. Of these participants who indicated beauty of the location as their reason for living bushland area, 17% (n=1) were male and 83% (n=5) were female, representing a gender disparity in this sample. While 83% (n=5) of participants kept pets on their properties, 17% (n=1) did not have a pet. This, combined with 83% of participants prioritising beauty of location having pets, aligns with Kruize *et al.* (2019) who examined emotional connections to nature. These choices reflect the complex interplay of aesthetics, risk perception and emotional attachments (Anton and Lawrence 2016).

Place attachment

Table 1 shows that place attachment is a motivator for people to live in bushfire-prone areas. Several reasons responsible for place attachment showed in this study. Some participants had been born in places near bushland and others had holidayed in such locations at a young age. Their experiences contributed to their affection for the regions. Even if they had been away for years, participants indicated that they still identified with it. Some participant responses about place attachment:

> *So, my mother was born here. And when she was an adult, she moved to Sydney and got married. And so that is where I was born and raised. And then when my parents wanted to retire, they move back to this area. And, like, my grandmother was still alive then. And yeah, so there is lots of family around this area. That is it basically…* (FHIE-INTER3_15_23052022)

> *So, we came here to Narooma because this is where we had holidayed for a month every single year. Since my husband was a little boy, this is where he came to. So, we came down here, we found a block of land. And we built a house down here.* (FHIS-INTER1_9_22062022)

These participants were deliberate about living in a particular place that happens to be bushfire-prone. Of these participants, 44% (n=4) were male and 56% (n=5) were female. Of these, 89% (n=8) had pets on their property and 11% (n=1) did not. This high pet ownership aligns with Foenander (2022) that looked at the role of pets in providing emotional support and resilience in challenging environments. This reinforces the multi-dimensional factors influencing people's understanding of risk and dealing with the risks associated with their living environments.

Work-related factors

Some participants indicted that the location of their workplace influenced their decision to live in the area (Table 1). Some participants were transferred to the regions, especially government employees like teachers. Others has established businesses in the area. These private business owners were constrained because they thought their business's potential to thrive was connected to being in such a location. Participants said:

> *I was transferred here in a teaching position with TAFE a long time ago and met my husband and then I got a transfer to Sydney. So over three years, we gradually got transferred back to the area.* (FHIE-INTER1_2_22042022)

> *When my son was eight weeks old, we moved here for business. And in 2013, my husband died of cancer, and that business closed. And I went on to work in the community and do various things. So, we were in this house, we built this house in 2000.* (FHIE-INTER3_17_22062022)

The data showed that work-related factors contributed to participant choice about living in a bushfire-prone area. In addition, the data showed a nearly equal gender distribution of male and female being 45% (n=5) and 55% (n=6), respectively.

Notably, 82% (n=9) of participants with pets indicates the intertwined relationship between occupational choices, personal preferences and the importance of companionship and again shows the varied motivations that shape decisions on where to live.

Property affordability

Many participants indicated they could only afford to buy land in regional areas and this was the only option available to them as low-income earners. They believed land was cheaper to acquire and build on and presented a lower cost of living than most urban centres. The money constraint they had led to their choice for living in bushland areas. Table 1 shows that property affordability was the second highest response in this study. One participant said:

> *I could afford to buy a house in Cobargo. When in 2000, I was a single parent, and some money that I invested just happened to be a really good investment. So, I had the opportunity to buy a house. And the only place that I could afford to buy a house was in Cobargo.* (FHIE-INTER7_23_28062022)

Despite acknowledging bushfire risk, participants indicted that affordable land was a consideration in their decision. Of these, 60% (n=3) were female and 40% (n=2) were male. This aligns with studies by Anton and Lawrence (2016) that explored economic factors influencing residence choices, particularly among low- and middle-income earners. The high rate of pet ownership (80%, n=4) points to the socio-economic dynamics that shaped their decisions with pets potentially serving as sources of comfort and companionship (Foenander 2022).

Relationship-related factors

Table 1 shows that some people were living in a bushfire-prone area because they were in a relationship with a partner who lived there. This highlights the importance of social networks and relationships in people's decision-making and relocation choices. This was categorised as an external factor because these participants cannot influence the other party who currently lives in a bushland area. One participant said:

> *I had met this woman online. I was living in Queanbeyan and I came down here and met her and travelled back and forth for several months, and then I decided I was sick of driving back and forth. So, I rented a place on the main street [of] Cobargo.* (MLUE-INTER8_24_28062022)

The data show that some participants resided in bushfire-prone areas due to their relationships. Of these, 100% were male. This emphasises the effect of personal relationships on living choices.

A growing number of people live in (and many are still relocating to) bushfire-prone communities. Despite this trend in New South Wales (Kruize *et al.* 2019), a study by Maund *et al.* (2020) showed that 90% of houses in bushland areas were neither designed nor built to withstand bushfire exposure.

This study from the interviews of 30 participants identified 7 reasons why people live and continue to move into bushland areas. These reasons of quest for a tree change, proximity to family, location beauty, place attachment, work-related factors, property affordability and relationship-related factors align with Kruize *et al.* (2019) that looked at urban expansion, the high cost of housing and the attractiveness of living in a natural environment. This study also considered work-related and relationship-related factors that affected people's decision-making and grouped these into internal and external factors.

Limitations

There are limitations in this study that affect its findings. The small sample size of 30 participants reduces the applicability of results to a broader population. The 7 identified reasons may not be exhaustive due to the small sample size, the locations of the study areas and the type of hazard event. However, the small sample size allowed for deeper exploration. The variations and perspectives of this cohort show the need for research with diverse sample groups. The study focused on people currently living in bushfire-prone areas in New South Wales who had recent experience of the 2019–20 summer bushfires. Data collection was done before the official start of the following bushfire season to avoid potential traumatisation of participants.

Conclusion

The reasons identified in this study suggest that people's motivations are varied and dependent on many factors as well as people's stages of life. The factors provide valuable insights into the motivations behind choice, including personal desires for lifestyle changes, proximity to family, aesthetic appeal, emotional attachment to the area, work-related factors, affordability and relationship-related aspects. Recognising that factors such as affordability and family ties play a role in people's decisions to live in bushfire-prone areas could guide initiatives to provide affordable housing or incentives for families to relocate to safer regions. Therefore, understanding the diverse factors that influence people's choices can have broader implications for disaster preparedness while contributing to community resilience. By tailoring initiatives that address specific motivations, communities might better adapt to the dangers posed by bushfires. This could include localised training to maintain firefighting capabilities, enforcing fire-resistant building practices and creating safe evacuation plans.

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Learning lessons and implementing recommendations

The argument

There is an urgency to learn lessons, implement review findings and incorporate findings from royal commissions, reviews and inquiries. What needs to change (i.e. legislation, expectation, policy) to enable lessons to be learned and implemented?

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The question implies that lessons are not learnt and the learning is not implemented. It would be wrong, however, to infer that a subsequent disaster means the lessons from the last disaster have not been learnt nor incorporated. While the Bushfire and Natural Hazards CRC Inquiries and Reviews Database[1] hosts inquiry recommendations, there is no data set to identify how many recommendations have been implemented, how they have been implemented and whether they have been effective. This creates room for the assumption that recommendations must not have been implemented or have not been effective. The *2009 Victorian Bushfires Royal Commission final report*[2] recommendation for an implementation monitor was unusual and gave some feedback on implementation, but the monitor and the various reports did not attract the same attention as the inquiry itself.

Even so, there is concern across the sector and the community generally that a great deal of time and money is spent on formal post-event inquiries. They are often opened with great fanfare, reported on with interest and reports are handed over to ministers and/or chief officers with solemn ceremonies and promises to implement the lessons identified. And a few years later, the process is repeated after the next catastrophic fire or flood, and we can anticipate that heatwave and pandemic will, in due course, be added to that list.

So, is there a failure in government or the emergency management sector to properly incorporate findings from royal commissions, reviews and inquiries? Is there a simple fix such as a change of legislation, expectation or policy that will ensure that what the next inquiry recommends will be adopted? And if there is a simple fix, should it be implemented?

Inquiry limitations

All inquiries have their limitations that must be recognised, and which mean it would be unwise to have legislation, expectations or policy to the effect that once an inquiry is called, government or the emergency services organisations must adopt all the recommendations that are eventually handed down.

Inquiries respond to a particular event and problematically, each event is necessarily different, so it may not be possible or appropriate to apply findings from one event to another. The lessons learnt from the response to one fire may not be transferable to the next fire, and even less so to the next disaster if it is a flood. State-based inquiries deal with the policy and management regime of the jurisdiction in which they are established. While there will be situations where the learning from one event is transferable to the next event or another jurisdiction, differences, both physical and in terms of governance and policy, between the jurisdictions and events may mean that the recommendations from one cannot be applied in the other.

The report by Cole *et al.*[3] identified that the great bulk of recommendations (at least until 2018) targeted state agencies and very little on the private sector, households or volunteers.

1. Bushfire and Natural Hazards Cooperative Research Centre, Inquiries and Reviews Database, at *https://tools.bnhcrc.com.au/ddr/dataspace-home*.
2. *2009 Victoria Royal Commission final report,* at *http://royalcommission.vic.gov.au/Commission-Reports/Final-Report.html*.
3. Cole L, Dovers S, Gough M and Eburn M (2018) *'Can major post-event inquiries and reviews contribute to lessons management?', Australian Journal of Emergency Management, 33(2):34–39.*

Governments manage and can direct agencies so those sorts of recommendations may be implemented while a failure to make recommendations directed at, or an inability to compel compliance by, the non-government sector may mean that vulnerabilities remain. It has been observed that analysis failed to consider First Nations Australians because the inquiries themselves did not address issues affecting First Nations populations. Inquiries are often and necessarily partial in their focus. Thus, their recommendations may not address the source of vulnerabilities nor identify all relevant lessons. Even when the recommendations are adopted, the vulnerabilities remain.

Recommendations designed to deal with one type of event may conflict with other competing interests. An inquiry into the death of a rescuer may lead to very different, and even conflicting, recommendations as that made by an inquiry into the death of a person waiting to be rescued. A royal commission may consider how decisions in other policy sectors impact on emergency management and, in particular, on the event that they are investigating. But they have much less capacity to consider the implications of their recommendations on other policy sectors. For example, a royal commission could recommend that homeowners should clear land around their home as a suitable solution to the problem of homes being lost to bushfire due to close proximity of vegetation. But the commission, subject to its terms of reference, cannot consider how that might effect amenity or environmental and other issues. An inquiry into wildlife protection, on the other hand, might recommend that people should not be allowed to clear native vegetation without an impact assessment and local council approval, but that would not consider the bushfire threat. Governments that are responsible for both ecological preservation and fire management have to consider how to balance these competing demands, but royal commissions, coroners and other inquiries, bound as they are by their terms of reference or legislation, do not.

Post-event inquiries do not and cannot consider the budget implications of their recommendations although this is something governments must do. The 2009 Victorian Bushfires Royal Commission recommended the buy-back of fire-prone land and that single-earth wire return and 22-kilovolt distribution feeders be replaced with aerial bundled or underground cabling. These were originally rejected by the Victorian Government in part on the basis of cost and research undertaken by the Powerline Bushfire Safety Taskforce, which found that the Victorian community was unwilling to pay the cost of meeting that recommendation. In 2005, the South Australian coroner recommended that the Minister for Emergency Services give further consideration to acquiring a firefighting helicopter (and he had in mind a Sikorsky Sky Crane/Erickson Air Crane) to be permanently or primarily stationed in South Australia without having to regard the cost or feasibility of investing in such an expensive, dedicated resource.

Inquiry recommendations are necessarily counterfactuals, that is, they are predictions that some other approach or some reform will work better but the future possibility is being judged against a past, known outcome. The recommendation may be implemented but it may not solve the problem. For example, the inquiry into the Ash Wednesday bushfires that swept across parts of Victoria and South Australia in 1983[4] recommended that:

> *'… a Minister is designated as Co-ordinator-in-Chief of disaster affairs and is responsible for direction and control across the whole spectrum of preparedness, combat and relief activities.'*

That was adopted into Victoria's emergency management legislation but was critiqued by the 2009 Victorian Bushfires Royal Commission that recommended the Parliament 'remove the title of Coordinator-in-Chief of Emergency Management from the Minister for Police and Emergency Services' and 'designate the Chief Commissioner of Police as Coordinator-in-Chief …' The 2009 bushfires did not demonstrate that the 1983 lessons had not been learnt and implemented, only that they were not effective.

Every proposed solution is someone else's problem. An inquiry can make a recommendation, but it falls on others to work out how to implement it and who must pay for it. A recommendation for stricter building controls in response to bushfire or flood hazards creates problems for homeowners who must pay for them and councils that have to implement them and who may face strong community resistance and a rise in candidates seeking election to oppose perceived government overreach. Those political realities must be managed, which may see an implementation that does not and cannot match the inquiries intent.

Finally, minds may differ on whether recommendations have been adopted. An inquiry may recommend that there is a public education campaign, or the development of resources, or training or that agencies cooperate. These may be accepted and implemented but different people may have different views on whether the implementation is effective or achieves the desired outcome. And it may be that it is only the next hazard event that 'pressure tests' the implementation. In that case, the fact that a continuing vulnerability is exposed does not mean that the past recommendation was ignored or not implemented.

Conclusion

We hope that post-event inquiries will identify valuable lessons from devastating experiences and come up with recommendations that, once adopted, will enhance resilience (or reduce vulnerability) to make society safer and secure. In fact, many of them do, and looking at the wide range of post-event inquiries can reveal common themes and cumulative insights that can inform the emergency management sector.

What is important to acknowledge is that merely adopting the recommendations for the next inquiry will not guarantee that there will not be a future disaster. Inquiry recommendations may be impractical, unaffordable, conflict with other important goals, may remove one vulnerability but expose another or may

4. Victoria Government (1983) *Report of the Bushfire Review Committee: on bush fire disaster preparedness and response in Victoria, Australia, following the Ash Wednesday fires 16 February 1983.*

simply end up not being the right recommendation. Further, the occurrence of another disaster does not mean the lessons from past events have not been implemented. The Black Saturday fires in Victoria in 2009 may have been devastating but they were less devastating than they might have been because of the lessons learnt from previous fires. The 2019–20 bushfire season affected many jurisdictions but had fewer deaths than the less extensive Victorian bushfires because of the lessons learnt and recommendations implemented post 2009.

Therefore, there is no single answer to the question 'what needs to change to enable the lessons to be learned and implemented?' What is needed depends on the event, the vulnerabilities exposed and the lessons identified. These will be different with each event and each inquiry.

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Responses

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Dr Eburn and I agree that lessons have the power to create dynamic change in processes and operations. However, I would argue that changes to legislation, policy and expectations are not the only avenues available for creating and cementing change in complex systems.

Establishing a lessons culture is critical to continuous improvement and should be the goal of every high-calibre organisation. But we should not be limited to using lessons like a rear vision mirror to analyse past events.

The premise that we see reoccurring themes (such as coordination, near real-time situational awareness, communications and loss of agency for communities) as an indicator that we have not learnt any lessons is unsubstantiated. I would argue that the reoccurring themes are entrenched characteristics of disasters. The real value of lessons lies in identifying common themes and insights across complex events and institutionalising adapting systems to minimise the impacts and effects of these entrenched characteristics, while still drawing on the benefit of history. The system should not, by design, wait for the wheels of government policy making to disrupt, adapt and drive change.

Our environment is rapidly changing. The 2023 Intergenerational Report (IGR) considers five of these major forces: an ageing population; technological and digital transformation; climate change and the net zero transformation; rising demand for care and support services; and geopolitical risk and fragmentation. This – coupled with more frequent, more intense disaster events and the consecutive, concurrent and compounding effects of these risks intersecting – means that Australia faces a challenging future that Australia's emergency management system needs to operate in.

With a changing operating environment, the lessons system must also adapt. The success factor in this environment is not how many lessons were identified and fully implemented in a post-hoc review, but how quickly emergency managers made sense of the situation; the speed to action and how quickly they identified and prioritised the critical areas in the system that needed to be stabilised; the speed to decision to clearly articulate the lines of effort that were required to mitigate and stabilise the situation; and finally, how effectively they communicated.

While disasters are complex, what the community wants to know remains the same. They want to hear: *what we know; what we do not know; what we are doing to mitigate the risks we have identified; what we want others to do; and what our communication tempo will be.* Using this information as our guide, and finding multiples channels, repeatedly, to communicate with the public will maintain public trust in the system and will be another measure of our success.

The lessons system therefore needs to be dynamic, adaptable and should operate using near-real time methodology, allowing rapid changes to be incrementally made within the system, and ensuring change that is in the public interest is immediately realised.

The seed article refers to inquiries, reviews and lessons systems that with hindsight – and often undertaken by lawyers or

auditors outside the emergency management system – make judgements without having the context of the people operating in the environment at the time, and in the fog of disaster. The near-real time lessons approach does include looking at previous reports and recommendations, but it also encourages and enables dynamic change while the event is unfolding.

NEMA fosters collaboration, inclusivity, and adaptability for lessons on a national scale, charting a collective course towards more effective problem-solving that will position Australia to better prepare for, respond to and recover from disasters today and into the future.

The National Coordination Mechanism (NCM) provides an opportunity for identifying and informally sharing real-time lessons across agencies nationally. But we also look for continuous improvement like desk top data collection and analysis, hot debrief, after action reviews and multi-agency debriefs. The data we collect and the insights we identify are integrated rapidly into our approach, priorities and capabilities without waiting for lengthy reviews or lessons processes.

The change is not in the lessons methodology, but how it is applied. We should shift from drawing on hindsight to a focus on near real-time or foresight and be prepared to make incremental adjustment that can be measured immediately. This can be achieved while still referring to previous reviews and lessons to measure our performance with the collective goal of building adaptable, complex systems that support and build national resilience.

Dominique Hogan-Doran SC

Director

Natural Hazards Research Australia

> The question raised by Dr Eburn of what needs to change to enable lessons to be learnt and implemented has many perspectives. When lessons are not properly institutionalised, they will be forgotten across time.

Post-event reviews need to develop implementation and delivery guides to accompany their recommendations, together with leadership and oversight mechanisms, to help meet the risk of institutional amnesia and ultimately wasted effort. Where the existing mechanisms do not already incorporate pre-event assurance, those need also to be included.

This was the approach taken by the Royal Commission into National Natural Disaster Arrangements[1] in 2020, which found that quality assurance and monitoring supports accountability and builds consistency across all levels of disaster management arrangements. With the goal of promoting best practice and continuous improvement across all phases of disaster management, these encourage the best use of resources, and best possible outcomes for our communities. The process of assurance, particularly when conducted by an external and independent body, enables a statement of confidence to be made as to the effectiveness of agencies operating within disaster risk mitigation and management arrangements. Assurance can also reinforce a shared responsibility for better disaster risk mitigation and management outcomes for the community.

The 2020 Royal Commission recommended that each of the Australian, state and territory governments establish these accountability and assurance mechanisms. Has this been implemented in any comprehensive or meaningful way across our nation? No, it seems not. Does a combination of institutional inertia or resistance explain the continuance of this unsatisfactory status quo?

As the Commissioners acknowledged, Australia's natural disaster risk is already alarming. As the CSIRO observed in its February 2024 report *Understanding the risks to Australia from global climate tipping*[2], there are dangerous climate tipping points that will affect Australia. The risks are real and cannot be ignored. The time to act is now.

1. Royal Commission into National Natural Disaster Arrangements, at *www.royalcommission.gov.au/natural-disasters*.
2. CSIRO (2024) Understanding the risks to Australia from global climate tipping. At: www.csiro.au/-/media/Environment/CSIRO_Tipping-Points-Report.pdf.

Andrew Gissing

Chief Executive Officer

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> The analysis by Dr Eburn shows the complexity of post-event inquires and I agree that such inquires have some benefit, but must be combined with proactive assurance mechanisms.

Shouldn't we move beyond a dialogue dominated by post-event reviews and pose the question of how do we best provide proactive assurance that we are prepared? Meaning, wouldn't it be prudent to be proactive in identifying risks and issues and putting management measures in place to ensure risks are reduced before disasters strike, rather than being reactive post event?

Post-event inquiries have been catalysts for successful nationwide policy changes. They provide political expedience and an opportunity for communities to engage in the debriefing process. However, they have their limitations and should not be the sole source of formal assurance and accountability.

Post-event inquiries tend to be ad hoc, narrow, hazard specific and backward-looking. Unless they provide recommendations that are reflective of the broader 'riskscape' they risk distracting governments with a focus on preparing for a recurrence of the last disaster rather than the next one, which may be very different.

Following the 9/11 terrorist attacks, inquiries led the United States Government to prioritise preparing for terrorism, not natural hazards. Then Hurricane Katrina occurred, and America's response failed. I have seen this in Australia too, with the 2009

Victorian Bushfires Royal Commission[1] focusing solely on the Black Saturday bushfires, excluding the concurrent extreme heat[2] that had taken more lives. This was followed by record floods in 2010–11 that led to another inquiry. The Victorian Floods Inquiry[3] not surprisingly found that many of the issues with Victoria's flood response were the same as those with the Black Saturday bushfires a year earlier. In the meantime, opportunities for change had been lost. It is commendable that the Royal Commission into National Natural Disaster Arrangements[4] in 2020 took a broader perspective.

Given the rapidly changing riskscape of our communities and the scale of continuous disaster operations, the need for proactive and pre-event assurance in addition to post-event inquiries is critical. We can't just assure our preparedness for the next major disaster through the lens of the previous one, nor through the next one. It will be too late.

There is a need for transparent, systematic, pre-event and risk-based assurance frameworks that provide assurance within the emergency management system and on key risk controls. These should be implemented and empowered by dedicated independent agencies with supporting legislation. Such organisations exist in Victoria and Queensland through the role of the Inspector-General Emergency Management. A recommendation of the Royal Commission into National Natural Disaster Arrangements was for each jurisdiction to establish an independent accountability and assurance mechanism; however, this has not occurred.

In establishing the Victorian Inspector-General Emergency Management, it was stated that a 'strong performance-monitoring and review body is essential for sector accountability'.[5] Such assurance mechanisms extend critical inquiry into preparedness for major disasters, providing for a proactive, continuous and risk-based perspective, with the opportunity to monitor and evaluate the extent of continuous improvement.

There is an answer to what needs to change. It is greater investment in proactive assurance mechanisms. We need to move from a focus on post-event reviews to pre-event foresight and assurance.

1. 2009 Victorian Bushfires Royal Commission, at *www.disasterassist.gov.au/Pages/disasters/previous-disasters/Victoria/Victorian-bushfires-January-to-February-2009.aspx.*
2. 2009 heatwave, at *https://knowledge.aidr.org.au/resources/health-heatwave-south-eastern-australia-2009/.*
3. *Review of the 2010–11 Flood Warnings & Response,* at *https://knowledge.aidr.org.au/media/4456/review-of-the-2010-11-flood-warnings-plus-response_victoria.pdf.*
4. Royal Commission into National Natural Disaster Arrangements, at *www.royalcommission.gov.au/natural-disasters.*
5. *Victorian Government (2012) Victorian Emergency Management Reform White Paper. Retrieved: www.emv.vic.gov.au/publications/victorian-emergency-management-reform-white-paper-dec-2012.*

A charter for fire-adapted settlements

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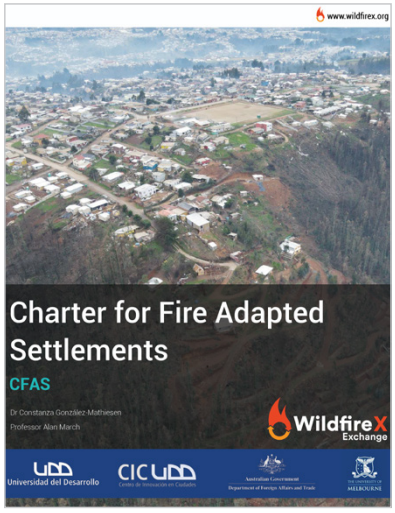
Abstract

Urban settlements in bushfire interface areas face many ongoing challenges that require integrated actions across jurisdictional boundaries and spatio-temporal scales. The Charter for Fire Adapted Settlements (CFAS) and its practice note have been developed as a relatively simple summary of key principles to achieve this. Its foundational principles can be used and adapted in a range of settings in Australia and internationally to understand risks, to develop or critique existing processes and to take action.

Introduction

The management of bushfire[1] risks in human settlements proximate to vegetated areas poses ongoing challenges. While dynamic change processes offer opportunities for action, many risks remain as 'wicked' and ongoing problems. As urban areas grow, associated demographic, socio-economic, transport and environmental pressures continue to emerge (McLennan and Handmer 2014). Further, establishing shared responsibility solutions that respond to associated climate change will prove increasingly difficult in the face of numerous competing demands (McCormack 2022) and diverse allocations of roles and responsibilities across public and private land.

This paper sets out CFAS as a common starting point for integrating understandings and actions in bushfire-prone settlements. First, challenges of managing bushfires in interface areas or peri-urban settlements are described, followed by a summary of the value of a charter. This paper sets out the methods used to develop a charter and its characteristics including an associated practice note.



The 12-page full charter is available online at: https://wildfirex.com.au/cfas-charter-for-fire-adapted-settlements/.

Challenges in bushfire interface settlements

Every year, more than 2 million small bushfire events are registered around the world. Most of them have no significant effects, yet a small proportion of them become very large incidents that have significant ecological and socio-economic consequences (Bowman *et al.* 2017). Bushfire frequency and intensity are increasingly associated with climate change and worsening weather conditions that result in extreme fires, a trend that is expected to continue (Jones *et al.* 2020). Expanding low-density urban sprawl and rural-residential developments are also contributing to increased exposure of people and assets to bushfires (Butt *et al.* 2009; Moskwa *et al.* 2018; Tedim, Xanthopoulos and Leone 2014).

Bushfire risk is typically highest in interface areas between vegetation and urban settlements where people, animals, property and infrastructure

1. The term 'bushfire' is used in Australia, whereas 'wildfire' is more common internationally.

are more exposed to bushfire hazards. In these contexts, considerable variation of topography and vegetation, combined with diversity of possible and existing settlements, building characteristics and changing demographics means that there is no one fail-safe approach to risk reduction. The inter-jurisdictional nature of these interface areas and the physical and functional links between settlements and adjacent suburban and rural municipalities challenges bushfire risk management. Added to this, urban growth decisions made by councils pressured to provide land for new development, pay limited or late consideration to bushfires and other localised hazard risks can result in urban growth to areas exposed to bushfires.

Value of a charter

Settlements in bushfire-interface areas require management that considers the specific challenges posed. Charters have been used in a variety of ways. As detailed in Salem Press (2020), charters are grants of privilege, responsibility and process relating to management of places, governance and operations of agencies, businesses or the exercise of power. Well known charters include the Burra Charter relating to the identification and ongoing management of heritage places in Australia (ICOMOS 2013), the United Nations Charter (United Nations 1954) and the Magna Carter – the foundational 'Great Charter' upon which modern democracy rests (McKechnie 2022).

The CFAS acknowledges the challenges that face communities in bushfire-prone areas. It provides principles that cut across aspects of understanding, responsibility and action that hamper opportunities to reduce bushfire risks. It establishes ideals to critique current practice and sets clear understandings of processes.

Development of the CFAS

The CFAS was produced within Wildfire Exchange, an online learning hub for the development, exchange and consolidation of built environment bushfire knowledge between Chile and Australia. The charter's development was an iterative process of design research that develops a product, in this case, the charter. It included 4 iterations.

The preliminary principles for fire-adapted settlements (Prototype 1) were established based on existing experience and a literature review covering 4 categories:

a) General context for assessing bushfire risk.
b) Dealing with bushfire risk in the built environment.
c) Places as part of networks and systems.
d) Governance systems for developing fire-adapted settlements.

Next, 2 online focus groups with the members of the Wildfire Exchange Steering Committee[2] were conducted, one in Spanish for the Chilean members and the other in English for the Australian members. Participants were asked to discuss principles for fire-adapted settlements. Based on the focus groups data, preliminary principles were revised and a new prototype (2) was developed together with Practice Note 1.

The practice note follows a similar approach to the Australian *National Emergency Risk Assessment Guidelines* (AIDR 2020) but includes the characteristics of bushfire-prone communities.

The revised charter and Practice Note 1 (prototype 2) were presented at the 2023 Australian Bushfire Building Conference where conference attendees could provide feedback. Prototype (3) was developed after this feedback.

Prototype 3 was presented at the seminar *'Principios para la adaptacion de asentamientos frente al riesgo de incendios forestales'* (Principles for the Adaptation of Settlements to the Risk of Bushfires) organised by Wildfire Exchange in Santiago, Chile. A panel of experts was invited to discuss fire-adapted settlements from their areas of expertise and to provide feedback on the draft charter. The charter was revised into the final version (prototype 4).

In its final form, the CFCA addresses 4 principles:

- Establishing Context and Fundamentals.
- Managing Bushfire Risk in the Built Environment.
- Understanding Settlements as Part of Networks and Systems.
- Governance Systems for developing Fire Adapted Settlements.

Practice Note 1, which accompanies the CFAS, summarises procedural aspects of the charter.

The CFAS

The charter's principles guide the design, occupation, management and governance of interfaces between vegetation and settlements. These principles provide a measure against which existing and future conditions can be understood and assessed. It is acknowledged that bushfire risk reduction includes other aspects that go beyond the scope of the charter, such as community education or ignition prevention. While the principles overlap across all stages, an ongoing and sequenced approach to achieving fire-adapted settlements is recommended.

Principle A – Establishing context and fundamentals

- Fire-adapted settlements are not overwhelmed by fire events. If property losses do occur, recovery significantly improves a settlement's risk profile.
- Risk assessments are a prerequisite for decision-making. They are oriented to various uses by different decision-makers and users: to understand exposure, likelihood and consequences; to assist response; improve mitigation and resilience and reduce vulnerability. This might be focused on settlements, vegetation, ecological systems, populations or infrastructure and systems.
- Settlements intentionally and sustainably meet diverse human and natural system goals, including the implications of bushfires.

2. The steering committee is interdisciplinary group of experts from Chile and Australia.

- Bushfires are expected in flammable landscapes, even if the fire return interval cannot be predicted.
- Future challenges are taken into account in risk assessment. Challenges might be heightened by climate change where more severe weather will occur. This may combine with changing demographics and settlement growth, large legacy stocks of older structures, and competing goals such as maintenance of habitat, biodiversity and limited resources.
- A common language of risk and associated terms exists and is used across disciplines to improve understanding and integration.

Principle B - Managing bushfire risk in the built environment

- Risk assessment in bushfire management involves potential consequences for human life, assets and the environment. This includes characteristics of place, including topography, physical attributes, ecological conditions, climate, cultural nuances and socio-economic factors.
- Risks are methodically deconstructed into constituent elements, addressing temporal scales ranging from daily dynamics to long-term perspectives. The multi-faceted nature of bushfire risk is assessed across spatial scales of large landscapes, settlement levels and individual sites, with a detailed understanding extending to road systems, precincts and entire settlements.
- Interactions between structures and flammable elements are considered. In addition to vegetation, this may include house-to-house transmission, outbuildings, fuel storage and urban morphology factors like road systems and the density of structures.
- Vulnerability of people, considering factors like age, ability, health, socio-economic status, experience and culture, is an interrelated resilience factor.
- The determination of 'acceptable risk level', grounded in considerations of risk equity, guides a systematic, transparent and prioritised approach to risk assessment and treatments over the short, medium and long terms.
- Exposure to bushfire hazard is generally reduced by separation of assets and people from fuels, modification of the hazard and improving structures against radiant heat, flame, embers, wind and tree strikes.
- High-risk settlements are prioritised, potentially requiring non-standard interventions, while urban planning avoids locating settlements or structures in high-risk areas.
- The maintenance, retrofitting and improvement of existing structures are employed to reduce risks, with a focus on environmental respect and aesthetically pleasing solutions such as parklands, gardens, energy efficiency and enhanced community connectivity.

Principle C – Understanding settlements as part of networks and systems

- A whole-of-system approach to settlement function and risk reduction is undertaken, rather than reliance on limited elements such as response, vegetation clearing or building resistance.
- Bushfire is understood and treated as one of many co-occurring hazard events, such as drought, heatwave, atmospheric pollution and electrical and communications failures.
- Vegetation management is approached in an integrated manner. This includes integration across jurisdictional, ownership, spatial and other boundaries. It encompasses the challenging range of risk factors across habitat protection, silviculture, tourism, viticulture and cross-jurisdictional settlement risk.
- Fire-adapted settlements are equitable, connected, economically stable, healthy and informed, which allows appropriate self-determination, organisation and agency.
- Acknowledging the different stakeholders involved in risk reduction, systems are in place to provide landowners and residents risk assessments. This includes details of 'ratings' or treatments to existing or proposed structures, land or vegetation. A range of opportunities for knowledge and skill development are established.

Principle D – Governance systems for developing fire-adapted settlements

- Governance systems are in place to make decisions that reduce bushfire risks, including integration between government functions and the private sector, interest groups, communities and individuals. Integrated governance action includes laws and regulations that integrate evidence-based and forward-oriented actions.
- Growth and change are managed to bring about risk reduction benefits over time. Opportunities, whether small or large, are taken to reduce risks during new development of land, redevelopment, recovery processes, when land changes hands or when investments are made in the built environment.
- Place custodianship practices are recognised, encouraged and integrated where appropriate, including indigenous or other cultural aspects.
- Governance processes are fit-for-purpose and provide for information and data gathering as well as analysis and application to decision-making. Governance should manage bushfire risks including processes that allow assessment of trade-offs between individual property and development rights and collective risk-management outcomes.
- The 'windows of opportunity' that often exists after large events are used to reduce bushfire risk, typically based on prior work.
- The concept of shared responsibility guides actions and decisions. This means that all parties take full responsibility within their capacity to reduce bushfire risks. It also acknowledges that there are limits to responsibility.

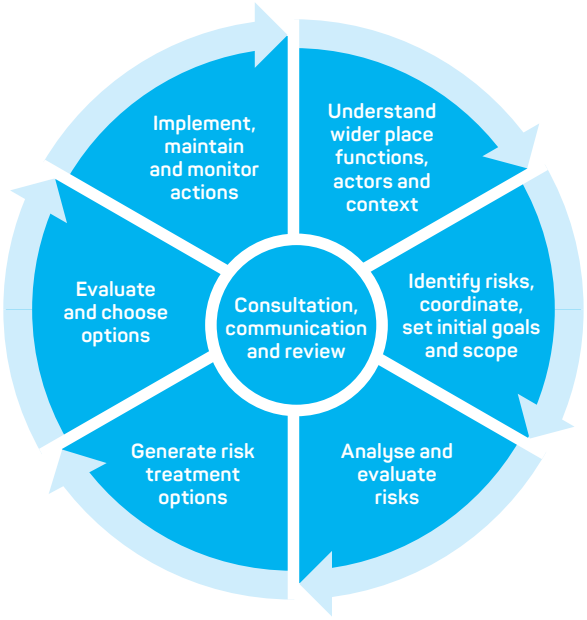


Figure 1: Charter for Fire Adapted Communities Practice - Note 1 process summary.

Practice Note 1 – Treating risk

The CFAS manages ongoing processes of change in a considered and integrated way. Practice Note 1 sets out the procedural stages of interrelated practice as illustrated in Figure 1. These steps are interpreted and applied according to circumstance. It adapts elements of the *National Emergency Risk Assessment Guidelines* (AIDR 2020). It can be used for a range of purposes, including developing understanding, procedural guidance, critique of existing settlements or of processes.

Understand wider place functions, actors and context

Understanding the functions and particularities of a settlement is an important first step. Each settlement has its own functions, characteristics, strengths and challenges that play a role in its resilience and ability to improve and change. It is useful to identify stakeholders, drivers, environmental conditions and demographics early in the process. It is also useful to establish initial aspirational goals for the community, often outside bushfire matters.

Identify risks, coordinate and set initial goals and scope

This phase identifies and coordinates stakeholders who have relevant information, roles, responsibilities and interests. In parallel, the scope and goals of the project are established as:

a) outcomes
b) spatial boundaries
c) targeted actions and scope
d) time periods
e) resources and responsibilities
f) context of other processes and influences.

Risk identification requires bushfire risks to be established and described, usually iteratively. The CFAS process assesses the wider risk environment but primarily understands risk from the perspective of the settlement, being:

a) the bushfire hazard
b) potential effects
c) current treatments and processes
d) elements at risk such as people, the environment, structures and infrastructure
e) consequences of potential bushfire interactions with the settlement.

Risks are identified with a spatial and physical aspect and in association with human and environmental elements. This includes mapped, tabulated and scenario-based descriptions at various scales of:

a) vegetation
b) fire history
c) topography, access, places of refuge, water sources
d) settlement characteristics such as morphology and structures' resistance
e) likely fire behaviour and interactions with the settlement
f) likely consequences.

Analyse and evaluate risks

Risk levels are determined by analysing the consequences and likelihoods of fire events. If a given fire event occurred, the outcome is described as the consequences to people, structures, economy, environment and community. Likelihood is the chance of the consequence occurring. In fire-prone settlements, likelihood is considered over extended periods such as 100 years. This would include factors such as growth forecasts and climate change. The relatively 'fixed' built environment assumes that worst-case fires will occur at least once during a structure's or a settlement's lifespan.

Risk analysis is undertaken by determining the likelihood and consequences and establishing a risk level for all appropriate scenarios. These will be spatially mapped. Evaluation of risks allocates priorities. A CFAS evaluation includes a spatial, mapped and tabulated approach to facilitate prioritisation.

Generate risk treatment options

Generation of risk treatment options is challenging. Nonetheless, deliberate integration of multiple objectives in parallel with bushfire risk reduction is a fundamental goal. Scenario and strategic planning are central to this. There are 2 steps in this process:

1. Develop objectives for risk treatment.
2. Develop options for risk treatment covering:
   - separation of structures from bushfire
   - hazard modification
   - improved resistance
   - improved response
   - improved recovery.

Importantly, the options developed will be spatial, regulatory, economic, educational and environmental, associated with overarching settlement change.

Evaluate and choose options

There will be a need re-establish the objectives set out in the beginning of the process. Risk treatment options chosen should prioritise primary causes over superficial symptoms. It is necessary that process and governance systems are in place, or are put in place, to facilitate the effective and legitimate selection of risk management options.

Implement, maintain and monitor actions

Processes of risk treatment will be ongoing and will require integration of activities across functional jurisdictions. These will include urban planning; building; forestry; transport; natural resource management; municipal, state and other agencies; developers or other interest groups (see also AIDR 2020).

Ways forward

Future and present challenges are likely to be heightened in the context of climate change, where severe weather will be more frequent, combined with changing demographics, ongoing growth of human settlements and land use. The possibility that communities can live and prosper in bush interface areas vulnerable to fire presents opportunities and challenges. This research sets out principles for fire-adapted communities. It also acknowledges that many places will require a transformational change to become fire-adapted but will realise the benefits that come from bushfire risk assessment and risk treatments.

Acknowledgment

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Crowd-sourced Felt Reports for 22 September 2021 MW 5.9 Woods Point earthquake: actions of the public

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Abstract

On the morning of 22 September 2021, at 09:15 Australian Eastern Standard Time, a powerful earthquake of moment magnitude MW 5.9 struck approximately 12 km to the northeast of the small village of Woods Point in the Victorian high country. This earthquake is the largest earthquake in Victoria in the instrumental era and it shook the residents of multiple localities around the epicentre, including Melbourne, where it notably caused a parapet and wall collapse, spilling debris onto Chapel Street, Windsor, among other reports of damage. The earthquake was felt across Australia's eastern states and territories. Geoscience Australia received 43,073 community felt reports through its Earthquakes@GA[1] (EQ@GA) website with reports of shaking coming from Victoria, South Australia, Tasmania, New South Wales, Australian Capital Territory and even Queensland. Nearly 76% of all felt reports were submitted within the first 24 hours of the earthquake and 45% were received within the first hour at peak rates of almost 700 responses per minute. This is the largest number of reports that Geoscience Australia has received for a single event since the reporting facility was added to the EQ@GA website in 2006.

The National Earthquake Alerts Centre

The Geoscience Australia National Earthquake Alerts Centre (NEAC) monitors for Australian and global earthquakes 24 hours a day, 7 days per week and publishes parameters for earthquakes that are within its remit, within specific timeframes and in accordance with standard operating procedures. Generally speaking, significant earthquakes[2] are published to the EQ@GA website within 20 minutes of the earthquake's origin time, which is the time the earthquake occurred (origin time), abbreviated to 'OT'. Exceptions to this are:

- earthquakes that have the potential to generate a tsunami (i.e. tsunamigenic earthquakes) are published within 10 minutes of the earthquake's OT (in accordance with the Joint Australian Tsunami Warning Centre Standard Operating Procedure)
- earthquakes that are not considered significant are published either within 60 minutes of the OT or on the next business day (depending on the location and other attributes).

These timelines strike a balance between the accuracy of information and the speed at which it is provided. Earthquake information (location, depth, time and magnitude) are estimates based on remotely observed data that is fitted to models of the Earth and, therefore, inherent uncertainties exist. Generally speaking, the uncertainty decreases (though it is not eliminated) as more time elapses and more data is available.

The 2021 M_w 5.9 Woods Point earthquake was not tsunamigenic as it was inland and too small to cause an underwater tsunami even if it had been

1. Earthquakes@GA website, at *https://earthquakes.ga.gov.au.*
2. Earthquakes in Australia that may cause widespread alarm, media or public interest are considered 'significant'. A lower magnitude threshold of 3.5 is used as a proxy for `significant' earthquakes. Outside Australia, a lower magnitude threshold of 6.0 is used as a proxy for a `significant' earthquake.

Table 1: Abbreviated description of the levels of Modified Mercalli Intensity (replicated from usgs.gov). The MMI categories are marked by Roman numerals ranging from I (not felt) to X+ (extreme shaking and total destruction).

Intensity	Shaking	Description/Damage
I	Not felt	Not felt except by a very few under especially favourable conditions.
II	Weak	Felt only by a few people at rest, especially on upper floors of buildings.
III	Weak	Felt quite noticeably by people indoors, especially on upper floors of buildings. Many people do not recognise it as an earthquake. Standing motor cars may rock slightly. Vibrations similar to the passing of a truck. Duration estimated.
IV	Light	Felt indoors by many; outdoors by a few during the day. At night, some awakened. Dishes, windows, doors disturbed; walls make cracking sound. Sensation like heavy truck striking building. Standing motor cars rocked noticeably.
V	Moderate	Felt by nearly everyone; many awakened. Some dishes, windows broken. Unstable objects overturned. Pendulum clocks may stop.
VI	Strong	Felt by all; many frightened. Some heavy furniture moved; a few instance of fallen plaster. Damage slight.
VII	Very strong	Damage negligible in building of good design and construction; slight to moderate in well-built ordinary structures; considerable damage in poorly build or badly designed structures; some chimneys broken.
VIII	Severe	Damage slight in specially designed structures; considerable damage in ordinary substantial buildings with partial collapse. Damage great in poorly built structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned.
IX	Violent	Damage considerable in specially designed structures, well-designed frame structure thrown out of plumb. Damage great in substantial buildings, with partial collapse. Buildings shifted off foundations.
X	Extreme	Some well-built wooden structures destroyed; most masonry and frame structure destroyed with foundations. Rails bent.

offshore. However, the first bulletin was released and published to the website approximately 12 minutes after the earthquake occurred (i.e. OT+12). The bulletin was expedited due to the earthquake size and the very large number of community felt reports received in the first 10 minutes after the quake, along with high levels of requests for information. The earthquake parameters were updated over the next hour.

The community felt reports received prior to the publication of the information were assigned to the earthquake immediately after its publication. Thereafter, people accessing the website were able to assign their own felt reports. Any residual unassigned reports were periodically assessed and, if appropriate, assigned to the earthquake.

The NEAC receives felt reports through the EQ@GA website in real-time. They are an invaluable resource for situational awareness in that they define where people and assets at risk are located, and how they may have been affected. They also inform Geoscience Australia's research on the attenuation of earthquake ground shaking and allow seismic hazard assessment that can be used by emergency management planners.

Earthquake intensity – community felt reports, FeltGrid and ShakeMap

The felt report questionnaire is accessed via the EQ@GA website and contains 15 multiple-choice questions that relate to the shaking experienced at a location at the time of the earthquake. Each response to a question is used in the equation that calculates the Modified Mercalli Intensity (MMI) at the given location (Wald *et al.* 1999a). A measure of MMI refers to 'real-world' effects experienced at a given location and is considered a more meaningful measure of the severity of ground shaking for a non-scientist than earthquake magnitude. That is, the MMI scale describes the effects of earthquakes on people, infrastructure and environment. The scale, its associated colour scheme and the descriptions of the earthquake effects are given in Table 1.

While there are a variety of factors that can influence perceived shaking, MMI values generally decrease with increasing distance from the epicentre. However, there are factors that affect this relationship. For example, sites located on unconsolidated soils and clays can amplify the propagating seismic waves relative to sites located on bedrock.

As the felt reports are received they are aggregated into gridded cells representing 20 × 20 km, 10 × 10 km, 5 × 5 km and 1 × 1 km resolution. These aggregated felt reports are collectively referred to as the FeltGrid and are displayed and updated on the website in real-time as more felt reports are received. The values provided in the felt reports within each cell are averaged and the cells are representative of average reported intensity across an area, with outlier reports of shaking (too low or too high) effectively being smoothed out. The 4 resolution levels allow emergency managers and the public to view the reported intensity by zooming in and out of the area of interest on the website. Figure 1 shows the FeltGrid at 20 × 20 km resolution. The intensity colour scale (see Table 1) indicates lighter perceived shaking in green and blue colours and stronger perceived shaking in orange and red colours, and is applicable to all subsequent maps.

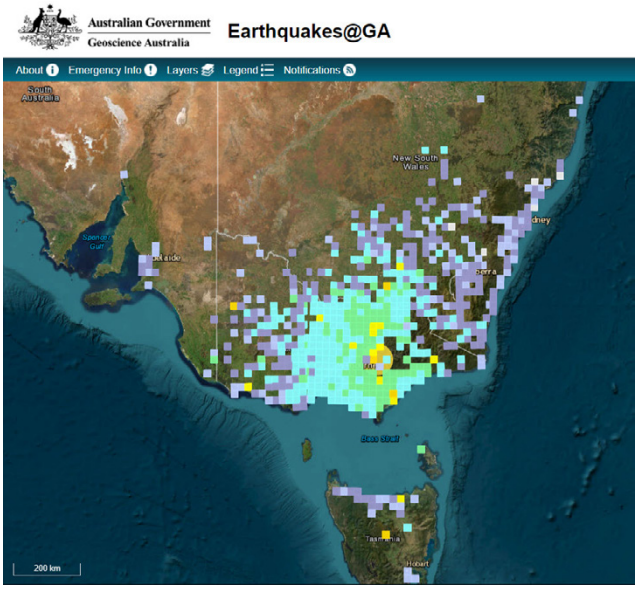

Figure 1: FeltGrid at 20 x 20 km resolution for the 22 September 2021 MW 5.9 Woods Point earthquake as displayed on Earthquakes@GA website. The FeltGrid at any resolution is averaged intensity over all the felt reports in a given cell. The yellow circle in the background of the FeltGrid indicates the earthquake location and its size relates to the magnitude estimate.

In addition to the FeltGrid the EQ@GA website contains the ShakeMap for any earthquake of local magnitude MLa 3.5 or larger. ShakeMap, developed by the US Geological Survey (USGS), provides near-real-time maps of shaking intensity following significant earthquakes (Wald *et al.* 1999b). As such, it is a useful tool for rapidly estimating the likely impact of an earthquake in terms of ground-shaking intensity, over a broad area.

ShakeMap has been introduced by Geoscience Australia to support post-earthquake decision-making by Australian emergency management agencies (Allen *et al.* 2019). Geoscience Australia has adapted ShakeMap for Australian earthquake and seismic monitoring conditions and uses it to model shaking intensity from Australian earthquakes above magnitude M_{La} 3.5.

ShakeMap combines information from felt reports submitted by the community through the EQ@GA website with telemetered seismic data, information about the regional geology (McPherson 2017), and models that estimate ground shaking for a given magnitude and distance from the earthquake. The first ShakeMap for an earthquake is usually available within 30 minutes of the earthquake's OT, and is regularly updated after the OT. The final version of ShakeMap for the MW 5.9 Woods Point earthquake is shown in Figure 2.

The colours shown in Figure 2 indicate modelled average intensity modified by the submitted felt reports (the colour scale is provided at Table 1). Coloured circles are locations of aggregated reports. Approximate (not measured) peak ground acceleration and peak ground velocity values for shaking categories are also listed in Figure 2 below the map (Worden *et al.* 2012).

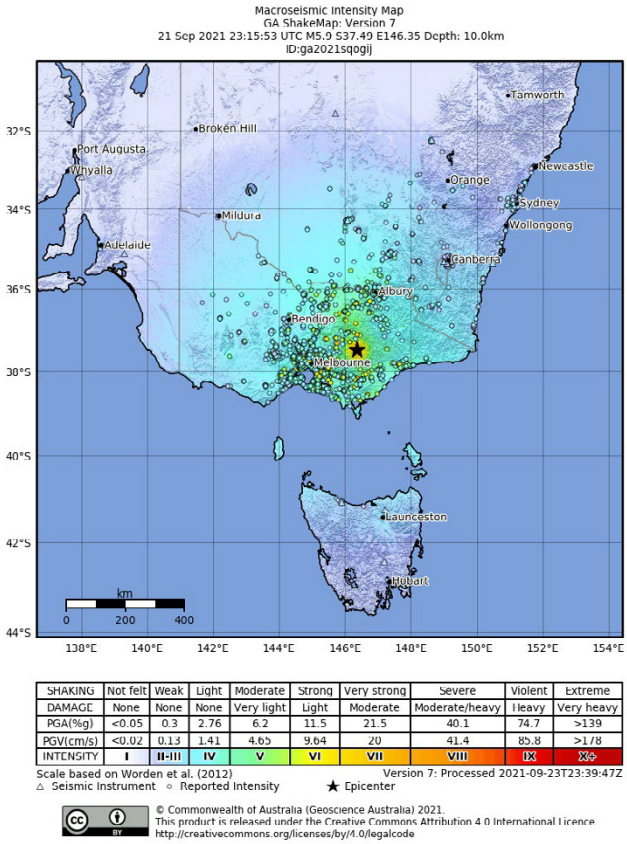

Figure 2: The ShakeMap generated 48 hours after the 22 September 2021 MW 5.9 Woods Point earthquake. The epicentre is marked by the black star.

Data

In this study, the actions taken by the members of the public during the 2021 MW 5.9 Woods Point earthquake are the focus. Individual felt reports are plotted on a map against a backdrop of the average reported MMI at 20 × 20 km resolution (shown in Figure 1). The 20 × 20 km aggregated MMI is the average shaking intensity experienced by people in that area during the earthquake and reported to Geoscience Australia.

This study used only the felt reports where consent to use the data for research purposes was given. This approval reduced the dataset to a total of 37,743 available felt reports (out of 43,073 submitted reports). The questionnaire required multiple-choice responses but also allowed respondents to answer a subset of questions using free text. The questions that could be answered or supplemented with free text included: describing the location during the earthquake, describing respondent reaction to the earthquake and adding information about respondent actions. While the information provided in free text was used for aggregation and average MMI calculation, the free-text format answers were not considered for this study when mapping the actions taken. Approximately 11% of available responses offered free-text, however, the decision to not use that data for this study allowed for simple data processing and enabled mapping and commenting on the standard responses.

When the free-text format reports were filtered out, a total of 33,715 reports were left that were used in this study.

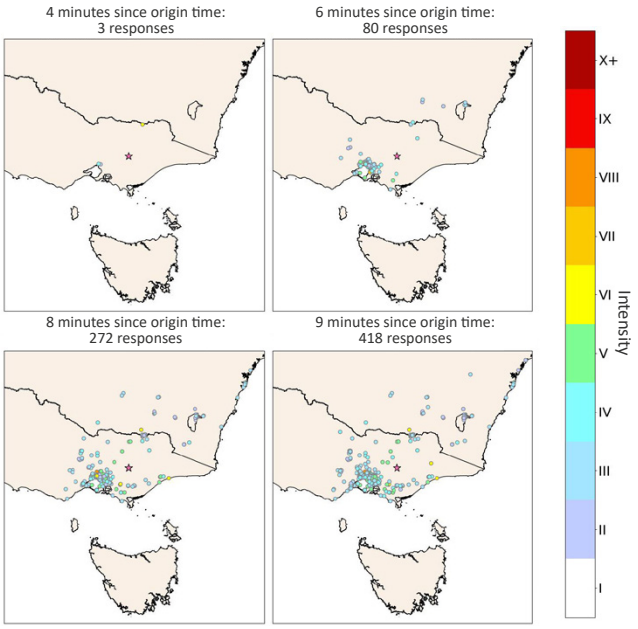

Figure 3: Number and spatial extent of community felt reports for the 22 September 2021 MW 5.9 Woods Point earthquake (epicentre marked by pink star) within 10 minutes of origin time.

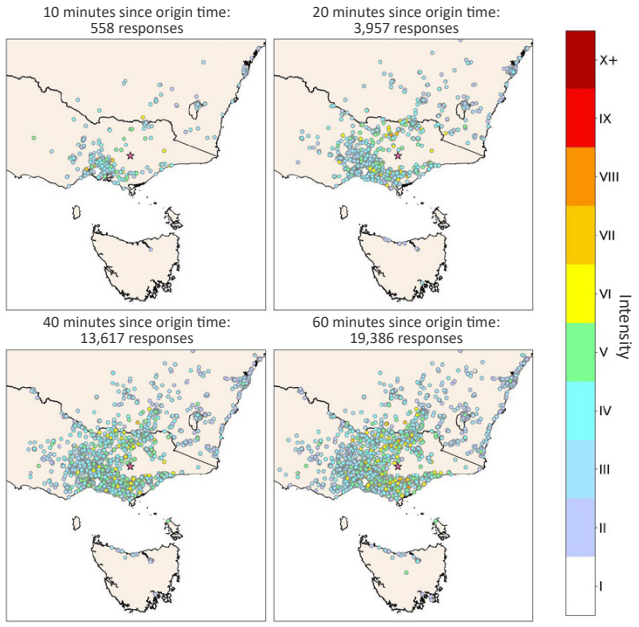

Figure 4: Number and spatial extent of community felt reports for the 22 September 2021 MW 5.9 Woods Point earthquake (epicentre marked by pink star) within 60 minutes of OT.

Crowd-sourced data and earthquake effects

Lilienkamp *et al.* (2023) demonstrated that crowd-sourced felt reports can be indicators of potential effects of earthquakes in their early stages, especially in areas where instrument observations of ground shaking are few. They developed a method to assess the impacts of a large number of earthquakes on communities using felt reports alone. This approach can be used as a 'traffic light' system for emergency management agencies based on 'impact scores', when applied in real-time. Impact scores are determined from the number and the geographical extent of submitted felt reports over a given time. This will depend on the severity of the earthquake, the population density and distribution in the affected region and the level of population participation. Lilienkamp *et al.* (2023) indicated that receiving 50 felt reports within 10 minutes from an earthquake's origin time (OT+10) is enough to start processing the felt report data and estimating the potential impact on localised communities.

Geoscience Australia maps, in real-time, the number and the spatial extent of submitted felt reports and the reported intensity of shaking in the FeltGrid and ShakeMap features through its EQ@GA website. Figure 3 and Figure 4 show the maps of felt reports submitted to EQ@GA within the first 10 minutes of the MW 5.9 Woods Point earthquake (i.e. prior to the earthquake information being published) and at regular intervals between 10 and 60 minutes after the earthquake, respectively. The coloured circles represent individual reported community intensities. These individual reports are averaged in the FeltGrid in real-time as new felt reports are received. Figures 3 and 4 show that the data contains sufficient information to be used in a similar 'traffic light' system to that of Lilienkamp *et al.* (2023). Consequently, emergency managers are encouraged to use the EQ@GA website to support decision-making after an earthquake.

Public response during the earthquake

The felt reports selected in this study were separated into categories based on the situation of the reporter during the earthquake and the actions they took.

When asked about the situation in the felt report, the questionnaire included options of:

a) Not specified
b) Inside a building
c) Outside a building
d) In a stopped vehicle
e) In a moving vehicle
f) Other.

The responses for 'Other' also provided free-text option. If free text was provided, those responses were excluded from the dataset. Having categorised responses by the situation during the earthquake, the actions taken in each situation were assessed.

When asked about actions (responses) in the felt report questionnaire, the questionnaire included options of:

1. Not specified
2. Took no action
3. Moved to doorway
4. Drop, cover and hold on
5. Ran outside
6. Other.

The responses of 'Other' were excluded.

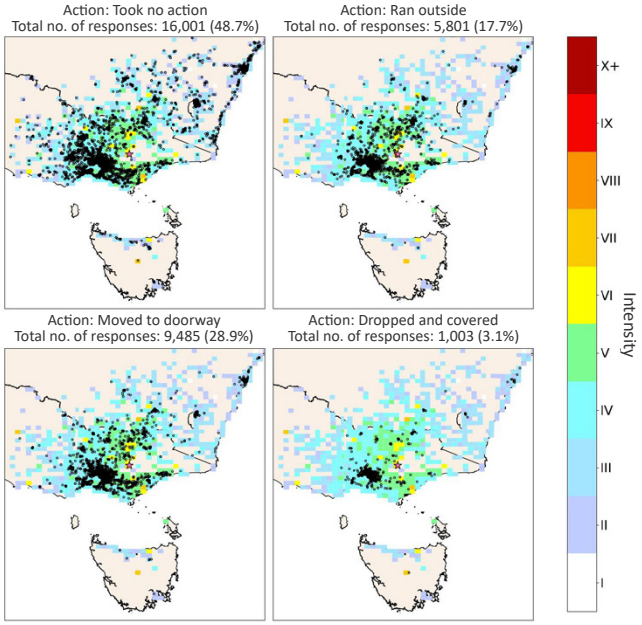

Figure 5: Responses of the 32,853 (97.4% of total) who reported being inside a building during the earthquake. Responses include (top left) 'Took no action' (48.7%), (top right) 'Ran outside' (17.7%), (bottom left) 'Moved to doorway' (28.9%) and (bottom right) 'Drop, cover and hold on' (3.1%). The background of each subplot shows the same MMI estimate, aggregated over 20 × 20 km cells (shown in Figure 1).

Figure 5 maps the reports where the situation was 'Inside a building'. The subplots show the locations for responses of options 2 to 5, plotted as black dots overlaying the 20 x 20 FeltGrid (shown in Figure 1). The total number of reports of a given action, and the percentage of the reports for the given situation, are shown for each subplot.

In this study, 97.4% of respondents stated they were inside a building during the earthquake. This is not remarkable given that, at the time, most eastern states were under pandemic lockdown restrictions. Of those who reported being inside a building, 1.7% did not specify a response. Despite the earthquake background reported intensity ranging from IV (blue, light shaking) to VI (yellow, strong shaking), 48.7% responders reported taking no action during the earthquake.

Light shaking on the MMI scale (see Table 1) is described as 'Felt indoors by many…dishes, windows and doors are disturbed; walls make cracking sounds. Sensation like heavy truck striking the building. Standing vehicles rocked noticeably'. Strong shaking on the MMI scale is described as 'Felt by all, many frightened. Some heavy furniture moved; a few instances of fallen plaster. Damage slight'.

Given the MMI descriptions of shaking, it is concerning that nearly half of respondents took no action to protect themselves. Of the respondents who did take action, only 3% took the recommended action to 'drop, cover and hold on'. The remainder either moved to a doorway (28.9%) or ran outside (17.7%). These are not recommended actions. These observations are very similar to those following the 2019 MW 6.6 earthquake offshore from Broome, Western Australia, where 1.3–3.0% of surveyed individuals followed the recommended course of action to 'Drop, cover and hold on' (Williams, Whitney and Moseley 2019). As these authors noted by, these figures suggest a gap in earthquake awareness in Australia. Knowledge and understanding of human behaviour during earthquake shaking is limited, and it is observed that even in seismically more active Aotearoa New Zealand, a low proportion of the population takes protective actions when subjected to earthquake ground shaking (Vinnell *et al.* 2023). In the destructive 2016 MW 7.8 Kaikōura earthquake on the South Island of Aotearoa New Zealand, a quarter of people (a marked difference from approximately 3% in Australia), captured on CCTV in Wellington International Airport, were observed taking some protective action, while the majority responded by standing, walking, looking around, or helping those near them (Vinnell *et al.* 2022). That said, the ground-shaking intensities experienced in Wellington during the 2016 Kaikōura earthquake were considerably stronger, and of longer duration, than those that would have been experienced by most people during the 2021 Woods Point earthquake. Thus, more people taking protective action during the Kaikōura earthquake is to be expected.

Damage

Of all the submitted felt reports, 3,394 indicated some level of damage (9% of responses). The questionnaire contained 14 different choices to describe damage, but only one option could be selected. Although it is reasonable to consider that multiple types of damage may occur at a location, in this study, we assumed that each respondent's selection would be the option closest to the worst damage they observed.[3] Future research will include investigating the damage type in selected suburbs and comparing that with the available exposure data (e.g. building types and vintage). However, the felt reports from the Geoscience Australia felt report system contain descriptions of damage caused by earthquakes and these data can be shared with emergency managers to support decision-making and research.

Conclusions

The 22 September 2021 MW 5.9 Woods Point earthquake was the largest onshore event to have occurred in Victoria in the modern instrumental era, and probably since European settlement. The NEAC received over 43,000 felt reports with a peak reporting rate of almost 700 reports per minute. The felt reports ranged in severity from personal alarm to building damage that included fallen masonry, cracked walls and chimneys and some buildings shifting over their foundations. Previous studies have shown that felt reports alone can be used to estimate the potential impact on a community of an earthquake in its early stages.

The number and spatial distribution of felt reports received by Geoscience Australia is visible on the EQ@GA website in real-time. FeltGrid and ShakeMap information is available shortly after the earthquake location and magnitude are determined by the NEAC. Respectively, these show the average reported intensity at

3. Note: at time of publication, Geoscience Australia is planning to improve the felt report questionnaire to enable responders to select more damage options.

spatial scales between 1 km and 20 km (updated as more reports are received) and modelled shaking intensity over a broad spatial area (updated periodically). These sources of information can support emergency managers in making decisions for coordinated earthquake response.

The study indicates that people in Australia generally do not know, and/or do not take, the recommended actions during an earthquake. The Drop-Cover-Hold[4] routine is the globally recommended course of action during an earthquake. Awareness campaigns and regular exercising, such as the annual Great ShakeOut exercise (Jones and Benthien 2011), could raise awareness about earthquakes to ensure safe outcomes following future earthquakes.

4. Drop-Cover-Hold, at www.shakeout.org/dropcoverholdon/.

Notes on data and resources

The de-identified felt report dataset used to create figures 3, 4 and 5 and Table 1 as well as the FeltGrid data aggregated at 20 km resolution used in figures 1 and 5 can be downloaded through the eCat tool at *https://pid.geoscience.gov.au/dataset/ga/147908*.

Shapefiles used to plot Australian states and territories for this study were downloaded from the Australian Bureau of Statistics website at *www.abs.gov.au/statistics/standards/australian-statistical-geography-standard-asgs-edition-3/jul2021-jun2026/access-and-downloads/digital-boundary-files*.

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The role of community service organisations in disaster resilience: the Hub project

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Abstract

This report presents the findings from the Creative, Community, Wellbeing and Resilience Hub (the Hub) project, a disaster preparation, recovery and resilience initiative developed and run by Blackheath Area Neighbourhood Centre in Blackheath, New South Wales. The aim of the Hub is to combine creative, practical and psychosocial support to develop an integrated, place-based, whole-of-community disaster recovery and preparation model. The Hub project delivered a program of events, workshops and activities on social connectedness, practical support, education (including property preparation before bushfire seasons) and psychosocial and physical wellbeing. The program ran from January 2022 to June 2023 after an initial consultation between June and December 2022. The program was developed in response to recent adverse events, particularly the cumulative toll of numerous natural disasters and the COVID-19 pandemic, and to prepare for future ones. The report found that participants in the Hub program overwhelmingly benefited from participating in the Hub with demonstrable improvements in community connectedness, experiences of belonging, participation in community events and resilience. The Hub is a model for effective community sector organisations disaster preparation, recovery and resilience work. The Hub project also revealed the work these organisations are already doing in emergency and disaster preparation, recovery and resilience as well as their effectiveness and the untapped potential of their long-term funding.

Background

The Upper Blue Mountains area[1] in New South Wales has experienced, like so many other places in the state and across Australia, a series of 'cascading disasters' (Massola *et al.* 2022:2). The Hub was initially developed in response to the 2019–20 summer season that had included bushfires, storms and rain events. This followed a previous severe fire season in 2013 that caused significant property loss in Mount Victoria. The Upper Blue Mountains experienced significant bushfires, particularly from the mega-blaze that encompassed the Gospers Mountain and Grose Valley fires. The area was declared a disaster area and suffered loss of properties, wildlife, infrastructure, environmental destruction and people experienced physical and mental health effects. The danger to towns and lives peaked in December 2019 and January 2020. The mega-blaze was eventually extinguished by a storm and rain event in February 2020.

In developing and implementing the Hub, the initiative also responded to the COVID-19 pandemic. Stay-at-home orders were implemented in the Blue Mountains local government area (Figure 1) from 23 March to 1 May 2020 and again from 26 June to 11 October 2021. These orders placed significant restrictions on people's activities and social distancing requirements continued

1. The Blackheath Area Neighbourhood Centre serves the towns of Blackheath, Mount Victoria, Medlow Bath, Megalong Valley, Bell, Mount Wilson, Mount Irvine and Mount Tomah.

Figure 1: Blue Mountains local government area.

Source: Blue Mountains City Council (2022)

beyond these periods. The rain events were significant, with the Blue Mountains being declared a disaster area in February 2020, March 2021, November 2021, February/March 2022 and June/July 2022 (NSW Government 2023).

One of the most significant outcomes of these cascading disasters was the community response to the 2019–20 summer season. These events brought people together in support of each other, their community and the Blue Mountains environment. However, this was most immediately interrupted by the pandemic, which isolated people from one another and their support systems.

These experiences affected the Upper Blue Mountains community's connection and wellbeing. This reflects a national trend, where a national survey (Climate Council 2023) found 80% of respondents had experienced some form of disaster since 2019 and, of those affected, more than 51% stated that their mental health had been 'somewhat impacted', with one-fifth of that group stating there had been a 'major or moderate impact' (Climate Council 2023:6).

The Hub project

The development of the Hub (Figure 2) was a response to these experiences and a way to assist communities to develop, maintain and strengthen resilience for future challenges. The project stemmed from the Blackheath Area Neighbourhood Centre's long-term involvement in community connectedness, including disaster preparation, recovery and resilience. Much was learnt from the experiences during and after the 2013 bushfires in Winmalee and Mount Victoria.

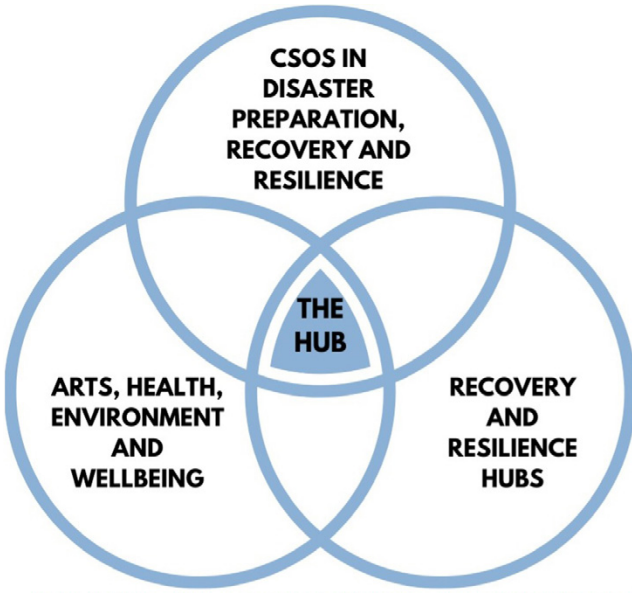


Figure 2: The policy, research and practice areas informing the Hub model.

The project was a consultative program that delivered community-driven events as requested by the community to meet specific needs. The Hub was developed using a strengths-based and consultative framework to engage the community to maximise their experiences, knowledge and capacities to strengthen and support existing networks and resources. Of particular importance was that the project was localised and contextually specific to respond to the needs of the Upper Mountains community, including age distribution, economic circumstances, mental wellbeing, social influences and geographical isolation. As such, the project was developed in consultation with the community to ensure the Hub was fit-for-purpose and accessible.

The Hub project consisted of 4 streams of activities: creative activities, community activities, wellbeing activities and resilience activities. Overall, 2,586 people attended 217 Hub events, constituting over 515 hours over 18 months. Hub activities were delivered by the Blackheath Area Neighbourhood Centre or delivered by the centre in partnership with other individuals, organisations and volunteers.

Hub activities were tailored to cohorts of adults, families, young people, seniors and people with disability. The activities catered to interests such as art therapy and play, animation and film, writing and reading, permaculture, beekeeping, Indigenous culture and crafts and economic and environment workshops. There were some activities explicitly focused on disaster resilience, such as post-traumatic growth and bushfire preparation workshops as well as art-based creative psycho-education groups for children and youth.

The Hub worked in partnership with other local community organisations to deliver projects such as the Blackheath Mural, art and music events, film and cultural festivals, information sharing events and memorial activities.

An important aspect of the Hub has been to use community partnerships in the development and delivery of Hub activities. Benefits of the partnership approach include:

- building on and extending existing relationships
- creating new partnerships with the longer potential for ongoing collaboration
- preventing the duplication of programs that may reduce participant attendance and/or competition by providers
- ensuring that funding is used to the utmost extent
- providing an opportunity for more dynamic program creation
- connecting people to other services and networks in the community.

This approach acknowledges the importance of past and current partnerships and builds on new partnerships to facilitate the future sustainability when project funding ends.

Research

Simultaneous to the planning and provision of the Hub was the research project. The research was a mixed-methods study using surveys with closed and open-ended questions and semi-structured interviews over the 18 months of the Hub program. Participants completed pre-activity surveys (n=113) and post-activity surveys (n=279[2]) and could indicate in the post-activity survey if they were interested in participating in a follow-up interview. Thirteen Hub attendees participated in follow-up interviews, as well as 2 Hub facilitators, to capture the experience from different perspectives and observations from the sessions. The research team undertook basic analysis of quantitative trends and thematic data analysis of qualitative data (Braun and Clarke 2006:79) using nVivo software. Open-ended questions were coded and analysed through SPSS software. The research project received ethics approval from the Nepean Blue Mountains Local Health District Ethics Committee (2022/ETH00045).

Results

Connection, belonging and participation

Hub participation had a significant effect on participants' feelings of connection. Figure 3 shows the responses to 'strongly disagree' or 'somewhat disagree' with the statement, 'I feel connected to community', dropped from 16% of all participants to 69% (-10%). Those who felt 'neutral' about the statement dropped from 18% to 6% (-12%) and those who 'somewhat agreed' or 'strongly agreed' increased from 66% to 88% (+22%). The increase was all in the 'strongly agree' column.

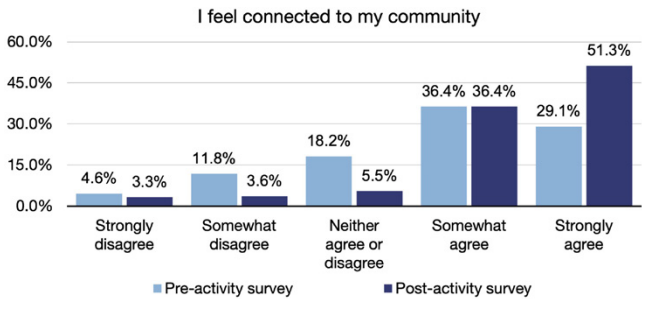


Figure 3: Responses to the statement 'I feel connected to my community'.

Hub participation had a significant effect on participants' feelings of belonging. Figure 4 shows that the people answering 'strongly disagree' or 'somewhat disagree' that they felt like they belonged dropped from 21% of all participants to 10% (-11%). Those who felt 'neutral' about the statement dropped from 13% to 7% (-6%) and those who 'somewhat agreed' or 'strongly agreed' increased from 66% to 82% (+16%).

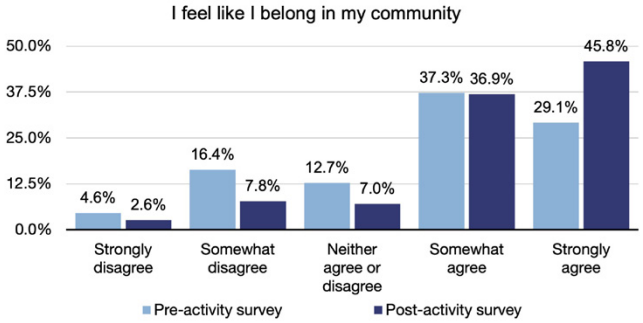


Figure 4: Responses to the statement 'I feel like I belong in my community'.

Hub participation had a significant effect on respondents' experience of active participation in the community. Figure 5 shows that the people answering 'strongly disagree' or 'somewhat disagree' that they actively participated dropped from 23% of all participants to 10% (-13%). Contrary to the previous answers, those who felt 'neutral 'about the statement increased from 10.9% to 11.3% (+0.4%) and those who 'somewhat agreed' or 'strongly agreed' increased from 66% to 79% (+13%). The increase in affirmative statements was overwhelmingly in the 'strongly agree' column.

2. Some of these participants may have participated on several occasions: 55% of the post-activity survey participants had attended the Hub before. The surveys were non-identifiable so repeat participation could not be identified.

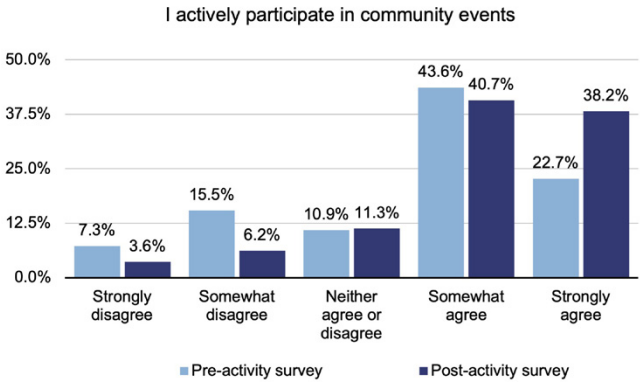


Figure 5: Responses to the statement 'I actively participate in community events'.

Resilience

Hub participation had a significant effect on participants' feelings that they could cope with emergencies. Figure 6 shows that the people answering 'strongly disagree' or 'somewhat disagree' that they could cope dropped from 19% of all participants to 7% (-11%). Those who responded neutrally dropped from 13% to 9% (-4%) and those who 'somewhat agreed' or 'strongly agreed' increased from 68% to 84% (+16%).

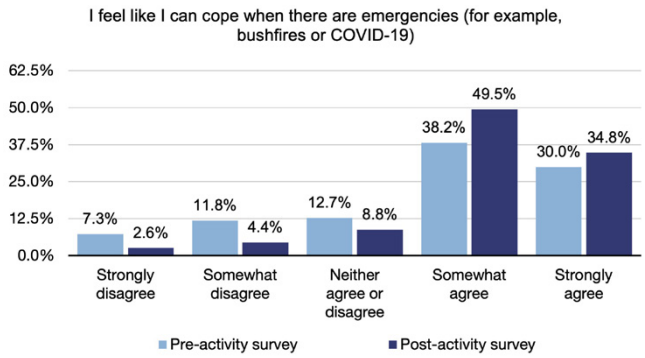


Figure 6: Responses to the statement 'I feel like I can cope when there are emergencies'.

Hub participation had a significant effect on participants' feelings that they could adjust to changing circumstances. Figure 7 shows that the people answering 'strongly disagree' or 'somewhat disagree' that they could cope dropped from 17% of all participants to 6% (-11%). Those who responded neutrally dropped from 9% to 6% (-3%) and those who 'somewhat agreed' or 'strongly agreed' increased from 74% to 88% (+14%). There were increases in both the 'somewhat agree' and 'strongly agree' columns.

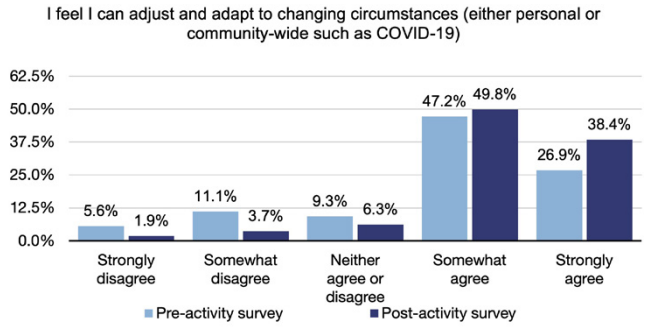


Figure 7: Responses to the statement 'I feel like I can adjust and adapt to changing circumstances'.

Enjoyment

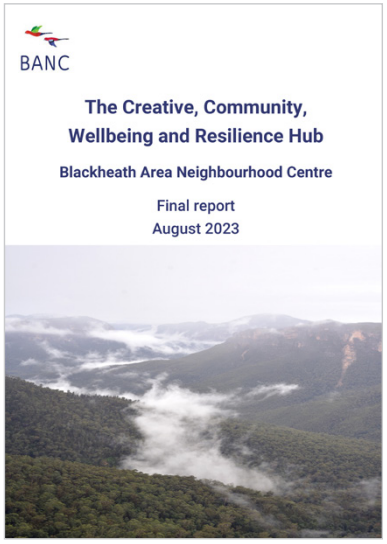
Participants overwhelmingly enjoyed attending their Hub activity with 99% answering a 'yes' that they had enjoyed the Hub. Reasons cited were that they learnt from the activity, they enjoyed the connection with others, the activities improved their wellbeing, it was fun and/or creative and/or useful. Open-ended responses were effusive with participants stating they 'absolutely loved the time spent in these pursuits', that they 'Love all of it. Love learning new techniques' and one participant stated they 'would be lost without this Monday group. The social aspect is so good for my mental health and the art helps with my self-esteem'.

In addition to enjoying the activities, participants found them useful and educational. A total of 94% of respondents found Hub activities either 'very' or 'extremely' useful and 89% of respondents either 'somewhat agreed' or 'strongly agreed' they had learnt or developed a skill as a result on their involvement. A vast majority of respondents (98%) stated they would recommend the Hub activity they attended to another person.

Qualitative participant reflections

The research generated qualitative data detailing participants' experiences of increased connection, resilience, learning as well as discussing the affective and emotional dimensions of attending the Hub. Full details are provided in the project's final report[3] but, in summary, a vast majority of participants described the Hub as making a 'huge difference' to their lives and as an experience of 'community-building', community connectedness and reductions in social isolation. For some participants, friendships established at the Hub extended into other areas of their lives. Several participants linked the increased connectedness with improved wellbeing outcomes and the Hub was 'vital to this process'. Participants also linked their experience at the Hub as assisting with challenges ranging from recovery from serious health conditions through to teaching their children how to problem solve, including managing the frustration of problem-solving processes. Participants also identified the Hub as assisting in developing resilience on a community level.

Overwhelmingly, participants felt like they had learnt something from attending the Hub, including learning about others, learning new skills and learning practical information about disaster



3. The Creative, Community, Wellbeing and Resilience Hub Blackheath Area Neighbourhood Centre Final Report, August 2023. At: *https://banc.org.au/wp-content/uploads/2023/10/Hub_finalreport-Aug-23.pdf.*

management. Several participants mentioned using their increased knowledge in their everyday lives. One of the strongest findings was that participants really enjoyed themselves, often stating they 'love' their Hub experiences. The Hub 'added something to our lives that was really valuable' with one participant asserting that 'I would go if you ran it 10 times. I would go again'. A participant stated they 'raved on' about the Hub to their friends and family, while another stated their weekly workshop was 'a pretty special group'.

What worked and what didn't?

An aspect of this research project was to ascertain feedback from participants: what did they feel worked in the Hub model and what didn't? There is further discussion of the feedback from participants in the extended report. The major finding, however, is the negative effect of funding arrangements and terms. Participants had a lot of feedback on their perspectives of what worked about the Hub, including the strength of the facilitators, the range of activities, feelings of safety, accessibility, especially in free access to activities. All the reflections on what didn't work were tied to funding: participants wanted to extend their Hub experience, including more allotment of workshop places, longer workshops and–particularly–the continuance of the Hub beyond funding cycles and into the future. Some participants reflected passionately about their desire and, to some extent, need for the Hub activities, particularly the weekly events, like art therapy and the writing group, to continue. 'It just so important to keep these classes' one participant stated, while another mentioned her concern for 'ongoing connectedness' in light of building resilience.

Future directions

The effectiveness of the Hub is demonstrated in the data. There was significant support from the majority of research participants that the Hub continue. This reflects the success of the Hub and its positive influence on community cohesion and connectedness amid the ongoing and urgent need for disaster preparation, recovery and resilience. Investigating opportunities for further funding and use of community service organisations to build resilience is a productive avenue to pursue.

The data demonstrates that the Hub is an effective disaster preparation, recovery and resilience model with wide applicability to other communities. In particular, the Hub draws on the strengths of a place-based organisation to build capacity and address needs during 'business-as-usual' times and quickly move into 'surge capacity' when disasters occur. Further funding of Hub projects for other community service organisations would enable a faster and effective response to disasters and ensure that these organisations have the required financial and other assets available at short notice.

The Hub model is an innovative integration of psychosocial activities and practical supports to address disaster preparation, recovery and resilience. The effectiveness of this approach is evident in the improvements across a wide spectrum of outcomes, from the tangibility of increased disaster preparedness through to the outcomes of increased experiences of belonging. The data reveal that an integrated model has a positive effect across a range of aims and it is worthy of further investigation as to whether an integrated model that includes a focus on psychosocial dimensions is more effective in addressing practical supports than practical support provision alone, as is the usual model of resilience hubs.

Acknowledgments

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Recovery planning with communities at the heart

Mark Trüdinger

Northland Civil Defence Emergency Management, New Zealand

This paper contains some words in Te Reo Māori, the indigenous language of Aotearoa New Zealand. Te Reo does not easily translate to English; much can get lost in translation and the 'will to translate' can be a colonising act. The *Australian Journal of Emergency Management* respects the indigenous languages of countries and, for international readers, has included some (but not all) translations within the paper. Following the oral kanohi-ki-te-kanohi (face-to-face) ways of learning, the author has used translations as the meanings offered to him by elders (not dictionary definitions) and as he understands them. It is understood that other people may have different ways of translating these kupu (words).

Recovery from the cyclone looks like preparing and resourcing our communities/marae to be the first responders as they have been over the last few years through cyclones, floods, drought, and COVID. My dream is that this event prompts investment into roading and infrastructure so sorely needed in our region. – 'Whangaruru Whānau'

The largest emergency in a generation

On 8 February 2023, Cyclone Gabrielle formed in the Coral Sea. New Zealand's meteorological service issued a severe weather warning for Te Tai Tokerau Northland, including severe rain and wind warnings. On Sunday 12 February, a Regional State of Emergency was declared, which was escalated to a National State of Emergency on 14 February. This was the third time a National State of Emergency had ever been declared in Aotearoa New Zealand. The cyclone hit the northern parts of Northland, increased in intensity further south, and then lashed Northland's west coast in its wake, with flooding causing evacuations over 3 days.

Major effects of the cyclone were damage to the state highway between Northland and Auckland and access to the region was significantly restricted. There were also interruptions to supplies, power, and communications as well as damage to 86 Northland schools (Northland Civil Defence Emergency Management / Te Rākau Whakamarumaru o Te Tai Tokerau 2023).

Northland farms were significantly affected with nearly 70% of the region's kūmara (sweet potato) crop destroyed, more than 250 dairy farms lost power, and at least 150 dairy farmers dumped milk. Some stock animals were killed and fruit and vegetable crops damaged.

Measuring the recovery effort for Northland

A critical part of recovery is the ongoing compilation of data. Often, the full picture is not available at the point of transition from response to recovery. The data that emerged in the year following the cyclone showed that:

- nearly 4,000 householders filed insurance claims relating to property damage
- 23,727 Civil Defence hardship grants were paid to Northlanders
- more than 300 Mayoral Relief Fund grants were paid to Northlanders, totalling more than NZ$1 million
- economic downturn in Northland during the event was estimated to be hundreds of millions of dollars
- geotechnical assessments showed some coastal properties were at risk of falling into the ocean in a future similar event
- the cost of rebuilding public infrastructure, including some basic resilience for the future, would total at least half a billion dollars (Trüdinger 2023).

While Northland was not as affected as other regions in Aotearoa New Zealand, these statistics are an reminder of the extent of this event and why it was the largest emergency in Northland in a generation and the largest recovery that Northland Civil Defence Emergency Management (CDEM) has ever coordinated.

Community consultation for recovery planning

The main guideline for recovery planning in New Zealand, *Strategic Planning for Recovery* (New Zealand Government 2017) states: 'Communities lie at the core of recovery. Every recovery vision, outcome, relationship and activity should have the community at the core of its purpose'. Within 2 months of the cyclone, Northland CDEM produced the Regional Recovery Plan for Northland (Northland Civil Defence Emergency Management / Te Rākau Whakamarumaru o Te Tai Tokerau 2023). This was completed within a very tight timeframe, but one proposed by community members themselves.

Put simply, a recovery plan asks, 'what just happened?' and 'what should happen next?'.

Northland's Kaipara District experienced extensive flooding.

Image: Kristin Edge, New Zealand Police

Previously, recovery plans in New Zealand have comprised tables of actions the government will take to rebuild infrastructure. This is important and our plan also included those lists. But we asked an additional question: 'how can we keep the people who are at the heart of the work at the heart of the work?'. In other words, if communities are at the heart of recovery, how might we demonstrate this? How might we hear from them?

Northland's Regional Recovery Plan therefore included community voice throughout. The first words in almost every section of the document are the community's words, which set the context for the content that followed.

The community consultation led to another stand-alone document, *Cyclone Gabrielle and Tai Tokerau Northland: Stories of community resilience and messages of support for the rest of Aotearoa New Zealand* (Trüdinger 2023). This document contained stories and voices from communities across Northland, in which community members could see their experiences reflected. It also contained messages of support for others in affected areas around the country. In this way, the community consultation had a wider and important purpose – to be a piece of community work in itself.

Our approach to community consultation

To find out community visions for recovery and community mahi (work) already occurring, Northland CDEM ran a whakawhiti kōrero (community consultation) project in March and April 2023. Consultation asked questions via community settings, face-to-face interviews and in an online survey. The idea behind this community kōrero (discussion) was to give people a chance to 'take a step back' and reflect on their circumstances and those of people in the wider area, networks, communities of concern, schools, workplaces and social groups.

Our approach was based on the idea that community consultation can be a site for relieving social suffering. Rather than extractive, or re-traumatising, it can be healing of people and their communities. Community consultation can also bring to light solutions, not only for the current event, but in preparation for future events that might otherwise be lost. In this way, we can 'rescue' people's lived experience and turn it into actions that benefit communities and help increase resilience.

Members of the Enhanced Task Force Green team with a Northland farmer. Enhanced Task Force Green was a key component of Northland's cyclone recovery and worked with more than 130 farmers across the region.

Image: Freda Walker, Enhanced Task Force Green team

To do this, we asked 4 sets of questions:

- How were you and your community affected by Cyclone Gabrielle?
- During the cyclone, and in the days that followed, what did you find most helpful? What were you thankful for? What examples did you see of people helping each other? What is helping your community get through this?
- What are your hopes and dreams for your community in the coming months after Cyclone Gabrielle? What does 'Recovery' from Cyclone Gabrielle look like to you?
- Some other areas of Aotearoa New Zealand were affected pretty badly. What message of āwhina (support) or encouragement might you have for them at this time?

From over 300 responses, people reflected the diversity of Northland communities. Respondents were Māori, farmers, mums, business owners, people with disability, young people, retirees, deaf people, community groups, emergency services workers as well as people of different faiths.

'Recovery' means different things to people. Beyond the facts of an event, what constitutes recovery will depend on how people and communities experience the event and the meaning they attribute to the experience. Recovery will also depend on what people and communities think should come next based on what they give value to. This means that the stories we heard during the kōrero differed. The visions for recovery efforts, and wider visions for communities' futures, also differed.

Collective narrative practice

The above questions were informed by a community-work approach known as collective narrative practice. Narrative practice is based on the idea that stories are shaping of people's lives, and that people make sense of their experiences in broader cultural contexts (White 2007). Narrative practice is a non-pathologising approach. Rather than undertaking 'needs assessments', evaluation and analysis and then providing a prescription for what others should do, narrative approaches ask questions about people's skills, knowledges and preferences for living. It links these to what people give value to, their histories and cultural practices.

Collective narrative practices that informed this community consultation included:

- **a 'de-centred, yet influential' orientation:** When working with people and communities, how might we keep those people at the centre of the work, yet still influence the outcome in a direction that they find helpful?
- **'experience-near' accounts:** How might we elicit accounts of events in people's own words, based on their own experiences (not just an external source's facts, statistics and analysis)?
- **'double-storied' accounts:** How might we ask not only about the real effects of an event, but also how people responded, or made sense of the events?

- **'landscapes of action' and 'landscapes of consciousness':** How might people be invited to reflect not only on who they 'are' but how they might like life to be? For example, we could ask what else might they imagine themselves doing (landscape of action) and what that would mean to them (landscape of consciousness).
- **'enabling contribution':** How might the tough times experienced by some people (e.g. in a disaster) contribute to relieving the social suffering of others?
- **'unity in diversity' (after Paulo Freiere):** How might we create documents, testimonies and historical records that weave together individuals' identifiable words into some kind of collective whole? (Denborough 2008).

Narrative practice uses other concepts and approaches. For other examples, see Arulampalam *et al.* 2006; Denborough 2008, 2012, 2018; Trudgeon 2022 and White 2007.

The following sections show how these ideas were woven into the questions we asked. These questions were simple, but not simplistic. They are in everyday language such that people of various ages and cultural backgrounds could find them relevant. However, behind the simplicity, they are highly crafted, just as the collected answers were highly curated.

How were you and your community affected by Cyclone Gabrielle?

This question invited people to express their experiences of Cyclone Gabrielle in their own words to provide 'experience-near' accounts rather than 'global' accounts of statistics and impact analysis.

By purposefully asking about 'you and your community', we heard about personal experiences and about people's wider circles of family, friends, neighbourhoods, workplaces, faith communities and villages. This helped shift the stories about the event from being singular, individualised accounts, to ones that come from concern for others and the concerns of others.

During the cyclone, and in the days that followed, what did you find most helpful? What were you thankful for? What examples did you see of people helping each other? What is helping your community get through this?

This suite of questions is based on the practice of 'double-storied accounts' to elicit accounts of hardship, loss and tough times as well as how people responded. These questions were designed to invoke personal and collective or community responses.

Asking what people were thankful for helps orient them in relation to help that was received and creates a context of gratitude. In an emergency, no formal emergency management response is perfect. By asking about what people found helpful, we heard positive accounts of the efforts of police, fire, ambulance Civil Defence, and local government as well of the actions of community organisations, social service providers, neighbours, marae (communal or sacred places) and sports clubs.

By asking 'what examples did you see of people helping each other?', we created a chance for other community members' actions to be witnessed and acknowledged, rather than just casually noticed (or seemingly go unnoticed). We have since learnt that this question – simple as it is – led to people making contact with neighbours, friends, family and even strangers and thanking them for the help they offered.

We were careful to ask 'what is helping your community get through this?' as we didn't want to assume that people had 'got through' the event already. Asking about 'getting through' acknowledged that personal and community recovery after events can take time. To ask 'what is helping' also brought forth what was working, rather than just accounts of impacts or what hadn't worked.

What are your hopes and dreams for your community in the coming months after Cyclone Gabrielle? What does 'recovery' from Cyclone Gabrielle look like to you?

Asking about people's hopes and dreams allows them to traffic in both the future 'landscape of action' and 'landscape of identity'; what are they hoping might happen next? What would that mean to them? This orientation creates a sense of possibility, hope, preferred direction and ideas for personal, community and government action. The answers to this question showed an array of steps people wanted to take towards their readiness for future events and projects they wanted to do with their neighbours, family or community. They also had practical ideas for things that government could do, which directly informed the Regional Recovery Plan and led to region-wide projects.

Asking 'what does "recovery" from Cyclone Gabrielle look like to you?' provided ideas of what the future might look like, but it also did something more profound. It handed over the definition of recovery to community members. While 'recovery' is defined under New Zealand legislation, and we included that in the Regional Recovery Plan, we prefaced it with community members' definitions of recovery. In this way, we were true to the Strategic Planning for Recovery, Director's Guideline for Civil Defence Emergency Management Groups, which states that communities are at the centre of recovery, while also allowing for multiple definitions of 'recovery', in community members' own words.

Some other areas of Aotearoa New Zealand were affected pretty badly. What message of āwhina (support) or encouragement might you have for them at this time?

This question is based on the narrative practice of 'enabling contribution' by creating messages from one community (or, here, a collection of communities) and providing them to others as messages of support, acknowledgment and encouragement. Some responses focused on sharing empathy, love and compassion for others' experiences. Some moved more into advice offered by community members who had experienced a similar event. *Cyclone Gabrielle and Tai Tokerau Northland: Stories of community resilience and messages of support for the rest of Aotearoa New Zealand* included these messages and was circulated to other regions in Aotearoa New Zealand to share with community members at community meetings and home visits.

The Regional Recovery Plan: some innovations

Based on this community consultation, Northland's final Regional Recovery Plan set 4 recovery priorities:

- Community wellbeing: given that many people were personally affected.
- Critical infrastructure: due to the damage to all forms of infrastructure.
- Rural support: given the widespread impacts on farmers across the region.
- Marae preparedness: marae (cultural hubs in New Zealand) play a crucial role during emergencies and can do so more easily with marae preparedness plans and resourcing.

The plan also included lists of tasks that each of the 4 councils in the region would undertake as part of the recovery, as is standard practice. However, the plan included:

- integrating community voice throughout the plan
- allowing communities to give their definition of 'recovery'
- a list of critical infrastructure commitments by the Lifeline Utilities[1] to rebuild infrastructure and increase resilience
- a list of primary industries recovery issues and opportunities, produced by the Northland Adverse Events team, comprising representatives from CDEM, the Ministry for Primary Industries and rural peak bodies and member groups.

As far as we are aware, these things had not been included in recovery plans before in New Zealand.

One year on from Cyclone Gabrielle, a lot of work has occurred within households, workplaces, sports clubs, religious settings, marae, Northland CDEM and government agencies. Much has been achieved, and much work remains.

1. Lifeline Utilities, at *www.civildefence.govt.nz/cdem-sector/lifeline-utilities*.

Acknowledgments

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Strengthening foundations of civil engineering role in Japan's disaster preparations

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Abstract

Civil engineering officers of local governments in Japan construct and maintain public facilities. In the event of disasters, these officers initiate the restoration of facilities, including damage to land or damage caused by landslides. In recent years, agreements among local governments have increased the opportunities to dispatch civil engineering workers from other local governments to disaster-stricken areas.

Background

In 2011, a few days after the Great East Japan Earthquake, I was dispatched to the Tohoku region to investigate the damage. The civil engineering staff of the local governments differ from the employees of private construction companies as they need to respond to disaster events. Local construction companies prepare disaster response agreements in advance and collaborate with local governments that manage public facilities. However, I faced a difficult problem as I worked in disaster response as an employee of a local government.

According to the National Institute for Environmental Studies (2017), 'In Japan, where there are many typhoons and earthquakes, the topographical and meteorological conditions make it prone to landslide disasters'. It should be noted that Japan is an earthquake-prone area. Therefore, disaster response is crucial for the civil engineering staff of local governments. However, no literature has been found that studies the problems experienced by civil engineers in municipalities who were in charge of disaster agreements and disaster drills. Therefore, the reconsideration and reconstruction of current disaster response methods to respond to the disasters efficiently and effectively is urgently needed.

Role of civil servants in disasters

The role played by civil servants in Japan during disasters is stipulated in the Disaster Response Basic Law (Government of Japan 2012). The law was enacted in 1959 following the Isewan Typhoon. Table 1 shows the roles of the national and local governments as set out in the Basic Act on Disaster Response. Civil servants must respond appropriately to serve residents after a disaster and can be broadly classified into their level of service, being national civil servants and civil servants in local governments. The civil servants in local governments are closely related to the residents of their area. Evacuation orders are provided to guide residents to avoid dangerous places. They are based on civil engineering technologies, such as estimating how such facilities may be damaged in a disaster. Therefore, the civil engineers in local governments responsible for issuing evacuation orders, which is their primary responsibility in disaster response, bear a great burden during disaster events.

Table 1: Roles of the national and local governments in the Disaster Response Basic Act.

	Establishment of disaster headquarters	Disaster prevention plan	Disaster response	
			Evacuation order	First aid
Country	Yes	Yes (obligation)	No	Yes (obligation)
Local governments	Yes	Yes (obligation)	Yes	Yes (obligation)

Topographic features of major cities in Japan and disaster response

In 12 of Japan's 21 major cities, the total area designated by each municipality as 'areas where building restrictions are imposed to prevent landslides associated with land development due to several unleveled cliffs' accounts for a 2-digit percentage of the total area (Ministry of Land, Infrastructure, Transport and Tourism 2022). In Japan's major cities, many residential areas are built on cliffs, which could result in landslides during earthquakes and typhoons. If roads are blocked by landslides caused by collapsed cliffs, the obligation to clear the road becomes a problem. The earth and sand from the collapse must be removed, but it is difficult to remove earth and sand immediately during a disaster. However, unless the earth and sand are removed, the roads used by nearby residents cannot be opened. There are cases where local governments have managed to clear such debris. However, local governments must balance their decision for each disaster site because they use resident taxes to remove earth and sand from privately owned land. The removal of debris is conducted over several days, during which time the roads remain closed. This can lead to a decline in public services.

Preparations that occur before a disaster event

Preparations that must occur before a disaster are disaster drills in which local governments, residents and related parties review disaster response and disaster agreements. Local governments and private companies must promise to cooperate in disaster response.

Disaster drills

Disaster drills are held regularly in all 21 of Japan's major cities. The main keyword for disaster prevention drills is 'residents' and the content of drills mainly relates to how to evacuate residents and conduct firefighting activities.

A survey related to disaster prevention was conducted (Tokuyomo 2022), which states that:

> *…in the United States, Hawaii, and New Zealand, where large earthquakes and tsunamis have occurred in the past, evacuation drills are customary. Emphasis is placed on first aid training. There is a strong tendency to learn how to give first-aid to injured people in the event of a fire. In recent years, there is a well-known disaster drill called 'Shakeout.' This is a disaster drill that is said to have originated in the United States and is a coined word that literally translates to 'blow away an earthquake.' It has undergone a transformation into a unique format called 'Shakeout' and is currently being reimported to Japan.*

There are several studies on community participatory disaster management in countries, including New Zealand, the United States and European countries (Bajek *et al.* 2008; Barra *et al.* 2010; Chou and Wu 2014; Çoban and Göktaş 2022; Li *et al.* 2022; Malla, Dahal and Hasegawa 2020; Mönter and Otto 2018; Novak, Lozos and Spear 2019; Tierney, Bevc and Kuligowski 2006; Zavar and Nelan 2020). All these studies are mainly disaster prevention studies related to training for residents. Disaster drills in Japan and in other countries focus on evacuation and firefighting activities.

As per OYO Corporation (2023):

> *As a result of conducting a questionnaire survey of victims of the Great East Japan Earthquake, it was found that it is important to revitalise disaster prevention drills in local governments in order to maintain awareness of disaster prevention.*

Disaster agreements

K City has concluded over 200 disaster agreements, including 20 in the construction sector. Table 2 shows 2 types of cooperation agreements (City of Kawasaki 2023).

In general, contracts are not required for grant aid, but contract procedures are required for paid cooperation. In addition, for the disaster agreement of K City's port authority, contract procedures were established for the event of a disaster 10 years after the conclusion of the first disaster agreement.

Yamashita (2015) states:

> *In 2014, we conducted a survey on disaster agreements with business operators in 1,741 local governments nationwide. 22.4% have experience of cooperating with business operators based on [omitted]. The method of construction for disaster response was decided quickly, but there were discussions concerning what kind of contract procedure would be good, and it took a certain amount of time to begin construction for disaster response. For the person in charge of the local government to understand the person in charge of the contracting party, it is necessary to regularly communicate with the person in charge of the contracting party. It is necessary to keep in regular contact… [omitted]… Departments and staff other than the disaster prevention department should actually understand the contents of the agreement.*

Table 2: Types of disaster agreements and implementation details.

Types of disaster agreements	Implementation details
Free cooperation	No payment to private companies for disaster work.
Paid cooperation	Payment to private companies for disaster work.

Views

There are new views that can assist in an effective and appropriate response in the event of a disaster:

1. It is important to identify contract procedures in the disaster agreement. It then is possible to rapidly begin disaster relief efforts.
2. It is important to revitalise disaster drills by implementing new drills such as emergency disaster recovery construction contract procedures. Considering several natural disaster types, training will be provided on restoration and contract work pertaining to disaster recovery. Disaster prevention drills can be revitalised by making changes to the disaster prevention drills of each year. By changing the contents of disaster prevention drills each year rather than fixing it, it is possible to prevent one from getting stuck in a rut.

This report is the result of the author's own ideas and does not represent any positions taken by the local government for which he works.

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Integrating emergency services planning into aged care under new legislation: is your organisation ready?

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Risk-e Business Consultants

Disasters can affect all community members, but some can be affected more than others. People living in aged care need particular assistance and their needs are foreseeable and should be planned for systemically. The aged care system is undergoing major reforms and a program of risk-based standards and legislative enhancements will take effect in Australia from 1 July 2024.

The Aged Care Quality and Safety Commission[1] is consulting on draft guidance resources to assist aged care providers, workers and stakeholders to understand and comply with the new Strengthened Aged Care Quality Standards[2] and *Aged Care Act 1997*.[3] These reforms aim to improve the quality of care and safety for older people in Australia receiving aged care services.

The role of emergency services organisations in the aged care sector has traditionally been limited to providing urgent response during an incident or emergency and some statutory engagement in the planning or approval processes for properties managed by aged care providers. There has been no over-arching legislative arrangement between emergency services planners and aged care providers and no requirement for engagement aside from calls for service during an incident. This is changing and will require genuine and accountably proactive collaboration between emergency services organisations and aged care providers.

In an effort to reform the provision of aged care, the Royal Commission into Aged Care Quality and Safety ran from 8 October 2018 to 1 March 2021. The commission's final report included 148 recommendations aimed at rebuilding and refocusing the aged care system in Australia.[4] These recommendations have been converted into standards that set out what is expected from providers of aged care. The new Strengthened Standards and Aged Care Act have specific standards that will affect the emergency services community, including:

- 2.10.1 – The provider develops emergency and disaster plans that describe how the organisation and workers will respond to an emergency or disaster and manage the risks to the health, safety and well-being of older people and workers.
- 2.10.2 – The provider implements strategies to prepare for, and respond to, an emergency or disasters.
- 2.10.3 – The provider engages with older people, family, carers and workers about the emergency and disaster plans.
- 2.10.4 – The provider regularly tests and reviews the emergency and disaster management plans in partnership with older people, families and carers, workers and other response partners.

How emergency management fits in

As a result of the new requirements, aged care providers must seek assistance and work with emergency services organisations during the consultation, planning, exercising and after-action review phases.

Aged care is provided across Australia and local conditions and risks vary. As such, aged care providers will need to partner with their local

The new Strengthened Standards and Aged Care Act have specific standards that will affect the emergency services community.

emergency services organisations to develop suitable plans for their specific risk profiles. The local emergency arrangements under relevant state and territory legislation will provide a sound point of contact. For example, in New South Wales, it would fall to Local Emergency Management Committees and, therefore, relevant Local Emergency Operations Controllers should be aware of the new legislation and the likelihood of aged care providers seeking assistance.

It is important for emergency services planners to understand that aged care emergency plans will not be limited to local residential aged care facilities but will need to be tailored for a variety of retirement living and care provided to older people in their own homes. Some retirement living communities offer flexible care and are significant developments with hundreds of residents on substantial sites. Planning will be particularly important in areas where some older people live alone and receive care on their properties.

The new Act includes substantial consumer consultation requirements including the creation of Quality Consumer Advisory Boards that are likely to be the mechanism for providers to consult with consumers about new plans. These groups are excellent outreach opportunities for emergency services organisations to share safety information and gather feedback on local issues or concerns.

There is also a requirement to exercise emergency plans. This can be tied to agency annual training schedules and help to enhance localised emergency managing plans.

The new standards and Act have a governance reform component that requires direct and accountable involvement of the governing board of each aged care provider and they will be held accountable for these arrangements. There may be opportunities for emergency service planners to meet with board members to provide training and guidance on compliance to the new regime.

Is this likely to happen?

Yes. As in many issues of public policy, particularly post-crisis or post-royal commission, a legislated response compels parties to act and applies penalties for non-compliance. The Aged Care Quality and Safety Commission will be checking compliance with all aspects of the new Act and its related requirements. There are penalties for non-compliance and a feature of the Act is the personal liability attached to senior officers, executives and boards of aged care providers. These sanctions can include being banned from the sector.

There is now a stringent legislative impetus for aged care providers to develop, consult and exercise their emergency plans. Notably, there will be a commission review after action from an incident or emergency and failures to have complied with legislation will be subject to penalties, along with any police investigation into damage, injury or death.

The care of older people is the primary remit of aged care providers and emergency services organisations have had limited involvement until an incident occurs. The new legislative requires providers to partner with local emergency services organisations to develop suitable plans and make sure these plans are current and exercised. The emergency management sector should acknowledge these significant changes and prepare for contact with aged care providers to meet the Act requirements. Emergency services planners should also be aware that care is provided to older people outside of residential aged care settings and the planning for community and flexible care arrangements will vary. This will allow for emergency plans to be tailored to local risks and environments so that the best operational arrangements are in place and ready to be activated in cases of emergency.

Endnotes

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Missing the forest for the flames: a narrow investment focus means missed opportunities and risk exposure

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Resilient Futures Investment Roundtable

Investment in systemic risk reduction and resilience can deliver a triple dividend by avoiding loss, reducing the costs of future disasters and unlocking economic opportunity and environmental and social benefits.

Despite the growing recognition of the urgency to invest in disaster resilience, there is a substantial shortfall in funding. The majority of the funding is from public sources. Private sector investment is needed to bridge the gap in finance so that communities, ecosystems and economies improve resilience to the growing effects of disasters and climate change.

The private sector can play a crucial role in investing in resilience-building to prepare for and recover from emergencies and disaster events. However, current approaches to assessing the benefits of investment tend to focus on mitigating immediate risks to assets and operations, while neglecting other opportunities for innovation and value creation. Such a narrow perspective fails to recognise the rising costs and effects of disasters, particularly in the context of cascading and compounding risks. It has been recognised that, across the globe, we are facing a 'new normal' of inter-related global risks with compounding effects that amplify consequences (polycrisis) that can only be addressed through systemic responses.

Figure 1 maps the importance of matching decision-making and management approaches to the nature of problems. Systemic approaches create a pathway to recognise the systemic nature of the challenge and that systemic problems need systemic solutions.

To ensure long-term sustainability in uncertain futures, the private sector can actively use systemic solutions for investment. By harnessing innovation and problem-solving capabilities and building roles and relationships with communities and nature, businesses can be transformative, instigate change and build resilient societies.

The Resilient Futures Investment Roundtable (RFIR)[1] is a coalition of public, private, research and not-for-profit organisations in Australia that work together to increase the flow of investment into disaster resilience. The RFIR is a forum and provides resources to enable organisations, including the private sector, to take systemic approaches to disaster resilience investment.

Over the past 2 years, RFIR members have shared expertise and experiences from practice. We have found that organisations struggle to effectively match the approach to risk assessment and investment decision-making to the nature of the problem. This makes it difficult to align investment with solutions that deliver real resilience. To counter this, the RFIR membership provides a many-perspective approach to help identify how the private sector can leverage its expertise and resources and can take on roles to lead systemic disaster resilience efforts.

Harness skills and knowledge

Through dialogue, policy engagement, formalised partnerships and taking a co-creation approach to project development, the private sector can bring skills, knowledge and expertise to take an active role in developing climate resilience solutions. The RFIR is one platform for cross-sectoral knowledge

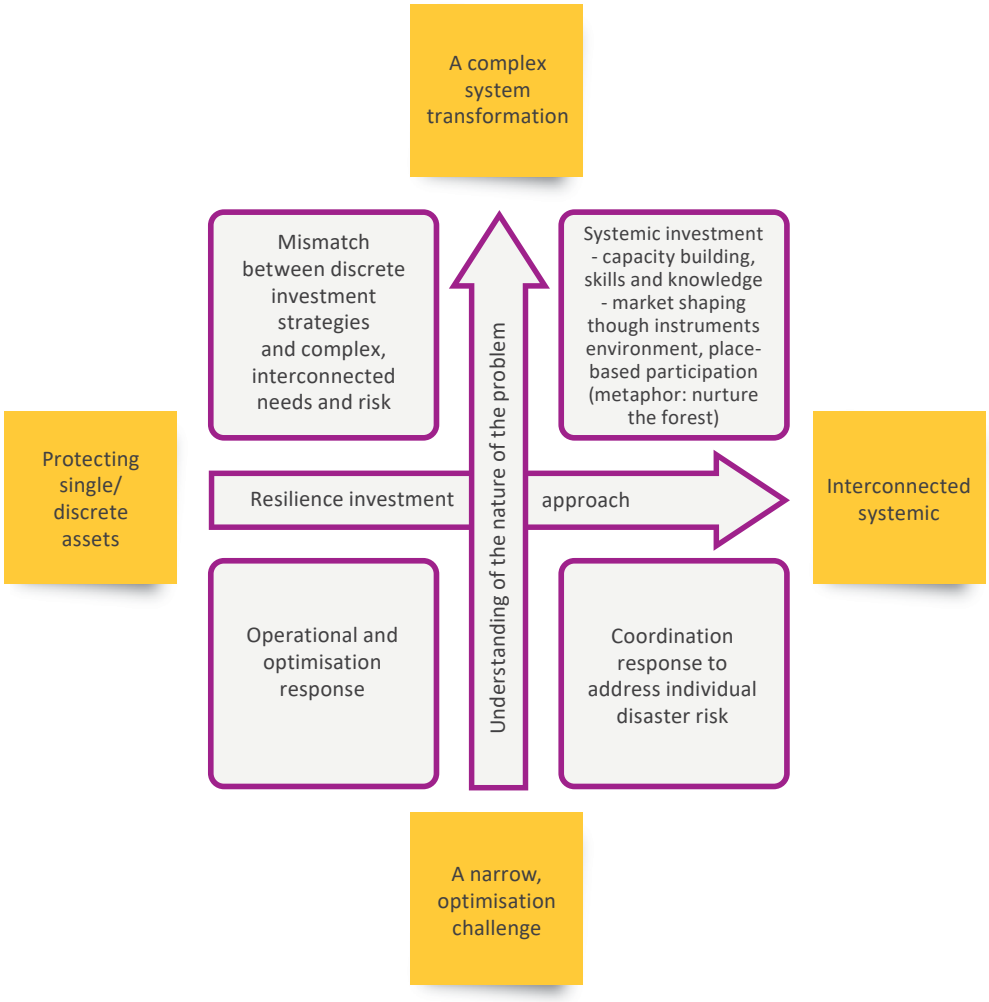

Figure 1: Mapping resilience investment to the nature of the problem.

sharing and capability building. It was created following research released by the Australian Business Roundtable for Disasters and Safer Communities[2] that found that investment was urgently needed to manage the rising costs and effects of disasters, but organisations needed support to make informed resilience investment decisions. The RFIR leverages the collective expertise of members to build capability and support diverse organisations, including the private sector, to make informed decisions for the future and to manage disaster risk and invest in a resilient, climate-adapted future.

Support early innovation

The private sector can move beyond its historic roles to look for opportunities to support early innovation. For example, as part of the Resilience Investment Vehicle, NAB and IAG explored debt financing and insurance premium reductions for property owners who undertake identified bushfire resilience upgrades on their homes. As part of that work, NAB and IAG supported the development of the Bushfire Resilience Star Rating app.[3] This highlighted how the private sector can take on an expanded role to support innovative approaches to encourage uptake of resilience measures using financial incentives. This is documented in the Resilience Investment Vehicle Insights Report.[4] Creating an environment for greater private sector investment in solutions is an ongoing area of work.

Participate in place-based resilience planning

The Enabling Resilience Investment approach[5] is a collaboration between CSIRO and Value Advisory Partners that has developed a place-based approach to investment. It provides a methodology for diverse local stakeholders representing various sectors and interests in a city or suburb. Stakeholders participate in collaborative workshops to identify risk-mitigation and the value that these options create in the community. This could be through jobs, infrastructure, social cohesion, economic activity and incomes. This identification of value to a broad range of stakeholders creates opportunities for novel funding and financing mechanisms. To date, these types of place-based efforts have tended to be led by local and state government and can be strengthened by greater participation from the private sector.

Support community-led resilience

The private sector can provide expertise and resources to help communities withstand and recover from disasters. For example, supported by ResilientCo and the Minderoo Foundation, the Millgrove community (63km east of Melbourne, Victoria) conducted a community-led planning process and identified initiatives to improve the township's resilience. One activity focused on local renewable power capacity and a community electricity microgrid to operate during emergencies and reduce power costs locally. The community identified a need for a 'community emergency hub' to provide relief to people and emergency workers before infrastructure gets up and running again.

Together with Toyota Australia, the Millgrove community is examining the feasibility of a hydrogen-powered generator to keep critical facilities running during and immediately after an emergency event. Details are available at The Resilience Canopy[6] website.

Work with boundary organisations

Boundary organisations act as a bridge between stakeholders to facilitate communication, collaboration and the exchange of knowledge and resources across traditionally separate sector or disciplines. Systemic resilience investment works when all sectors (public, private, not-for-profit, research and communities) combine expertise and perspectives about systems and disciplines. Boundary organisations such as Climate-KIC Australia facilitate this collaboration and help to bridge the gap between stakeholders, for example, through convening cross-sectoral efforts like the RFIR.

To realise the potential in climate resilience investment, businesses must think creatively about their role and consider unconventional approaches to participate in creating resilient futures. Taking a systems approach leads to working with partners and communities in new (and perhaps uncomfortable) ways. These new ways of working recognise that businesses are important parts of local communities, ecosystems and economies and that systemic resilience protects everyone against risks and is a building block for long-term sustainability.

Endnotes

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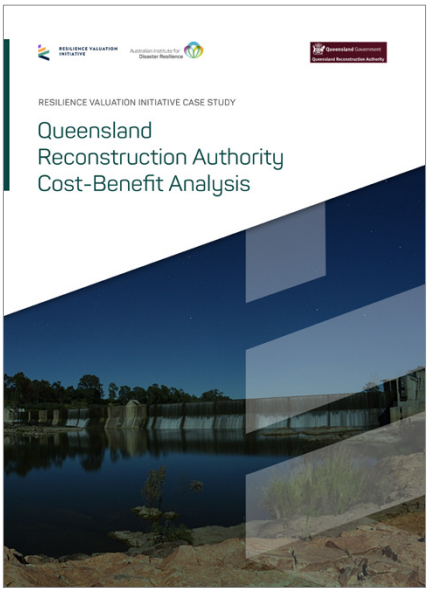

Resilient Futures is creating resources developed from practical experience to improve decisions around when, where and how to invest in resilience.

Facing the storm: the increasing effect of severe weather on mass gathering events

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Severe weather events increasingly threaten the safety of mass gatherings, particularly music concerts. Enhanced risk assessment methods, along with greater awareness from both artists and attendees, are essential. This awareness forms a significant part of a broader crowd and event safety culture. Additionally, the music industry has an important role to play in reducing the carbon footprint of large-scale events, which can contribute to environmental sustainability efforts.

The year 2023 was the warmest year on record[1], a distinction that underscores the escalating effects of climate change on the environment and society. Particularly affected were mass gathering events, including music concerts and festivals, which experience a heightened risk from severe weather events. From intense heatwaves and storms causing attendee discomfort and health risks and even deaths to the cancellation and postponement of events, the challenge is multi-faceted. Last year's record-setting temperatures serve as a reminder of the urgent need to change the organisation of mass gatherings. Table 1 is a non-exhaustive list of events and mass gathering events affected by weather condition during 2023. The list provides examples of incidents that made headlines in English-speaking media and does not reflect all occasions of events derailed by extreme weather. This shows the increasing scale of this problem.

The role of organisers and venue operators

Event organisers and venue operators manage the safety risks of events. Their responsibilities extend beyond operational management to include in-depth risk assessments, contingency planning and proactive safety measures tailored to the specific requirements of the event, the location, and potential consequences posed by different weather scenarios.

One of these responsibilities is the implementation of rigorous safety protocols to prevent incidents like structural collapses. This involves regular safety audits and ensuring that temporary structures, such as stages and barriers, are designed to withstand extreme weather conditions.

In addition to structural safety, organisers must prioritise risk assessments that consider weather forecasts as a major component. This involves monitoring weather patterns and being ready to adapt plans accordingly. Contingency planning is crucial for different scenarios, including the possibility of pausing, delaying or cancelling events based on weather conditions. These plans should be communicated clearly to all stakeholders, including attendees, to ensure everyone is aware of potential risks.

A critical aspect of these preparations is making adequate provisions to respond to weather expectations. For example, in regions prone to extreme heat (e.g. Taylor Swift concert in November 2023 in Brazil where attendees suffered burns from heated metal bars), organisers should consider the choice of materials and design elements in venues to mitigate such a risk. This may include using materials that do not conduct heat or providing shading and cooling areas for attendees.

Organisers should employ other approaches like using infrared cameras to monitor temperature variations within crowds, setting up ample water

stations for hydration in hot conditions and having trained front-of-stage barrier personnel and crowd managers for swift safety responses. If a situation arises, there should be pre-hospital care for medical emergencies and clear procedures for pausing or stopping shows. Organisers can also change event timings to cooler periods of the day and use misting showers around stages in cases of extreme heat. These measures, alongside crowd planning and monitoring practices such as crowd-sensing technology, are essential to maintain a safe event environment.

The role of artists

Artists, with their influential platform and connection to the audience, play a critical role in ensuring the safety and wellbeing of attendees at mass gatherings. Their position means they can actively contribute to safety and environmental awareness in many ways. During live performances, artists are often the first to notice changes in crowd behaviour or potential safety hazards. Their ability to assess the situation and respond quickly can help mitigate risks. For example, during the Taylor Swift concert, the artist's decision to pause the show to distribute water and provide safety instructions was a decisive action that helped manage the risk. This incident highlights how timely interventions by artists can significantly enhance safety.

Artists can influence crowd behaviour positively. Their announcements or actions can calm an agitated crowd, encourage orderly behaviour or facilitate a speedy response to an emergency situation. Artists can also draw attention to unfolding threats and guide the audience in taking appropriate safety measures.

Given their role, it is essential for artists to equip themselves with crowd safety knowledge and be familiar with potential sources of risks at their concerts and any effective interventions. Understanding the dynamics of large crowds, recognising signs of distress or danger among attendees and knowing how to effectively communicate with the event staff and the audience are skills that can help artists contribute to the safety and success of an event.

Cultivating a ‘crowd and event safety culture’

The development of a robust 'crowd-safety culture' is a critical aspect of safety at mass gathering events. This concept goes beyond adherence to rules. It is about fostering a collective sense of responsibility and awareness among attendees regarding their own safety and that of others. Educating attendees about potential risks is the foundation of a crowd-safety culture. This education includes information on how to recognise and respond to health emergencies, such as heatstroke or dehydration, which are common in large, densely packed crowds, especially in hot weather. Organisers can disseminate this information through channels like social media, event websites and informational booths at the event. Promoting a safety culture extends beyond providing information. It involves engaging attendees in safety practices. Another aspect of fostering a crowd-safety culture is promoting a community mindset, where attendees look out for each other. Encouraging attendees to stay vigilant, offer help to those in need and be respectful of each other's space and wellbeing can create a secure and enjoyable environment.

In a crowd-safety culture, individuals are adept at recognising potential risks, including those related to weather, both prior to and during an event. They can make informed assessments about the level of hazard a situation poses and respond appropriately, while also influencing others to do the same. This culture encourages proactive behaviours, such as choosing not to attend an event if it seems too risky or preparing adequately by bringing sunscreen, water or rain jackets based on expected weather conditions. This means that risk assessment is a shared responsibility; not only do organisers and venue operators assess risks, but attendees also acknowledge their own personal risk and take actions that align with improved safety. Actions like checking weather conditions, heeding alerts, carrying appropriate gear and being willing to adhere to evacuation orders or accept event cancellations for safety reasons are integral components of this culture.

While the concept of safety culture describes a quality rather than a quantity, its state can be quantitatively measured using standardised self-reporting instruments. This approach enables authorities and organisers to conduct cross-cultural comparisons and monitor the status of safety culture. Monitoring helps identify potential declining trends in safety attitudes and practices. When these trends are identified, targeted interventions, behavioural campaigns and awareness-raising initiatives become essential tools to improve and maintain a strong safety culture.

Shifting the event industry towards sustainable practices

As severe weather events increasingly challenge the event industry, it is imperative to recognise that adopting environmentally sustainable practices is more vital than ever. Mass gatherings, particularly music concerts and festivals, significantly contribute to increasing the global carbon footprint. These events involve vast energy consumption for lighting, sound systems and other operations, often powered by non-renewable energy sources. Additionally, the transport of artists, staff and attendees contributes substantially to greenhouse gas emissions. Fortunately, the industry has started to recognise its environmental effects and is taking steps to rectify it.

Artists play a vital role in promoting environmental sustainability too by advocating for eco-friendly practices and raising awareness about the environmental effects of events. Artists can inspire fans and attendees to adopt sustainable behaviours.

There are currently non-profit organisations that collaborate with musicians and festival organisers to adopt initiatives that ‘green’ the concert industry. These initiatives include eliminating single-use water bottles at events and sourcing local food and sustainable biodiesel. The adoption of such initiatives can ultimately eliminate the use of millions of single-use bottles at concerts.

There is a need for proactive campaigns to address greenhouse gas emissions related to the music industry. Such programs can encourage the music community to reduce the carbon footprint and neutralise what they cannot reduce by funding projects that reduce greenhouse gases. Some artists are proactively addressing their environmental impact. For example, some have linked concert ticket sales to tree planting[2], or have had their carbon footprint of touring audited by a climate change research centre. These efforts show there is a shift towards environmental sustainability actions in the event industry. The widespread adoption of these practices will significantly reduce the industry's carbon footprint and benefit the industry itself.

Summary

The challenge of severe weather during mass gathering events, intertwined with the event industry's impact on climate change, calls for a unified commitment to safety and sustainability. Organisers, artists and attendees must embrace responsible practices and cultivate a safety and environmental stewardship ethos. Such action will help mass gatherings remain dynamic platforms for human connection and celebration, harmonised with the imperative of environmental sustainability. The resilience and future viability of these events hinge on the collective adaptability and responsiveness of every stakeholder involved.

Table 1: A selected list of events and mass gatherings affected by severe weather events during 2023.

Date	Location	Event	Incident and impact
Jan 2023	Mt Smart Stadium, Auckland, New Zealand	Sir Elton John's concert	Concert cancelled half an hour before start and fans evacuated[1]
Jan 2023	Auckland, New Zealand	Laneway Festival	Event cancelled[2]
Mar 2023	Apollo Theatre, Belvidere, Illinois, United States	Heavy metal concert	Sudden storm caused a roof collapse, killing one person and injuring dozens[3]
Apr 2023	Virginia Beach, United States	The Water Festival	Third day of festival cancelled due to bad weather conditions[4]
May 2023	Rose Bowl stadium, California, United States	The Cruel World Festival	Severe thunderstorm alert, forcing festival goers to evacuate the venue[5]
Jun 2023	Bridgeport's Hartford HealthCare Amphitheatre, Connecticut, United States	Young the Giant concert	Event rescheduled due to air quality concerns affected by the smoke from Canadian wildfires[6]
Jun 2023	Madrid, Spain	Primavera Sound Festival	Event cancelled due to adverse weather conditions[7]
Jun 2023	The Far in Manchester, Tennessee, United States	Bonnaroo Festival	Event paused and evacuation order given due to a thunderstorm alert[8]
Jun 2023	Red Rocks Amphitheatre, Colorado, United States	Louis Tomlinson concert	Seven concert goers hospitalised and nearly 100 injured due to a severe hailstorm before the start of the concert. Event was cancelled[9]
Jun 2023	West Michigan, United States	Electric Forest Festival	Concertgoers temporarily evacuated the venue due to severe thunderstorm alert[10]
Jul 2023	United Kingdom	Tiree Music Festival	Event cancelled due to bad weather conditions, with campers stranded in ferry terminal[11]
Jul 2023	Acrisure Stadium, Pittsburgh, Pennsylvania	Ed Sheeran concert	Heatwave caused 17 transports to hospital including one seizure and two cardiac arrests[12]
Jul 2023	Amsterdam, The Netherlands	Awakening Festival	Third day of the music festival cancelled due to severe weather conditions and storm[13]
Jul 2023	Xfinity Theatre in Hartford, Connecticut, United States	Jason Aldean concert	The artist ran off stage mid-concert after having heat exhaustion[14]
Jul 2023	Chicago, United States	Pitchfork Music Festival	The festival temporarily evacuated due to dangerous weather conditions[15]
Jul 2023	Phoenix, Arizona, United States	The Disturbed concert	Event cancelled and rescheduled due to extreme heat[16]
Aug 2023	Bend, Oregon, United States	My Morning Jacket and Noah Kahan concerts	Worsening air quality from wildfire smoke led to cancellations[17]
Aug 2023	California, United States	Insomniac's Debut Interstellar Event	Event cancelled due to Hurricane Hillary[18]
Aug 2023	British Columbia, Canada	ThumpTown music festival	Event cancelled and postponed due to wildfire risk[19]

Aug 2023	Talking Stick Resort Amphitheatre, Phoenix, Arizona, United States	50 Cent concert	Event cancelled and postponed due to severe heatwave[20]
Aug 2023	FedEx, Washington DC. United States	Beyonce concert	Shelter in place order was issued in anticipation of heavy rain and lightning, resulting in overcrowding and heat exhaustion in the concourse area. Event was delayed[21]
Aug 2023	Seoul's World Cup stadium, South Korea	World Scout Jamboree ceremony	Reported health issues and evacuation order resulting from heatwaves as well as a typhoon threat[22]
Sept 2023	Huston, Texas, United States	Danzig concert	Event cancelled due to extreme heat[23]
Sept 2023	Allegiant Stadium, Las Vegas, United States	Ed Sheeran concert	Some fans waiting outside the stadium required medical attention due to the scorching heat. Event cancelled[24]
Sept 2023	Brooklyn Mirage, New York, United States	Pretty Lights show	Event postponed due to heavy rain and flood conditions[25]
Sept 2023	Black Rock desert, Nevada, United States	Burning Man Festival	Attendees got stranded in heavy rain and mud[26]
Oct 2023	São Paulo, Brazil	Tomorrowland Brazil Festival	Extreme rain led to the cancellation of the second day[27]
Nov 2023	Rio de Janeiro, Brazil	Taylor Swift concert	A young fan died due to extreme heatwave[28]
Nov 2023	Canberra, Australia	Spilt Milk Festival	Event postponed due to unsafe weather conditions and an approaching storm[29]
Dec 2023	Sydney, Australia	Good Things Festival	Festival ended abruptly due to wild storm and evacuation order issued[30]

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Improving long-term disaster recovery research in Australia through boosting dataset comparability

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Emergencies and disasters are increasing in frequency and complexity in Australia and around the world.[1] It is well established that the effects of these events take a long time to recover from. There is strong and growing evidence to show that different segments of society are exposed to disasters in different ways, with people and communities affected in interconnected and compounding ways.

Despite knowing that the consequences of disruptive events can be pervasive and long lasting, Australia lacks a consistent approach in the way it collects data and analyses information about the medium and long-term effects and rates of recovery.[2]

In addition to a lack of long-term recovery data, Australia has no unified approach to how disaster experiences are measured and how data is captured. This limits the ability of data to inform research, practice and policy by making it difficult to compare datasets between disaster recovery studies as well as other sources of population-level data (e.g. general social surveys). This presents difficulties for communities, policy makers and practitioners to draw on evidence to make decisions.

As researchers in emergency and disaster management, we aim to improve outcomes for people and communities. We think there is a pressing need for greater standardisation in the way that data is collected about how people and communities are exposed to disasters. While addressing this issue requires a diverse research agenda with a range of approaches and goals, it is nevertheless essential to provide a core basis for consistent ways to assess disaster exposure. This will improve the comparability of datasets across populations, timeframes and events as well as improve the reliability of questions asked.

If we improved the comparability of data sets across different disaster-affected populations, we would improve the ability to:

a) develop a finer-grained understanding of protective and vulnerability factors
b) better predict the long-term effects of disasters
c) better assess the effectiveness of interventions and programs
d) learn lessons from disaster events across time
e) develop common analytical methods and procedures to assess and score data
f) use this evidence base to improve policy, interventions and support
g) pave the way for improved data sharing and research collaboration.

We are contributing to these aims in 3 ways.

Encouraging the sharing of survey instruments

In 2021, Emergency Recovery Victoria commissioned the University of Melbourne to undertake the Community Recovery study into how people who were affected by the 2019–20 summer bushfires were recovering. The study had 4 aims:

- To examine mental health and wellbeing of diverse groups in affected areas.

- To examine perceptions of the recovery process (e.g. satisfaction, fairness, comparative judgements).
- To capture experiences of utilisation of the service system.
- To describe community priorities for recovery.

Between August and November 2022, 989 people from fire-affected communities in Victoria participated in the study. A preliminary summary of the results is available on the University of Melbourne website.[3] The survey instrument was co-designed with Emergency Recovery Victoria and an internal working group at the university. Where possible, we selected pre-existing instruments and indexes, such as the K-10, PCL-5 (both commonly used in mental health screening questionnaires), major life event inventories (used by Australian Bureau of Statistics[4] and Household, Income Labour Dynamics in Australia[5]) and selected disaster exposure items as used in the Beyond Bushfires study (University of Melbourne) and the Regional Wellbeing Survey (University of Canberra).

We are in the process of working with other researchers to offer components of the survey tool in the hope that it can improve the efficiency of their survey design and that we can increase the number of comparable recovery data sets across a range of disasters.

Developing an Inventory of Disaster Exposure

The University of Melbourne and the University of New South Wales are seeking support to develop an Inventory of Disaster Exposure. This will be available to researchers and organisations so that the sector has consistent approaches to capturing information about disaster exposure.

People are being exposed to multiple, compounding and cascading disaster events. Not only do most studies of disaster effects look at singular events rather than the lifetime experience of disasters for individuals or communities, the way that disaster exposure is measured is inconsistent and is often idiosyncratic to each study. This lack of a standardised approach to the measurement of exposures makes it difficult to understand the effects of multiple disasters and to compare data sets looking at the long-term results of disasters and perceptions of recovery.

To minimise these challenges, the Inventory of Disaster Exposure will be designed to be used in studies and assessments by organisations. The index would be based on a systematic framework of disaster exposures (e.g. threat, property damage and loss, bereavement, displacement and relocation and disruption). This multi-dimensional approach would support a nuanced assessment of exposure, compared to single item measures that assess general impact. Subsequently, a pool of candidate items (as drawn from existing surveys and/or created anew) would be collected and crafted for subsequent validation and analysis. This would provide a shared base for new information arising from new research topics and emerging issues.

Planning a long-term recovery tracking study

As part of the new *HowWeSurvive* initiative[6] (launching in September 2024), the University of New South Wales is planning a long-term, repeated study across decades to track the progress of recovery. In 2024, we will be inviting ideas about what we need to track. In addition to using the Inventory of Disaster Exposure, we intend to use approaches to data collection that can be compared to existing instruments, such as those used by the Australian Bureau of Statistics; Household, Income Labour Dynamics in Australia and the Regional Wellbeing Survey. Within ethical guidelines, we intend to share de-identified data sets with other researchers to ensure that we can all learn as much as possible from participants and can collectively work to improve outcomes for disaster-affected people.

The field of disaster recovery research is expanding. The methodological know-how already exists to make the needed improvements in data collection and assessment. As consensus around the importance of this grows, we will advance our understanding of patterns of disaster exposure and how different profiles are linked to risk and consequences.

We will work with others to ensure that the evidence base about experiences of long-term recovery is improved to support policy and practice. This includes how we reshape the understandings and practice in recovery, given the escalating challenges communities face.

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AdaptNSW Forum 2023: navigating uncertainty together

Dr Isabel Cornes

Australian Institute for Disaster Resilience

The AdaptNSW Forum was held in December 2023 in Sydney on the lands of the Gadigal of the Eora Nation and attracted more than 350 participants. The forum explored 'navigating uncertainty together' that included subthemes of new narratives, systems transformation, scientific and cultural knowledge and managing risk.

The future is inherently uncertain. However, climate changes and recent consecutive and severe weather events are pushing many individuals, communities, organisations and governments beyond the levels of uncertainty we may previously have been comfortable with. In the forum's opening address, The Hon. Penny Sharpe MP said that the NSW Government had legislated net zero emissions by 2050, along with an emissions reduction target of 70% compared with 2005 levels by 2035.[1] This was a positive opening that highlighted the importance of multi-partisan support for effective action on climate change.

Embracing imagination and creativity

Aligned with the themes of new narratives and systems transformation, the conference program included several interactive workshops and presentations on the critical roles of creativity, imagination and the arts to facilitate reflective and transformational thinking about individual and societal values. Embracing creativity and imagination allows us to consider unconventional or alternative options in planning and implementing future adaptation approaches. It can also give space to consider the needs of 'non-human animals'[2] and ecosystems and how their needs can be embedded in adaptation. While creative activities might seem awkward at first, this discomfort is an important step in working outside of comfort zones to engage differently with complex problems.

The forum encouraged participants to reflect on what climate adaptation means in our professional roles, but also what it means spiritually and emotionally as individuals living in a changing world. With levels of climate anxiety on the rise globally[3], Dr Chloe Watfern explored the psychological implications of engaging with climate change on a regular basis, the importance of mental health and wellbeing, and the role of the creative arts in personal and community resilience.[4]

Disaster risk reduction, climate adaptation and sustainable development

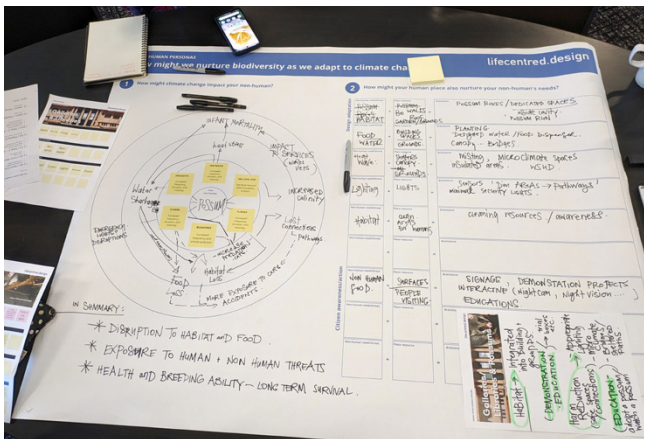
The forum presented a range of extreme events and issues, including the floods in the New South Wales Northern Rivers, the implications of extreme heat in urban areas and the role of bushfire science in bushfire planning. These examples highlight the need to draw out and elevate the interconnections between disaster risk reduction, climate adaptation and sustainable development. The United Nations Global Assessment Special Report 2023[5] states that 'growing inequalities and pressures on the planet… are reversing hard-won development gains'. Thinking about risks systemically[6] shows that the complex challenges of disaster risk reduction, climate adaptation and sustainable development are perpetuated and exacerbated by similar and often the same forces.[7] In turn, the ways society might address these challenges also shares similarities, such as reducing social and economic inequalities, rehabilitating lands and waterways and improving land-use planning and building practices.

The AdaptNSW Forum explored 'navigating uncertainty together'.

Image: Isabel Cornes

What I took away from the forum

It is critical that we navigate uncertainty together. This means embracing moments of awkwardness and seeking out different ways of thinking. It also means continuing to work at building relationships, collaborating and breaking down departmental, sectoral, research and state and territory silos. Finally, the forum also reiterated the importance of improving understandings of uncertainty and how we might better communicate and cope with uncertainty into the future.



Creative activities were an important step in working outside of comfort zones to examine complex problems.

Image: Isabel Cornes

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