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SUPPORTING A DISASTER RESILIENT AUSTRALIA

Driving into floodwater: using data to inform workplace safety

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

Foreword

Rob Cameron OAM
Former Director-General
Emergency Management
Australia

After two and half years as the Director-General of Emergency Management Australia, and several years dedicated to the national effort to manage disasters, this is the final time that I will be writing for the *Australian Journal of Emergency Management*.

The 2019–20 bushfires were unprecedented both in scope and in the number of jurisdictions simultaneously affected over a sustained period. These cumulative bushfire events severely tested the collective national response in terms of resource demands and large-scale resource mobilisation across multiple jurisdictions.

Our emergency services and emergency management agencies are world class. This is continuously displayed. However, in the wake of events of recent years, we need to observe - collectively, calmly, and respectfully - what worked and what did not work over the high-risk weather seasons of 2018–19 and 2019–20. The Royal Commission into National Natural Disaster Arrangements, together with the several state and territory inquiries, will be central to that. Collectively, as a sector, we need to display leadership, learn from the past and ensure that these lessons are applied to reduce the risks we face and to make improvements where we can. This is ever more relevant as we experience the ongoing COVID-19 pandemic.

Over the last couple of years, there have been achievements that are shifting the way we, as a society, are proactively reducing our vulnerability and building our resilience.

Developing the *National Disaster Risk Reduction Framework* was a truly national effort, with representatives across all jurisdictions, government, industry and the community involved. The framework is the foundational document that captures a shared vision to make disaster risk informed decisions and reduce risks within their control. It was endorsed by the then Council of Australian Governments on 13 March 2020.

With a National Action Plan underway to implement that framework, and a commitment of $261 million between the Australian Government and states and territory governments to fund disaster risk reduction initiatives, we can see the determination and unity across all governments to reduce disaster risk and build a more disaster resilient Australia.

The early themes that are emerging from the Royal Commission and the various state and territory reviews of the events of this last summer, are pointing to clear themes: that we need to collectively work together to better understand our risks, to do more to reduce our risks and to collectively share our resources.

With the frequency and intensity of natural hazards forecast to increase, and future high-risk weather seasons to commence earlier, last longer and have more severe impacts on Australian communities, there is an expectation that we can act sooner to protect lives, livelihoods, property and communities.

The *Australian Journal of Emergency Management* acknowledges the contributions of Rob Cameron to emergency management throughout his career and, in particular, during his time as Director-General, Emergency Management Australia. The AJEM Advisory Board also acknowledges outgoing Editor-in-Chief Dr John Bates and AJEM Editorial Advisory Board Chair, Professor John Handmer for their guidance and contributions to the development and enhancement of the journal.

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COVID 19: Australian perspectives

Emeritus Professor Gerry FitzGerald MD FACEM, FRACMA, FCHSM
School of Public Health and Social Work, Queensland University of Technology

The COVID-19 pandemic may be a defining event of the 21st Century in much the same way as the influenza pandemic of 1918 changed a world already tortured by world conflict. Australia's experience may well shape our future and our position in the world.

Throughout history, pandemics have posed the most significant threat to the health and wellbeing of people and to societal functioning. Whether caused by novel viruses such as the Spanish Influenza of 1918, or outbreaks of common pathogens such influenza, tuberculosis, malaria or HIV/AIDS, pandemics have been the most lethal. In addition, the extensive impacts of pandemics on communities is such that they have considerable and often world changing social and economic effects.

The COVID-19 pandemic has realised our worst fears. The SARS Cov2 virus is a novel Coronavirus, which emerged from live animal markets in Wuhan and spread throughout China and out to the rest of the world. While it mostly causes a mild upper respiratory infection, it can induce severe pneumonia associated with adult respiratory distress syndrome that is often fatal. The disease is also associated with long-term morbidity.

This disease is spread by respiratory means. Like other respiratory viruses (e.g. influenza), the expired air of infected people contains the virus either enclosed in water droplets or as viral particles alone. It can spread through direct inhalation of contaminated air or by touching where the virus particle has settled. However, this disease has behaved differently to other respiratory viruses. It adversely affects older people and those with chronic disease. It does not appear to affect children to the extent that other respiratory viruses do. It is not only milder among children but also apparently less likely to infect them at all. Thus, children and schools have not been the significant source of spread that would ordinarily be expected.

The effects of the overall health of populations of COVID-19 remain unclear. Official data collated by the World Health Organization reveals a worldwide incidence of three in 1000 people and one death for every 10,000 people; a case-fatality rate of 3–4 per cent. However, these figures are likely to underestimate the real incidence and overstate the fatality rate. Many countries have reported increased death rates above that expected. Only a portion of these are explicable by diagnosed COVID-19 cases. In Italy for example, additional deaths are twice the number of diagnosed COVID-19 deaths. The additional deaths are either from undiagnosed COVID-19 or from other causes resulting from lost access to health care.

The numbers of cases are likely to be significantly more than those diagnosed. Many countries including the US have been unable to maintain a comprehensive testing regime. Population-level studies based on antibody screening or computer modelling have reported real population incidences much higher than those reported; for Kobe in Japan, over 800 times more and for England and Wales, 28 times more. Best estimates suggest a real-case-fatality rate of around one per cent, which is still ten times that for seasonal influenza. However, the incidence and the fatality rate vary across the world. This is influenced by socio-economic, socio-political and health systems factors along with the effectiveness of community leadership and management.

Within this context, Australia and New Zealand have restrained the incidence and population mortality rate. We were not unprepared. Following experience with SARS, Ebola virus disease and swine flu, enhanced worldwide alerting systems were developed based on the *International Health Regulations 2005*. All countries, including Australia, developed pandemic response plans based on influenza as the most likely cause.

These systems acted to quickly alert nations of the risk. In response, Australia rapidly instituted enhanced border control, physical distancing and personal hygiene measures in accordance with a rapidly developed Coronavirus Response Plan. Australia's large moat enabled the control

of external entry and an extensive testing regime and effective contact tracing. There was also an admirable outbreak of responsible collaboration among levels of government and cohesion among public health advisers.

Stopping the spread of an infectious disease is based on a simple core principle; separating people with the disease from people who are vulnerable.

This requires identifying infected people and those with whom they may have come into contact. It also means immediately isolating those people from others and monitoring to identify whether they have caught the disease. This 'test, track and trace' approach is a core population health strategy. This is complemented by population-level strategies that enhance community-wide physical distancing and personal hygiene to reduce the tracing burden. The 'pandemic paradox' is that the more severe the illness, the easier it is to control. For example, SARS was a very severe illness. If you got it, you knew it and could reduce social interactions that spread the virus. On the other hand, the milder swine flu epidemic in 2009 spread very easily.

The traditional population-level approaches rely on isolating populations with high rates of infection. This is challenging in highly mobile communities and therefore state and territory governments have relied on clearly defined state borders as a means of defining communities. In Australia, this has caused consternation within border communities.

This is not to say that all responses were perfect. There are many lessons to be learnt. However, within the limits of information available at the time, they have proven largely effective. There will always be initial confusion. Until the pandemic plays out, it is not possible to determine its true severity and effects.

There has been a tendency in the public discourse to latch onto single solutions; from wearing masks to ingesting bleach. These measures contribute to breaking virus transmission and their relative contribution to risk reduction is influenced by the social and epidemiological environment.

The fundamental (perhaps existential) challenge is whether the risks of the disease outweigh the impact of measures to stop the spread of the disease. For SARS or Ebola, there is no doubt that they do. On the other hand, the relatively mild swine flu had a case-fatality rate that was probably less than seasonal influenza. COVID-19 is somewhere in between.

All disasters including pandemics have significant health, economic, environmental and social consequences. People have painted Australia's response as a choice between health and economic consequences. This is too simplistic. Economic consequences have health consequences. The most common cause of poor health is poverty. On the other hand, the direct health effects of this disease are significant. If Australia had the death rate of the USA, then there would be 10,000–15,000 deaths. If Melbourne had the death rate of New York City, there would be 10-15,000 deaths in Melbourne alone.

This pandemic will also result in significant social change. The 'age of entitlement' is challenged by this event and this reflected in some of the more outlandish human responses. Perhaps one good outcome will be to revalue social responsibility.

Novel infectious diseases will disappear once the population is no longer vulnerable. This can be achieved by 'herd immunity', acquired either through exposure to the disease or through vaccination. Achieving herd immunity through disease exposure will result in many more deaths. The safest and most effective means of control (a vaccine) has proven challenging. Unlike influenza, there is no effective vaccine for coronaviruses. Indeed, previous attempts to develop a vaccine for MERS and SARS were disappointing and tended to have significant adverse effects. For influenza, we just need to change the strains in the current vaccine. Reports on early stage testing of vaccine candidates is proving promising and, hopefully, will result in the availability of effective vaccines early in 2021.

Because of Australia's relatively low infection and death rates we have not had to face the ethical challenges of other nations. Apart from the population health services, our health systems have not been overwhelmed to a stage that required determination of who can and who cannot be treated. There has also been significant adverse effects for health workers, which potentially reduces health care capacity further. When vaccines emerge, we will need to determine some order of distribution to the world's population. This is overlayed by whether we accept the risk of an unproven product without evidence of a long-term risk profile.

What have we learnt?

Without presuming the outcomes of definitive evaluations, there are emerging issues from which we can learn for future resilience.

1. Our messages need to be clear and consistent particularly in the environment of uncertainty. Much of the confusion has come from the diversity and multiplicity of commentators as well as those informed only by prejudice and delusion. We need to work out ways to control the message and ensure they are resistant to ignorance and delusion.
2. Our supply chains, particularly for health services, have been challenged by a combination of panicked demand and disrupted supply. Our health systems are less resilient than in the past because the emphasis on efficiency has resulted in reliance on just-in-time delivery and has reduced stockpiled resources.
3. It should have been recognised earlier that this pandemic is a disaster that requires national and local disaster management action.
4. We need to quickly identify and deal with behaviours derived from people's stupidity and ignorance that threaten the health and wellbeing of communities.

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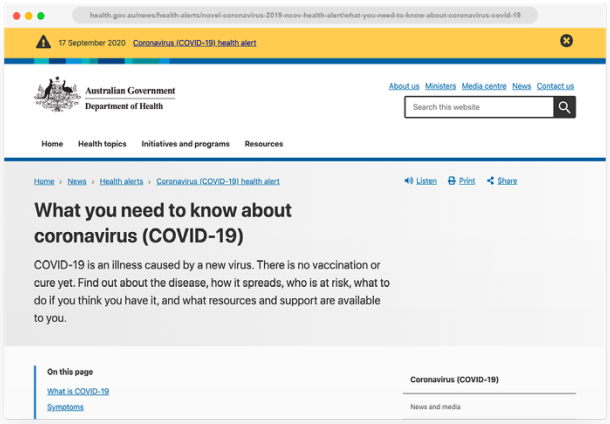


Source: Australian Government Department of Health website.

Where to from here?

Australia has (largely) suppressed the virus. We aspired to elimination while recognising how difficult such a strategy was to sustain. Some say elimination is not practical and we should accept low rates of the disease and restore the economy. Elimination is the best route to economic revival and the states that have achieved elimination are (currently) experiencing mild economic revival. However, the outbreak in Victoria and others around the world demonstrate that such a strategy is not actually possible. We cannot plan for a limited number of cases. The virus's infectivity, and the human behaviours that enable its spread, are impossible to limit. We can only aspire to virus elimination and accept low rates of infection if elimination is not possible.

We need to learn from this event. We need to capture the lessons from the Australia perspective as well as internationally. There is no shortage of science. To date, more than 40,000 articles have been published in the first six months of this year. They speak to better understanding of the disease, but also to the effectiveness of treatment, control and containment methods.

What we can do is capture these lessons and use them to inform public policy and planning. We suggest a think tank to enable this. The emphasis is not on blame but rather to evaluate the extensive research and the experience and to translate that into practical and cost-effective measures. This will help us prepare and make our socio-economic structures and health systems resilient to the challenges of pandemics.

End notes

World Health Organization Coronavirus disease (COVID-19) situation reports. At: www.who.int/emergencies/diseases/novel-coronavirus-2019/situation-reports [17 August 2020].

Mannucci E, Nreu B & Monamia M 2020, *Factors associated with increased all-cause mortality during the COVID-19 pandemic in Italy. International Journal of Infectious Diseases, September, pp.121–124. doi. org/10.1016/j.ijid.2020.06.077*

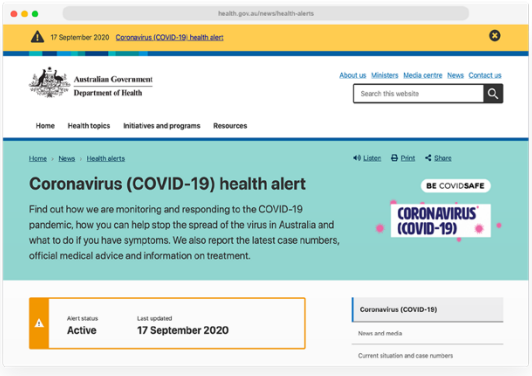
Fenton N, Osman M, Neil M & McLachlan S 2020, *Coronavirus: our study suggests more people have had it than previously estimated. The Conversation, 26 June 2020. At: https://theconversation.com/coronavirus-our-study-suggests-more-people-have-had-it-than-previously-estimated-140996 [1 September 2020].*

World Health Organization *International Health Regulations (2005).* At: www.who.int/ihr/publications/9789241580496/en/.

Coronavirus (COVID-19) health alert

The Australian Government Department of Health website includes easy-to-access and understand information about COVID-19 as well as associated help, resources and latest updates.

Access the departments web site at: www.health.gov.au/news/health-alerts/novel-coronavirus-2019-ncov-health-alert?utm_source=health.gov.au&utm_medium=redirect&utm_campaign=digital_transformation&utm_content=health-topics/novel-coronavirus-2019-ncov.



The unequal burden of disasters in Australia

Professor Mehmet Ulubasoglu
Deakin University and Bushfire and Natural Hazards Cooperative Research Centre

Bushfire and Natural Hazards CRC research has shown that the true costs of disasters are typically greater than what the direct damage estimates suggest.

The project, Optimising post-disaster recovery interventions in Australia, estimated significant income losses for individuals living in disaster-hit areas within the years following natural hazard disasters in Australia. Using four case studies representing different hazard types, in different parts of the country and covering different scales, the research revealed additional costs that would not normally be picked by the direct damage estimates.

For example, according to Deloitte Access Economics (2016), the direct total (tangible and intangible) damages of the 2009 Black Saturday bushfires were $7 billion. However, we found that, following the Black Saturday bushfires, agricultural employees who lived in the fire-ravaged areas lost an average of $8,000 in annual income for the next two years. Employees in the accommodation and food services industries lost an average of $5,000.

This research also found that the burden of lost income as a result of the disasters is not borne equally. That is, the income gap routinely increased after disasters. For example, following the 2010-11 Queensland floods, which were reported to have costed $14.1 billion in direct damages, the difference between those on low and middle incomes in the Brisbane River catchment area increased by about $7,000 a year.

Low-income earners, small-business owners and part-time workers are more likely to lose income following a disaster. Middle and high-income earners, full-time workers and owners of larger businesses are far less likely to lose income; indeed, they might even earn more. This means that disasters resulting from natural hazards can cause the income divide to become larger.

Further, certain demographic groups exhibited lower economic resilience in returning to their pre-disaster income levels in the aftermath of disasters. Following the Black Saturday bushfires, low-income individuals and the female workforce experienced lower income levels that persisted until 2016, seven years after the fires. This contrasts with high-income earners, who despite having lost income in the short term, were able to bounce back to their original income trajectory by 2016. This suggests that the income divide persisted in the medium term.

Methodology

We used the Australian Bureau of Statistics' individual-level, de-identified, longitudinal census data sets[1] from 2006, 2011 and 2016 in a difference-in-differences modelling, where we compared the incomes of people living in disaster-hit areas with those in comparable areas not affected by disasters.

We examined the following disasters caused by natural hazards:

- the 2009 Black Saturday bushfires in regional Victoria
- the 2009 Toodyay bushfire in Western Australia
- the 2010-11 Queensland floods in the Brisbane River catchment
- Cyclone Oswald 2013 in Queensland's Burnett River catchment.

These disasters represented different hazard types (i.e. bushfires, cylones and floods), different severity (i.e. catastrophic, medium scale, and small scale), and different locations (i.e. regional areas, metropolitan areas or a small town).

While there were research limitations related to observing individuals every five years, the

1 This is a confidential and proprietary dataset that is held by the ABS and does not require ethics approval to use, but the project team completed the necessary Microdata Access Training around confidentiality issues.

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anonymised census dataset comprises a five per cent representative sample of the Australian population, providing a significant amount of observations that enable a granular analysis. Also, findings that were common and robust across the different disasters provided additional confidence in the results.

Who loses?

Across most of the disaster types, scales and areas, those most likely to lose income following disasters were employed in agriculture, and accommodation and food services (covering the tourism industry). This effect was almost uniform across all case studies, except for the Toodyay bushfire.

In addition, being employed in disaster-sensitive sectors meant that there were flow-on effects onto certain demographic groups who had a high employment concentration in those sectors. These groups included, low-income earners, small-business owners, part-time workers and sometimes the female workforce.

Who gains?

Post-disaster income losses do not affect full-time workers or higher-income earners nearly as much as others in the affected communities.

Unlike the groups of people who lose, gains are not uniform. It varies by disaster. For example, after the Black Saturday bushfires, those employed in Victoria's public and administrative services benefited most, with their income increasing.

After the 2010–11 Queensland floods, incomes were higher for health and retail employees in the Brisbane River catchment area. Low-income earners lost an average of $3,100 in the year following the floods. Middle and high-income earners earned a higher income of an average of $3,770 and $3,380, respectively, for the same time period.

Relief and recovery funding

Our analysis suggests that the way in which relief and recovery funding is invested may inadvertently contribute to widening the income gap, or at least does not fully prevent the increased divide.

The main reason is how programs are structured. Funding tends to be channelled to businesses, not households. Businesses receive tax deferrals, special disaster assistance grants, back-to-business workshop grants, clean-up operation grants, exceptional disaster assistance and other forms of subsidies.

In the six months following the Queensland floods, for example, just 10 per cent of the recovery spending went to income and wage assistance. At least 80 per cent went to businesses (Chamber of Commerce and Industry Queensland 2011).

Building a more sustainable model

Overall, there is room to rethink how we might build a more sustainable model for disaster recovery.

Local businesses assessing the impacts of the Brisbane floods in 2010–11 on their stock.

Image: Angus Veitch (CC BY-NC 2.0)

It's important to assist businesses because they are arteries of the economy. But four possible improvements to the current recovery funding model could help minimise the widening of the income gap.

First, assistance programs should make it a priority to balance the imperative of short-term aid with the importance of not making inequality worse in the longer term.

Second, funding arrangements need to account for the characteristics of different disasters, and the different patterns of social effects. Not all disasters are the same, but the current funding model tends to treat them as if they are.

Third, programs should account for the greater vulnerability of households that depend on part-time, casual work and other forms of insecure work.

Fourth, programs should acknowledge the susceptibility of different employment sectors. While the Natural Disaster Relief and Recovery Arrangements scheme provides some benefits to the farming sector, other sectors, such as accommodation and food services, can also be hit hard.

Income matters. It shapes all household decisions. With more frequent and extreme weather events predicted, disasters present an increasing threat to social equality and all the benefits that flow from that. It is crucial to ensure relief and recovery efforts do not inadvertently contribute to widening the gap.

End notes

Deloitte Access Economics 2016, *The economic cost of the social impact of natural disasters.*

Chamber of Commerce and Industry Queenssland 2011, *Six Months on from Queensland's Natural Disasters A Report to the Queensland Government.*

Ulubasoglu M 2019, *Optimising post-disaster recovery interventions in Australia. Deakin University and Bushfire and Natural Hazards CRC. At: www.bnhcrc.com.au/sites/default/files/managed/downloads/optimising_post-disaster_recovery_interventions_annual_report_final.pdf.*

Facing fire with foresight: the Community Based Bushfire Management project in East Gippsland

Fiona Macken
Safer Together, Victoria

Reducing risk using community-based and place-based approaches addresses problems that are specific to a location or a community.

The Mallacoota community has been involved in the Safer Together program since 2015. The Community Based Bushfire Management project is part of the Victorian Government Safer Together program. Community members work with a facilitator and take a community development, strengths-based, place-based approach to reduce their bushfire risk. Place-based approaches are favoured by many in the emergency management sector as well as by the Victorian Government. Communities work with agencies such as the Department of Environment, Land, Water and Planning and Victoria Country Fire Authority (CFA) as well as local government to establish connections, learn from one another and determine strategies that reduce bushfire risk at the community level. Around 30 communities across Victoria have participated in the project.

Communities have varied in many ways: in size, demographic profile, bushfire risk, vegetation and ecological profile, fire history, socio-cultural variables and more. Community diversity means a range of risk-reduction strategies have been collaboratively devised by those involved in the project. Some of these communities have experienced bushfire (e.g. Wye River), but none has endured the extreme conditions faced by communities in East Gippsland during the summer of 2019–20. These fires burnt for more than three months and destroyed hundreds of thousands of hectares of East Gippsland vegetation. Multiple communities were exposed to these fires, including Cann Valley communities, Buchan and Mallacoota. All these communities participate in Community Based Bushfire Management project.

Mallacoota residents discuss vegetation management during a visit to bushland in local areas.

Image: Michele Kearns

The program started in 2015 and Mallacoota was one of the first six communities to be involved. In these early days, the facilitator spent much time working on bringing the community together over the issues related to bushfire risk.

Since 2018, the focus for Mallacoota has largely been on the development of a vegetation management plan, particularly for the western aspect of town. The community, working with project agencies and local government, devised a fuel-break plan for this high-risk aspect of the town. This plan took time to devise because the land upon which the break was planned has multiple private landowners who had to be involved to develop the fuel break. At the same time, the community identified that information on insurance was not clear and they organised a seminar on home insurance. Chris Nicholson from Victoria Legal Aid travelled from Melbourne and presented 'After the Fire – Insurance and Rebuilding'. This session provided local residents with vital information related to insurance and

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property rebuilding after a bushfire, including the application process, disclosures, underinsurance and the cost of rebuilding. Some residents who attended the event had not updated their insurance in over 15 years and others had homes with features that would not have been covered by their current policy. Others were worried about being underinsured and attendees asked questions about the crisis aspects of insurance and claiming.

Two weeks after this session, the devastating fires struck.

After the fires, residents who lost everything contacted Chris and thanked him for the session and to tell him that, because of what they learnt, they had increased their insurance and were in a better position to rebuild.

When asked about the value of these sessions and that this information had been requested by the community, Chris said:

Knowledge is power. If people understand how insurance works and what they are dealing with, they are armed with that knowledge, they will know how to protect their assets and they will know what they need to do when a crisis hits. [The talk] was a great example of how the community, the department and different agencies are working together.

Despite the vast devastation caused by the fires in 2019–20, the Mallacoota community has returned to its fuel-break plan development. Despite being in the midst of recovery (and the COVID-19 pandemic), the community recognises that there are still large areas of unburnt, high-risk vegetation surrounding the town and they are determined to see their fuel-break plan come to fruition.

The township of Buchan joined the project in 2019. Residents did not have much time to work with the local Community Based Bushfire Management facilitator to develop any bushfire risk-reduction strategies. They had, however, had discussions and meetings and the relationships and networks proved valuable since the summer fires. Facilitator Gail Cumming said:

While we have not yet had the opportunity to talk about what the community might like to do to reduce their bushfire risk, they do all know each other a lot better, and they know the agency and local government staff a lot better. These relationships have made things easier now that we are in recovery. People know who to turn to, they are happy to pick up the phone and make a call. Everything is so much easier when you know one another.

The Cann Valley includes many small communities, such as Cann River, Combienbar, Club Terrace and Noorinbee, all of which were affected by the 2019–20 fires. Each community is unique and has its own particular needs. Gail is the local facilitator there also and has worked closely with the community, with Bushfire Recovery Victoria and others to determine the community's focus. Prior to the fires, these communities worked with Gail on issues of high fuel loads surrounding the communities, the finer details of the local incident management plan and local Neighbourhood Safer Place options. These discussions brought people together and helped to develop relationships and they also improved the understanding of risk and the fire potential of the area. All of this increases preparedness at the household and personal levels.

In the months since the fires, community members in the Cann Valley have focused on approaches that aid recovery as well as preparedness for future events. Sessions with Dr Rob Gordon, a well-known and well-respected trauma psychologist, presented opportunities for people to share and record their personal stories. There is also work being done by Landcare to restore the land and discussions regarding the rebuilding of community assets have occurred. There are also plans to host 'stay and defend' workshops, which is a CFA education program.

One of the many important issues raised while working with the Cann Valley communities is the needs of the local Indigenous community. Gail teamed with Aileen Blackburn, a local leader of Monero/Yuin descent, to understand what these needs are and how they are included in community-based bushfire management in the area. One of the desires of Aileen and her fellow community members is to see more traditional land care occurring, including cultural burns. This has become one objective for the area. Aileen said:

Our ancestors and Monero descendants of Cann River have long cared for country and continue knowledge of culturally driven fire tools essential for the spirituality and wellbeing of our children, grandparents, women and men's business. The bushfires have shown that the land and people are one, when one is hurt we all hurt. Efforts to improve bushfire preparedness and land management into the future must include substantive meaning Aboriginal decision-making across the entire breadth of land and water management. Far East Gippsland is indeed fire-prone country, but with willingness of all community to work with us, and adopting more culturally appropriate interagency consultation methods, we can use our voice to help and, in doing so, respect our ancestors and this land.

The beauty of approaches like those used in the Community Based Bushfire Management project is the flexibility they offer. No two communities are the same and by allowing time and space for a community approach, unique strategies to reduce bushfire risk can be developed. In East Gippsland, this approach has allowed communities to share their stories, build connections and work collaboratively with others to determine how they would prepare for, and recover from, bushfire.

End notes

Community Based Bushfire Management in Victoria. At: https://knowledge.aidr.org.au/resources/ajem-october-2019-community-based-bushfire-management-in-victoria/.

Victorian Government Place Based Approaches. At: www.vic.gov.au/framework-place-based-approaches/place.

Bushfire Recovery Victoria. At: www.vic.gov.au/bushfire-recovery-victoria.

Planning for COVID-19 safe aerial firefighting operations

Leone Knight
Australian Institute for Disaster Resilience

The fires scars of 2019–20 are etched into the collective memory and landscape of Australia. Never had we burned so ferociously, mobilised the scale of firefighting resources and attracted the relentless glare of the national and international media. Images of the Erickson Air-Crane and large air tankers dropping their crimson payloads from the heavens loomed large.

Our leaders were asked uncomfortable question about climate change and our preparedness for this foreseeable emergency.[1,2] The National Aerial Firefighting Centre (NAFC) received a funding injection.[3] Devastated communities wanted answers.[4] In the ashes of the Black Summer, the Royal Commission into National Natural Disaster Arrangments arose to examine critical issues, in large-scale emergencies.[5]

It is against this backdrop of heightened agency, community and political interest, that the COVID-19 pandemic has emerged, to complicate planning and operations for 2020–21.

NAFC General Manager, Richard Alder, said, 'If we have collectively learnt nothing else from the 2019–20 bushfire season, it is that we need to plan for the worst!'

Queensland has taken delivery of the Q400, an advanced emergency response large air tanker.

Image: Conair

The role of NAFC

NAFC facilitates the coordination and procurement of firefighting aircraft on behalf of the states and territories. NAFC plays a crucial role in facilitating the sharing of aerial resources between Australian agencies and in the development of national protocols and systems for aerial firefighting. For the 2020–21 season, NAFC continues to consult with the aircraft operators, alongside jurisdictional, federal and aviation authorities, to facilitate COVID-19 safe planning and operations.

The demand for aerial firefighting resources

NAFC and state and territory agencies are planning for the possibility that COVID-19 considerations may place extra demands on aerial firefighting assets for the 2020–21 season. A heightened emphasis on rapid initial aerial attack may assist in reducing reliance on ground crews and minimise the time in COVID-19 exposure environment. It also factors in the potential difficulties for deploying ground crews generally and possible constraints on accessing surge capacity from other jurisdictions, due to cross-border travel restrictions.

Effectiveness and responsiveness of aerial assets

The effectiveness and responsiveness of aerial assets in the COVID-19 environment may be limited to some degree. They may be less mobile as risk-mitigation plans may require return-to-home-base

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Inside the Q400MR a firefighting aircraft that can carry 10,000 litres of water or retardant.

Image: Conair

to reload and refuel, and maintenance crews may be operating under COVID-19 constraints. There could be interruptions to ground support, such as retardant loading and refuelling. Access to surge capacity through 'call-when-needed' aircraft may reduce and access to additional large air tanker resources at short notice would be unlikely.

Pandemic risk mitigation

A small portion of the national fleet is sourced from the northern hemisphere requiring movement across national and jurisdictional borders. To maximise the safety of operating in the COVID-19 environment, NAFC is consulting with contracted suppliers, and federal, jurisdictional and aviation authorities. NAFC and state and territory agencies have identified key areas of risks to manage that include:

- establishment of services - getting the aircraft and crews in place for the season, including transit from overseas and interstate
- safe operations in place - minimising the risk of disruption to services and ensuring business continuity arrangements for service disruption, including isolating crews to reduce any infection risk
- resource sharing - building on existing protocols and procedures for sharing resources between jurisdictions or (or regions, where regional restrictions are in place)
- additional resourcing - identify and source other aviation resources that may be required for the season
- contract management and administrative issues - such as contract exemptions, impacts on the cost of providing services, notice periods.

Risks are currently being addressed through stakeholder collaboration and cooperation. Parties will have plans for aviation operations under COVID-19 restrictions during the 2020–21 severe weather season.

Bombardier Q400 water-bombing aircraft arrives in Australia

Detailed planning was undertaken to enable the mobilisation to Queensland of the Bombardier Q400 water-bombing aircraft. The arrival of the Canadian aircraft into Australia had its challenges, due to COVID-19 travel and quarantine restrictions. The Australian operator of the plane, Victorian-based Field Air, worked with its Canadian partner and Australian and International government agencies to ensure its timely arrival.

The flight path included a stopover in the Solomon Islands on 23 August. The Solomon Islands Government supported a request from the Australian Government to enable the aircraft to refuel and the two Canadian pilots to rest overnight, under tightly managed infection control protocols. The Q400 arrived into Brisbane for customs clearance on 24 August and flew to Bundaberg on the same day.

The crew was tested for COVID-19 on arrival in Brisbane and returned a negative result on 26 August. They operated in an isolation bubble for 14 days and were only permitted to move under Queensland Fire and Emergency Services (QFES) escort between their accommodation, the airbase and the aircraft.

At the Bundaberg airport, the crew could undertake routine maintenance and servicing of the Q400. They used a side entry to the airport, did not enter or transit through the terminal, and their office space was away from other airport staff. The

Extensive use was made of aerial firefighting resources during the 2019–20 bushfire season.

Image: Wayne Rigg

crew used face masks and maintained social distancing when interacting with QFES officers.

As the Q400 water-bombing aircraft is a large air tanker[6], it operates in the field with a smaller TC690 supervision plane and the pilot from Victoria was granted access to Queensland under essential worker provisions. The TC690 arrived in Bundaberg on 27 August and the pilot was quarantined and tested for COVID-19. The pilot was released after receiving a negative result on 29 August and cleared to commence duties.

The Q400 crew were required to socially isolate before commencing service on 1 September but remained in their isolation bubble for the full 14 days until 7 September. They were subject to the same social and work COVID-19 safe requirements as all Queenslanders.

International and national cooperation a critical success factor

The journey of the Q400 from Canada to Australia required the cooperation of different authorities not usually involved in processing arriving international firefighting aircraft. Collaboration between the Solomon Islands Government, Emergency Management Australia, the Department of Foreign Affairs and Trade, QFES and Queensland Health was a critical success factor in delivering the Q400 to Queensland in a COVID-19-safe operation.

In this climate of heightened interest in aerial firefighting, the COVID-19 pandemic has emerged to complicate planning and operations for 2020–21. NAFC has consulted widely and has predicted increased demand for aerial assets, identified risks requiring mitigation and areas of increased operational challenges. NAFC and states and territory agencies are actively working with contracted suppliers, and federal, jurisdictional and aviation authorities to play their part in supporting a COVID-19 safe 2020–21 bushfire season.

End notes

1 Bushfire and Natural Hazard CRC Australian Seasonal Bushfire Outlook. At: www.bnhcrc.com.au/hazardnotes/63#:~:text=The%20Australia%20Seasonal%20Bushfire%20Outlook,Natural%20Hazards%20CRC%20and%20AFAC.

2 Emergency leaders for Climate Action: At: www.climatecouncil.org.au/wp-content/uploads/2019/04/fire-chiefs-statement-pages.pdf.

3 NAFC received an $11 million funding boost in January 2020 from the Australian Government.

4 Hasham N 2020, *Making sense of Australia's bushfire crisis means asking hard questions – and listening to the answers. The Conversation. At: https://theconversation.com/making-sense-of-australias-bushfire-crisis-means-asking-hard-questions-and-listening-to-the-answers-129302*. https://theconversation.com/making-sense-of-australias-bushfire-crisis-means-asking-hard-questions-and-listening-to-the-answers-129302

5 Royal Commission into National Natural Disaster Arrangements interim report at: https://naturaldisaster.royalcommission.gov.au/.

6 The Q400 is one of the most advanced fixed-wing large air tankers in the world and can drop 10,000 litres of water, foam or retardant. 2020 was the first time a Q400 had been operational in Australia and the first time a large air tanker has been based in Queensland.

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Injecting primary care into disaster health management

Dr Penelope Burns[1,2]
Dr Kaitlyn Watson[3]
Dr Elizabeth McCourt[4]

1 Australian National University
2 Western Sydney University
3 University of Alberta
4 Redland Hospital

The World Association for Disaster and Emergency Medicine (WADEM) Primary Care Special Interest Group (SIG) brings together researchers, educators, health practitioners and management personnel with interest and expertise in primary care during disasters.

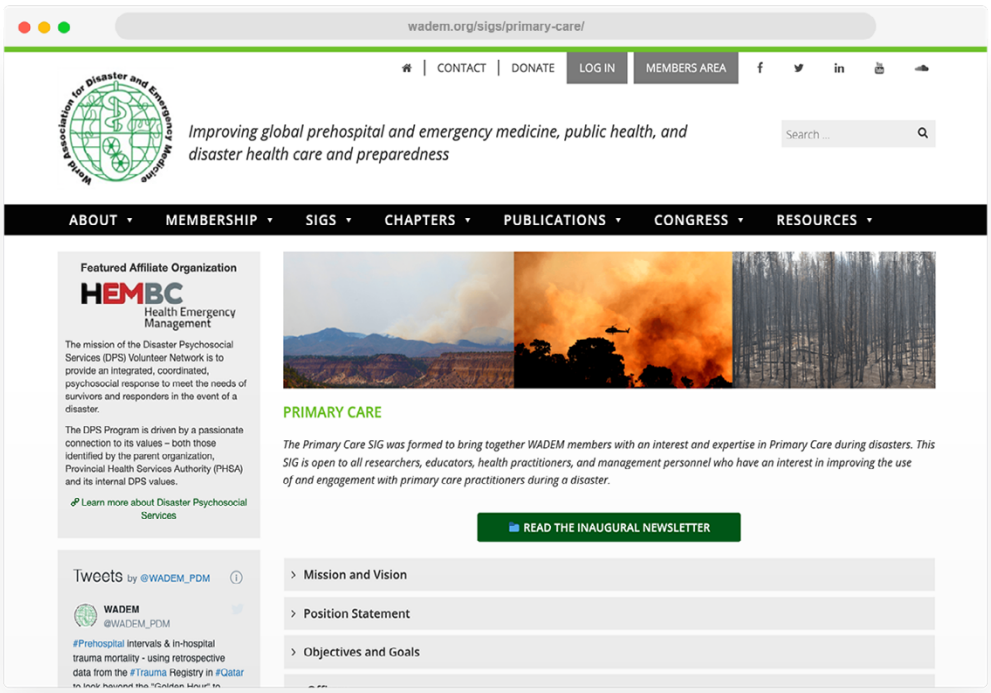
The SIG was created after the 2019 WADEM Congress, where the inaugural 'Primary care in disasters' stream attracted primary care professionals from around the world. During this congress, general practitioners, nurses and pharmacists mixed with other disaster health responders and professionals to discuss better integration of local primary care health practitioners at the planning, preparing, responding and recovering phases of emergency events.

The group discussed examples of primary care at the 2019 WADEM Congress from the Nepean Blue Mountains Primary Health Network in NSW that launched a new *Emergency preparedness guide for Primary Health Networks and others supporting the local General Practitioner Response during emergencies*. The Canterbury Primary Response Group from New Zealand provided an outline of their extensive preparedness and response activities during the 2009 H1N1 pandemic as well as the response to the 2010 and 2011 earthquakes and the Christchurch Mosque shootings. From the Pacific Region, the Pasifika Medical Association presented their approach to integrate primary care in disaster planning.

The WADEM SIG facilitates the global exchange of information, experiences and strategies to strengthen healthcare provision so all levels of healthcare can effectively work together at a time when communities need it most. The group formed at a time when the world was experiencing its first stages of the COVID-19 pandemic. COVID-19 puts primary care in the frontline of the pandemic without adequate integration in pandemic response plans. This failure for primary care to be adequately integrated resulted in rapid adaptations that could have been better planned, discussed, and addressed in the earlier planning phases or even before the pandemic struck.

Dr Kaitlyn Watson and Dr Elizabeth McCourt at WADEM Congress and the launch of the Primary Care Special Interest Group.

Image: Dr Penelope Burns



WADEM website.

In Australia, two million consultations with general practitioners and 1.5 million presentations to pharmacists occur every week. This interface with the public puts primary care professionals in the frontline for surveillance and early identification of cases. People usually present with symptoms that could be clinically indistinguishable from seasonal influenza, rhinovirus (common cold) or hay fever. Thus, first contact triage and management is critical to the overall response to a pandemic.

In the current climate of stressed and strained health care professionals and working conditions, medical groups, including primary care groups, have freely shared their resources and experiences to assist in the global response. This helps to decrease the duplication of effort at a time of limited human resources. In particular, the Canterbury Primary Response Group experience of general practitioner respiratory clinics used in New Zealand during the 2009 H1N1 pandemic has been a contribution to our understanding in Australia where these clinics have not previously been used.

The newly launched WADEM Primary Care SIG will be a significant facilitator for support to primary care practitioners facing challenges during emergency events and an active advocate for greater integration of primary care into health management. The group will also provide up-to-date evidence-based online resources on their website for delivering and managing primary care during disasters. The SIG provides quarterly newsletters on primary care matters relating to disaster events and podcasts that are all accessible and on the website. The SIG will hold a 'primary care' stream at each biennial congress; the first official one being held in Tokyo at the WADEM 2021 congress. The WADEM Primary Care SIG invites others interested in disaster primary care to join the SIG and contribute to the discussions.

End notes

Wentworth Healthcare n.d., *Planning for Disaster Management. An emergency preparedness guide for Primary Health Networks and others supporting the local General Practitioner Response during emergencies. At: www.nbmphn.com.au/Resources/About/268_0618-DisasterPlanning_F.aspx.*

Royal Australian College of General Practitioners 2019, *General Health of the Nation 2019. At: www.racgp.org.au/FSDEDEV/media/documents/Special%20events/Health-of-the-Nation-2019-Report.pdf.*

The Pharmacy Guild of Australia n.d., *The nature, extent and impact of triage provided by community pharmacies in Victoria. At: http://6cpa.com.au/wp-content/uploads/The-Nature-Extent-and-Impact-of-Triage-Provided-By-Community-Pharmacy-in-Victoria-Full-Final-Report-.pdf.*

Join via the website: https://wadem.org/sigs/primary-care/.

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Sharing knowledge to put disaster risk reduction in action

Melissa Matthews
Australian Institute for Disaster Resilience

Australian Disaster Resilience Conference presents Knowledge Week was hosted online in August, exploring the theme of 'Disaster Risk Reduction in Action: Pathways to Success'.

Since the release of the *National Disaster Risk Reduction Framework* in 2019, Australia – and the world – has been faced by overwhelmingly large and complex threats.

The devastating Black Summer took hold in the context of Australia's warmest and driest year on record, sparking a climate change debate that raged in tandem with the fires themselves. And, as the fire risk started to wane, COVID-19 risk began to grow and emerge as a very different emergency.

Conference keynote speaker Alice Hill, told delegates, 'This year will be one for the history books. As we see more events occurring at once it's proving that our old method of doing things where we assume that there will be one fire, one hurricane, one tropical cyclone, simply does not hold going forward. And that means we need to look ahead, plan ahead and be better prepared.'

Alice Hill spoke extensively about the impact of climate change on disasters, emergency management and resilience. She highlighted that living in an age of consecutive, concurrent and compounding disasters requires a rethink on how we do things at a very fundamental level.

'With climate change, everything is historic. The worst storm that we just had maybe not the worst storm going forward. In all likelihood, it won't be,' she said, speaking to the need to plan for and incorporate record breaking risks in strategic and operational planning, system redundancy and mutual aid arrangements.

The four themed days of the conference looked at: collaborating for impact, local leadership, community creating change and business fostering resilience. Speakers from government, academia, business, the not-for-profit, community and eduction sectors shared leading examples and research.

Key issues addressed were:

- new partnerships, frameworks and approaches for disaster risk reduction and resilience in both high-level policy and strategy environments and the community-facing arena
- inclusive approaches to risk reduction and preparedness that respect, draw on and support communities
- lived experience informing community action, spontaneous volunteering and effective recovery
- leadership, decision-making and data availability
- reducing risk via targeted collaborations at the interface of insurance, business and community needs.

The conference included the launch of the *Community Engagement for Disaster Resilience Handbook*, Disaster Resilient Australia-New Zealand School Education Network National Forum and a virtual afternoon tea hosted by the Australian Disaster Resilience Network.

The task at hand is harnessing the knowledge shared and guidance available to take individual and collective action to reduce disaster risk and strengthen resilience.

Recent history has brought forward events that are unprecedented, but not unforeseeable. Our world is interconnected and the cascading impacts of hazards on health, society, the economy, the environment and financial and political systems has never been more evident than in 2020. There is a compelling case for broad-ranging efforts to put disaster risk reduction into action, and people's lives and livelihoods are at the heart of it.

View conference presentations and proceedings at www.knowledge.aidr.org.au/collections/australian-disaster-resilience-conference.

Developing disaster leaders for contemporary times

Associate Professor David Parsons
Charles Sturt University and Crisis Management Australia

In 2017, the New Zealand Government completed its review of the country's emergency response capabilities. The review was to make sure New Zealand's emergency response capabilities and frameworks are well placed to meet future challenges.

As a result of the review, the New Zealand Government commissioned a revolutionary change to the capabilities required for response and recovery leaders. The previous command-and-control style of training is no longer adequate.

Massey University established a consortium of New Zealand and Australian education specialists to form Response and Recovery Aotearoa New Zealand (RRANZ) with a charter to build and improve the capabilities of leaders in response and recovery roles. RRANZ programs focus on the contemporary leadership capabilities needed to lead multi-agency responses and recovery operations, particularly in novel situations.

The program commenced in 2019 and covers VUCA (Volatile, Uncertain, Complex and Ambiguous) environments, network leadership principles, leading through influence, working in effective partnerships with Māori communities, creating good decision-making environments, creating high-performing teams, the ethical base for decisions, social licence, psychosocial impacts of disasters, community leadership and managing self and others in high-stress environments.

The program consists of online interaction and virtual discussion forums combined with an intensive face-to-face block. A key component of the face-to-face block is daily simulations with teams working on complex and novel disasters. A specialist coach observes the teams and conducts reflective coaching sessions. Participants learn to use tools and techniques they can apply in multi-agency response and recovery operations. Through reflective practice and coaching, participants explore ways to improve their leadership potential.

Across the ditch in Australia, the Australian Institute for Disaster Resilience (AIDR) worked with Queensland Disaster Management Training Command to develop a suite of master classes on leadership capabilities in emergencies in Australia (see Zsombok J 2019). AIDR teamed with The Learning Organisation and Crisis Management Australia to establish three master classes covering topics of high-consequence decision-making, leadership in crisis, disaster and adversity and coordinating teams operating in disaster.

AIDR collaborators, Dr Christine Owen and David Parsons, are currently independently developing a new master class, 'Leading in Uncertain Times'. The master classes provide participants with insights into their personal leadership approach and they walk away with practical tools they can adopt to improve their leadership performance.

And in Canada, the Centre for Applied Disaster and Emergency Management at the Northern Alberta Institute of Technology recently launched their comprehensive Crisis Management Program.

New and returning disaster threats are highlighting the nature of society as a complex adaptive system. Developing contemporary leadership capabilities to lead effectively in the current context is of the highest importance.

End notes

Zsombok J 2019, *Queensland's leadership and crisis management education, Australian Journal of Emergency Management, vol. 34, no. 4, p.13.*

Crisis Management Program. At: www.nait.ca/nait/continuing-education/programs/crisis-management-essentials-certificate.

For more information: New Zealand: Dr Tracy Hatton, tracy.hatton@resorgs.org.nz, Canada: Josh Bowen, CADEM@ nait.ca, Australia: Dr Christine Owen, christine.owen@learningorg.com.au and David Parsons, dparsons@csu.edu.au.

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Our World Our Say: young Australians speak up on climate change and disaster risk

Brigid Little
Australian Institute for Disaster Resilience

Throughout August 2020, young Australians communicated the results of a national survey on their experiences, perspectives and priorities for action, related to climate change and disaster risk.

We want to be ready for when disasters strike through greater preparedness, and we want to reduce the intensity and frequency of disasters through climate action. We know that on our current trajectory disasters will come thicker and faster. We want to know how to plan, prepare and protect ourselves and our communities in an increasingly unsafe world.

Source: Our World Our Say: National Survey of children and young people on climate change and disaster risk

Gathering the data

From February to April 2020, approximately 1500 young Australians (10 to 24 years old) completed the online survey, conducted alongside similar youth surveys across the Asia-Pacific region. The Australian Institute for Disaster Resilience (AIDR) and World Vision Australia led the design and implementation of the survey, supported by partnering organisations, UNICEF, Oaktree, Save the Children, Plan International Australia and the Australian Red Cross.

In June, a youth advisory panel analysed the survey data and contributed to the development of the survey report. The panel members, selected from more than 80 applications, hailed from rural and urban locations across the country and were broadly representative of different ages, genders, cultural backgrounds and abilities.

Supported by AIDR and World Vision, the youth panel members participated in two online workshops, group and independent data analysis tasks, as well as reviewing and editing the formal survey report. These activities aligned with the 2020 focus on youth voice and participation championed by the AIDR Education for Young People Program and the Disaster Resilient Australia-New Zealand School Education Network (DRANZSEN).

Messages and calls to action

The survey data indicated concern about the far-reaching impacts of climate change and specific concerns about climate-related disaster risk:

- 78 per cent of respondents reported being 'concerned' or 'very concerned' about climate change.
- 83 per cent of respondents recognised a connection between climate change and natural hazards.
- 73 per cent of respondents reported being 'concerned' or 'very concerned' about experiencing a disaster.

Participants identified transitioning away from fossil fuels, listening to scientists and improving the management of land and water as their top three priority areas for action by the government to address climate change. To reduce the risk of disaster, younger respondents identified accessibility of evacuation centres, continuity of essential services and community education as priority areas for government action.

Natural hazard education and disaster resilience

The survey posed several questions about respondents' lived experiences of natural hazards, recollections from the classroom and the content they value most to understanding and address disaster risk.

These questions revealed a disconnect between the hazards that young learners have experienced and the hazards they encounter through formal education. Young people were most likely to have learned about earthquakes (76 per cent) although far fewer had experienced an earthquake themselves (8 per cent). In contrast, they were most likely to have experienced extreme heat (63 per cent), but less likely (42 per cent) to have learned about it in school.

It is interesting to note how closely the priorities for learning identified in the survey reflect national priorities related to disaster risk reduction and resilience. This alignment is evident despite low awareness of the *National Disaster Risk Reduction Framework* (14 per cent) and the *Sendai Framework for Disaster Risk Reduction 2015–2030* (5 per cent) among participants. Young people are embracing a vision of education that enables them to plan, prepare, respond and recover from hazard events, and to play a role in prevention and mitigation of risk from a young age.

Table 1: Perspectives on natural hazard education from the youth survey report.

What do you think are the most important things young people need to learn about natural hazards and the risk of disasters? (Top 5)	
73%	How to plan and prepare for natural hazards and disasters
70%	How to care for themselves and others if their community experiences a natural hazard or disaster
69%	Where to access emergency warnings and alerts
66%	The actions children and young people can take to prevent or reduce the impact of natural hazards and disasters
64%	The causes of natural hazards and disasters
When you studied natural hazards, did you learn about...? (Top 5)	
72%	The causes of natural hazards and disasters
54%	The potential impacts of natural hazards and disasters on your community
48%	The influence of climate change on natural hazards and disasters
45%	The types of natural hazards that could affect your community in the future
45%	How to plan and prepare for natural hazards and disasters

Youth voice: providing a platform

With this report, we aim to amplify the voices of young Australians and invite decision-makers to engage with us in developing solutions for a resilient and sustainable nation.

Source: Foreword - Our World Our Say: National Survey of children and young people on climate change and disaster risk

A commitment from the partnering organisations to children's rights to protection and to participate in decision-making that affects them, drove the process of engagement with young people leading to the publication of the survey report. This commitment continues and has facilitated opportunities for youth panel members to share the findings of the report alongside their own unique stories and perspectives.

Youth panellist Tara Tolhurst, a 20-year-old student from Newcastle, shared her experiences of bushfire, flood and drought in the *Sydney Morning Herald*. In the article, Tara spoke about the mental health effects of living through disasters and the lack of classroom learning about climate-related disasters in the Australian context.

Natalie Dajkovich and Ashley Wild, university students from Canberra and Melbourne, respectively, led a session at AIDR's ADRC20 Knowledge Week, presenting the survey report to around 170 participants. The recording of this session has attracted attention on AIDR's YouTube playlist.

After Natalie and Ashley's powerful online presentation, the Hon. David Littleproud MP, Minister for Agriculture, Drought and Emergency Management, agreed to take part in an evening webinar. The survey findings were introduced to a new audience and provide an opportunity for dialogue between the Minister and youth panel members. Alexander Matters, Grace Lewis, Halima Bhatti, Maddison Canteri, Piper Blake and Riley Curtain joined Ashley for this webinar.

Maddison, a 17-year-old student and climate activist, from Cairns, shared her experiences of learning about tropical cyclones using data from the Philippines, rather than locally relevant data from cyclone-prone North Queensland. Like many of the survey respondents, Maddison is not just calling for action from the government or powerful interest groups but is also demonstrating her commitment to safe and sustainable communities through her actions. Maddison works as a volunteer for the Queensland State Emergency Service.

The webinar was a great show of determination from the youth panel members who made themselves available, planned their contributions and liaised with facilitators from AIDR and World Vision at two days' notice. We can honour their contribution to the national conversation on climate change, disaster risk reduction and resilience by championing youth voices in strategic planning and acting on the recommendations of these intelligent, informed and committed young leaders.

Information about this study is at: www.aidr.org.au/media/7946/ourworldoursay-youth-survey-report-2020.pdf and www.aidr.org.au/media/7967/youth-survey-report_messages-to-government_2020.pdf.

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How new modes of storytelling engage Australians in disaster preparedness and long-term resilience

Emma Morris
Australian Broadcasting Corporation

In 2020, the ABC launched Your Planet, a season of stories exploring the environment and climate challenge. The ABC TV three-part series Big Weather (and how to survive it), presented by Craig Reucassel, is a centre piece of content.

The series highlights how people can prepare for and survive frequent extreme weather events. Mt. Resilience is an augmented reality (AR) experience developed to accompany Big Weather as part of the impact strategy.

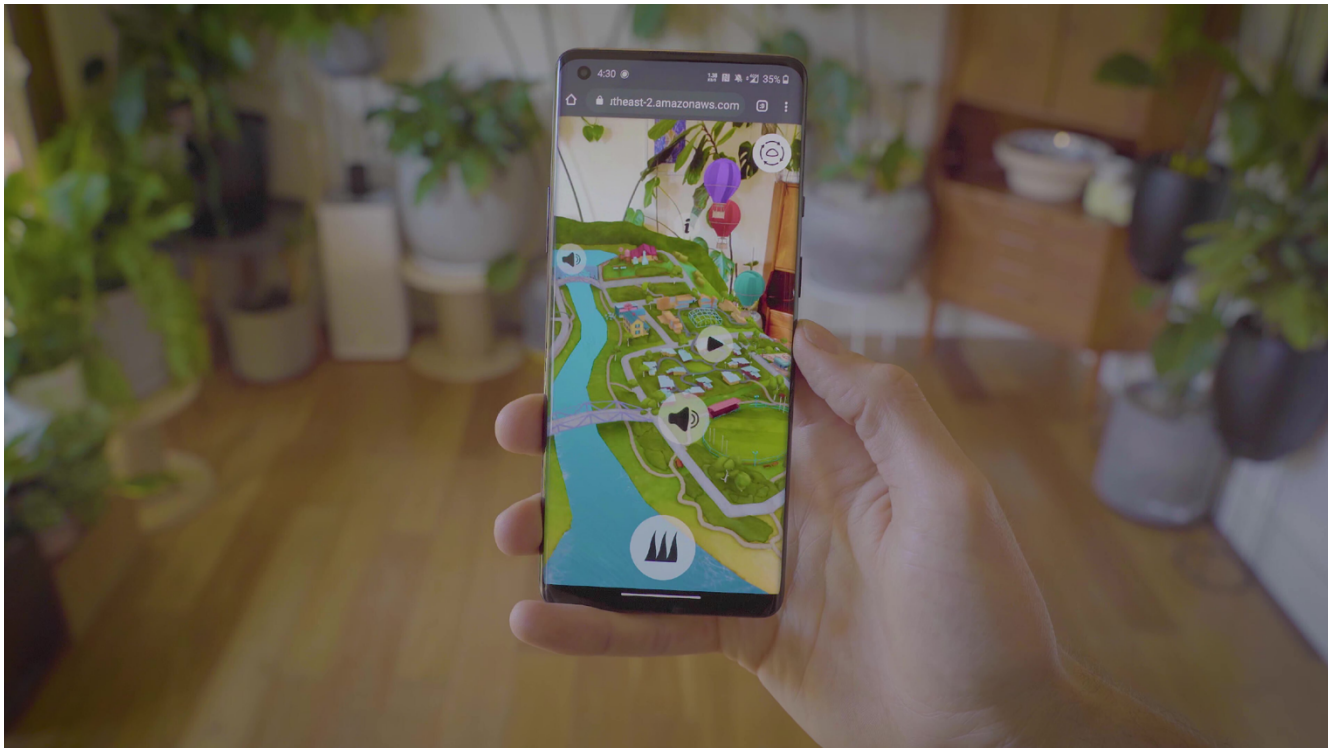
Mt. Resilience entices audiences to explore a vibrant regional town in AR via their mobile phones. Intricate 3D modelling brings the town to life as you discover how its residents survive and adapt to bushfires and severe storms.

Augmented reality is an experiential storytelling medium that layers digital content over a real-world environment. The use of webAR skyrocketed in 2020, emerging as a popular tool for marketing campaigns. WebAR makes AR experiences more accessible to mainstream audiences as the experience is delivered instantly to mobile devices through a web browser rather than via an app. Audiences can open Mt. Resilience via a live link or QR code.

Mt. Resilience illustrates complex concepts in engaging, colourful and fully immersive AR sequences. A 2018 study found that AR experiences delivered almost double

Mt. Resilience

Image: Australian Broadcasting Corporation



Mt. Resilience is an augmented reality experience developed to accompany *Big Weather.*

Image: Australian Broadcasting Corporation

(1.9 times) the levels of engagement compared to their non-AR equivalent.[1] As the ABC team pitched the project at the start of 2020, Google had measured a 25-times increase in the use of WebAR.

The ABC team and XR studio PHORIA developed Mt. Resilience to combine creative and scientific approaches to experiential storytelling. The full team included CSIRO and Bureau of Meteorology (BOM), Indigenous organisations, over 35 experts from various fields and people who had experienced extreme weather firsthand.

The ABC consulted extensively with the BOM to ensure the stylised AR experience was scientifically correct and reflective of real-world weather events and weather phenomena. Indigenous artist Blak Douglas helped the team visualise Indigenous concepts and also played Yidaki[2] on the sound track.

The overall story of Mt. Resilience and the solutions presented for individual extreme weather events were rigorously interrogated by leading experts and a core team of CSIRO scientists. Resilience is a complex problem, which was why it was imperative to include a broad range of opinions and real-world experiences in the overall narrative. Throughout the development process, workshops and consultations were held to inform the direction of the content, the design of the town and the stories to be told.

Using immersive media to tell the Mt. Resilience story was paramount to the team. The biggest challenge was tackling a nuanced story about complex topics while pioneering a relatively new form of experience in WebAR.

The team hopes the experience will be a relatable and positive conversation starter that provides insight into a world where we have learnt to adapt to extreme weather and have made the necessary changes to live with a changing climate.

End notes

1 Andrew H 2018, www.zappar.com/blog/how-augmented-reality-affects-brain/.

2 Yidaki is an Aboriginal word for didgeridoo in eastern Arnhem Land in the Northern Territory.

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Australian reviews and inquiries into the natural disasters of the 2019–20 summer

Emeritus Professor Frank Archer
Dr Caroline Spencer
Dudley McArdle
Dr Suzanne Cross
Monash University Disaster Resilience Initiative

Following the extensive bushfires in the 2019–20 summer, Australia has established a number of reviews and inquiries at the national, state and territory levels. Most of these reports will be published in the months ahead.

The list detailing the current reviews and the URL link to reports are provided in three sections:

- previous reviews and inquiries into Australian bushfires
- selected analyses of the 2019–20 summer bushfire season (Table 1)
- government-led reviews and inquiries (Table 2).

Previous reviews and inquiries into Australian bushfires

- Bushfire and Natural Hazards Cooperative Research Centre: Disaster Inquiries Database 2019 provides an extensive collation and analysis of over 300 reviews and inquiries of bushfires in Australia. At: www.bnhcrc.com.au/news/2019/inquiries-housed-database.
- Cole L, Dovers S, Eburn M & Gough M2017, *Major post-event inquiries and reviews: review of recommendations*. At: www.bnhcrc.com.au/publications/biblio/bnh-4392. This provides a structured review and analysis of recommendations from previous Reviews / Inquiries of bushfires in the Australia.
- Royal Commission into National Natural Disaster Arrangements 2020, Background Paper: Australian inquiries and reports concerning natural disasters. At: https://apo.org.au/sites/default/files/resource-files/2020-05/apo-nid303949.pdf.
- NSW Rural Fire Service Library, Bush Fire Post Event Reviews and Inquiries. At: http://nswrfs.intersearch.com.au/cgi-bin/koha/opac-showpage.pl?pageid=Bush+Fire+Post+Event+Reviews.
- Forrest Fire Management Victoria, Previous Reviews and Inquiries. At: www.ffm.vic.gov.au/history-and-incidents/reviews-and-inquiries.
- Australian Government, Senate Committees. Previous bushfire inquiries. At: www.aph.gov.au/Parliamentary_Business/Committees/Senate/Former_Committees/agric/completed_inquiries/2008-10/bushfires/report/c02.

Table 1: Selected analyses of the 2019–20 summer season.

Jurisdiction	Review body	Report title	Numbers of recommendations
Nil	Peer-reviewed journal paper	• Filkov AI, Ngo N, Matthews S, Telfer S & Penman FD 2020, *Impact of Australia's catastrophic 2019/20 bushfire season on communities and environment. Retrospective analysis and current trends, Journal of Safety Science and Resilience, vol. 1, issue 1, September 2020, pp.44–56. At: www.sciencedirect.com/science/article/pii/S2666449620300098.*	Nil
Nil	Peer-reviewed journal paper	• Arriagada NB, Palmer AJ, Bowman DMJS, Morgan GS, Jalaludin BB & Johnston FH 2020, *Unprecedented smoke-related health burden associated with the 2019–20 bushfires in eastern Australia, Medical Journal of Australia, published online: 23 March 2020. doi: 10.5694/mja2.50545*	Nil
New South Wales	Climate Council of Australia	• Hughes L, Steffen W, Mullins G, Dean A, Weisbrot E & Rice M 2020, *Summer of Crisis, Climate Council of Australia Limited. At: www.climatecouncil.org.au/wp-content/uploads/2020/03/Crisis-Summer-Report-200311.pdf.*	34-page review
New South Wales	Grattan Institute	• Duckett S, Mackey W & Stobart A 2020, *The health effects of the 2019–20 bushfires Submission to the Royal Commission into National Natural Disaster Arrangements. Grattan Institute. At: https://grattan.edu.au/wp-content/uploads/2020/04/Grattan-Institute-submission-to-Royal-Commission.pdf.*	18-page review

Table 2: Government-led reviews and inquiries into the 2019–20 summer bushfire season.

Jurisdiction	Review body	Report title	Numbers of recommendations
National	Royal Commission into National Natural Disaster Arrangements	• Royal Commission website (https://naturaldisaster.royalcommission.gov.au/). • Royal Commission Interim Observations (https://naturaldisaster.royalcommission.gov.au/publications/interim-observations-1). • No recommendations, released 31 August 2020. • Draft propositions by Counsel Assisting, released 3 September 2020 (https://naturaldisaster.royalcommission.gov.au/publications/draft-propositions). • Final report expected 28 October 2020.	Five background papers Four issues papers Submissions available online
National	Senate Finance and Public Administration References Committee	• *Lessons to be learned in relation to the Australian bushfire season 2019-20.* At: www.aph.gov.au/Parliamentary_Business/Committees/Senate/Finance_and_Public_Administration/Bushfirerecovery. • Submissions and public hearings closed. • Report scheduled by the last sitting day of the Parliament in 2021.	Submissions and public hearings available online
Queensland	Inspector-General Emergency Management, Queensland	• *Queensland Bushfires Review 2019–20, Report 2: 2019–20.* Released 20 February 2020. At: www.igem.qld.gov.au/queensland-bushfires-review-2019-20.	72-page review of progress on recommendations from the 2018 bushfires in Queensland
New South Wales	Independent, State Government appointed	• Owens D, O'Kane M, *Final Report NSW Bushfire Inquiry.* Released 13 July 2020. At: www.nsw.gov.au/nsw-government/projects-and-initiatives/nsw-bushfire-inquiry.	460-page review with 76 recommendations
Australian Capital Territory	Standing Committee on Justice and Community Safety Legislative Assembly for the Australian Capital Territory	• *Review of ACT emergency services responses to the 2019-20 bushfire season.* At: www.parliament.act.gov.au/parliamentary-business/in-committees/committees/standing-committees-current-assembly/standing-committee-on-justice-and-community-safety/review-of-act-emergency-services-responses-to-the-2019-20-bushfire-season#tab1537116-2id. • Scheduled to report during 2020.	Submissions closed Hearings completed
Australian Capital Territory	Independent external consultants, Synergy Group	• *ACT Emergency Services Agency Operational Review of the Bushfire Season 2019/20.* At: ACT Emergency Services Agency Operational Review of the Bushfire Season 2019/20. Released 20 August 2020. At: www.esa.act.gov.au/sites/default/files/2020-08/ACT%20Emergency%20Services%20Agency%20Operational%20Review%20of%20the%20Bushfire%20Season%202019-20.PDF.	121-page review with 31 recommendations
Australian Capital Territory	Internal	• Johnson R 2020, *Report to the Minister for Police and Emergency Services on ACT Government coordination and response during the 2019–20 Bushfire Season.* Released 20 August 2020. At: https://esa.act.gov.au/sites/default/files/2020-08/Report%20on%20ACT%20Gov%20Coord%20%20Response%20during%202019-20%20Bushfire%20Season.pdf.	38-page review with 4 recommendations
Victoria	Inspector-General Emergency Management, Victoria	• Independent Inquiry 2019–2020 Victorian Fire Season. At: www.igem.vic.gov.au/vicfires-inquiry. • *Inquiry into the 2019–20 Victorian fire season Phase 1 Community and sector preparedness for and response to the 2019–20 fire season.* At: www.parliament.vic.gov.au/file_uploads/Inquiry_into_the_2019-20_Victorian_Fire_Season_wqcRWCNG.pdf. • Phase 2 Report 'Relief and Recovery' due mid 2021.	376-page review with 17 recommendations
South Australia	Government of South Australia	• *Independent Review into South Australia's 2019-20 Bushfire Season.* Released June 2020. At: https://safecom-files.s3.amazonaws.com/current/docs/Independent%2520Review%2520into%2520SA%2527s%25202019-20%2520Bushfire%2520Season%2520-%2520Web%2520Upload.pdf.	168-page review with 15 recommendations

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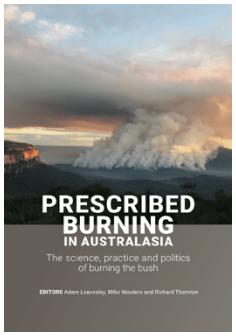
Searching for objectivity in burning



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Prescribed Burning in Australasia: the science, practice and politics of burning the bush is the latest attempt to consolidate the voices, opinions and the science on prescribed or planned burning (referred to as burning in this review) across Australasia. And it does it well with authors from all fields – land and fire agencies, academia, indigenous contributors and field practitioners. Make no mistake; you are reading the writings from the experts on burning.

The book is so timely, as Australasia and the world grapple with the wildfire problem and search for ways to lessen the consequences.

The format, with one to four pages on each subject, makes it easy reading and has forced the authors to be pointed and concise. There is good referencing so the reader can easily follow up for a deeper understanding.

Rather than go into the detail what each chapter reveals, I will highlight a few key points, especially the gems or those findings that made me sit up and say – wow!

For me the best gem was the chapter on Aboriginal burning with points like:

- 'fire has spirit and authority and will shape the land based on the culture of the wielder'
- 'if you look after country, it will look after you'
- 'if you heal country, you heal community' – so true as our communities and beloved bush suffer and try to heal from repeated high intensity bush fires
- 'you can always add to a small fire but cannot take away from a big fire' must be told to everyone before they light a burn.

And I encourage you to find the many gems that resonate with you throughout the book.

It is apparent that there are still differing opinions between the authors on burning. This book gives you the opportunity to follow the threads on the different perspectives and make up your own mind, hopefully without bias. Of course, the authors also agree on many factors including:

- burning close to assets gives the best protection
- crown fires are unlikely in burns at least up to five years old
- strategic burning based on risk modelling is the most effective.

Most researchers and land managers call for more research and some give the impression that this is needed before burning can proceed on any scale. Is this inertia appropriate as we face hotter and drier times?

I strongly favour the adaptive management approach of the writers on burning in water catchments. They show clearly that there are gaps in knowledge but provide a best practice guide through their recommended approach in an easy-to-apply table. More scientists must do this for their field of expertise, so burning programs can push ahead based on the best knowledge at the time.

It is apparent northern Australia really has its burn management well developed and working and are gaining the benefits such as carbon credit sales and a better environment. Likewise, Western Australia shows what leadership and decades of large area burning can do to reduce the damage from bushfires in the south-west corner of the state.

As I closed the book, I pondered - had it informed us on two key questions?

- What is the risk of loss from the now common massive fires compared to the possible loss of values from burning and difficulty in burning to the scale needed for adequate protection?
- What is the broad scale alternative to protect us and the bush from fire, if burning is not the answer?

A few things I looked for but were not included were the community voice on burning, especially from those close to the bush; what a national burn and fire policy might look like; and more commentary on why governments will not strongly invest in bushfire prevention through burning over the futility and costly attempts of trying to control the big fires.

Overall, however, the book does achieve the intent of objectively providing a lot of the evidence around burning. How we tackle the bushfire crisis in our land is so demanding and there is a need for real urgency in applying workable approaches in prevention.

Prescribed Burning in Australasia: the science, practice and politics of burning the bush is a must-read for these challenging times.

Abstract

Since 2001, approximately 45 per cent of all flood fatalities in Australia are attributed to people entering floodwater in motor vehicles. This behaviour is considered high-risk and avoidable. However, for emergency services personnel performing their duties, there may be additional pressure to take on such risks. In Victoria, the Victoria State Emergency Service (VICSES) is the control agency for floods and storms and its personnel encounter floodwater frequently. At an organisational level, good workplace health and safety practices are fundamental and duty of care is of paramount importance. VICSES personnel are discouraged from driving through floodwater; an exception being when responding to life-threatening situations. Doing so exposes staff to personal harm and driving through floodwater in work vehicles can result in vehicle and equipment damage. There is also the potential for VICSES reputation damage if people observe VICSES personnel driving into floodwaters and not heeding safety advice to 'never drive (walk, or ride) through floodwater'. This raises public safety concerns if people take similar risks. This paper presents findings from a larger study into the circumstances in which SES personnel drive through floodwater in SES or private vehicles. Outcomes from this research will inform policy, practice and training to improve safety, keep staff and equipment safe and model good practice in communities.

Driving into floodwater: using data from emergency responders to inform workplace safety policy and practice

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Introduction

Entering floodwater is dangerous, whether in vehicles or on foot. Haynes and colleagues (2017) documented that over 1859 flood fatalities were recorded in Australia between 1900 and 2015. In recent years, approximately 45 per cent of all flood fatalities have been vehicle-related, with males in their 50s and 70s overrepresented in the fatality statistics (Ahmed, Haynes & Taylor 2020). Work-related fatalities account for a modest proportion of flood fatalities, as do those linked to professional emergency service rescuers, 12 per cent and 4.1 per cent, respectively (Coates 1999 and Coates & Haynes 2008, cited in Becker *et al.* 2015). Other studies have shown that over half of all unintentional flood-related drowning deaths in the ten-year period 2004–05 to 2014–15 were a result of driving through floodwaters (Australian Water Safety Council 2016). By understanding the circumstances and motives underlying this behaviour it may be possible to identify new and improved ways to promote safer behaviour for both the general public and those in higher-risk occupations, such as emergency services.

This study forms part of a three-year research project on flood risk communication.[1] This project focused on the behaviour of the public during times of flooding and sought to inform flood risk communication strategies. It was conducted in collaboration with State Emergency Services (SES) end users across all Australian states and territories.

The research reported here is a sub-study that explored the risk attitudes, behaviours and practices of SES personnel to identify the situations and the contexts in which they drive into floodwater in SES vehicles. Data were collected in four SES jurisdictions in Victoria, New South Wales, the Australian

1 Building resilience through flood risk communication. At: www.bnhcrc.com.au/research/floodriskcomms.

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Capital Territory and South Australia. This paper reports data from Victoria only, however, study findings may support similar organisations in Australia and internationally where personnel have emergency response responsibilities in flood and storm conditions.

The VICSES is a volunteer-based emergency service organisation, with approximately 5200 volunteers and 200 employees with 149 units across Victoria. It is the control agency for flood and storm emergencies in Victoria and has the primary responsibility for planning for and responding to these (Victoria State Emergency Service 2019).

Methods

Survey design

A survey was developed in collaboration with SES end users. It was divided into sections covering general and work-related driving experience, demographics and deployment details, willingness to drive through floodwater, experiences of driving through floodwater an experiences of turning around from floodwater.

If respondents had experienced a recent event of driving through floodwater (or turning around), they were asked a series of questions about that one event. This included the type of vehicle they were in, water and road characteristics, weather, lighting, the actions of others in the vehicle, their perception of risk and factors that influenced their decision to drive through or turn around.

Administration

The survey was administered using Survey Monkey. An invitation was emailed to all VICSES staff and volunteers with a message from the Chief Officer, Operations and also promoted through internal social media channels and newsletters. Data were collected over an eight-week period from 8 April to 31 May 2019. A reminder was sent in the final week of data collection. The Macquarie University Human Research Ethics Committee granted approval for this study (Reference number: 5201700133).

Participants

At the close of the survey, 381 VICSES personnel had responded. Of these, just over three quarters (76 per cent, n=288) were male, 21 per cent were female (n=80) and the remaining 3 per cent (n=12) did not specify a gender.

The age profile of the study sample was compared to that of the organisation overall. Figure 1 shows the survey sample was generally older overall and there was significant overrepresentation of people aged 45–54 years.

The majority of the sample (89 per cent, n=323) was volunteer personnel, 5.5 per cent were career (salaried) staff (n=20), and 5.5 per cent served as both career staff and volunteers (n=21).

Just under half the volunteer respondents had a length of service more than 10 years (44 per cent, n=149), and 30 per cent (n=98) had served 5 years or less. Just over half the career staff had been in the organisation for 5 years or less (54 per cent, n=37).

The sample included personnel from all Victorian SES regions with the largest representation (41 per cent, n=150) from Central Region, which is the largest VICSES region. All respondents held a valid driving licence and 91 per cent (n=347) had approval to drive SES vehicles.

Driving through floodwater definition

The focus of this paper is the act of driving through floodwater. The definition of 'floodwater' used here relates to floodwater on a road. This was agreed to with SES end users to ensure it would be relevant for SES personnel. For the purposes of this survey, 'floodwater' is defined as an environment with:

- water across the road surface
- little to no visibility of the road surface markings under the water (i.e. uncertainy of road quality/integrity and possible depth)
- water on normally dry land (flowing or still).

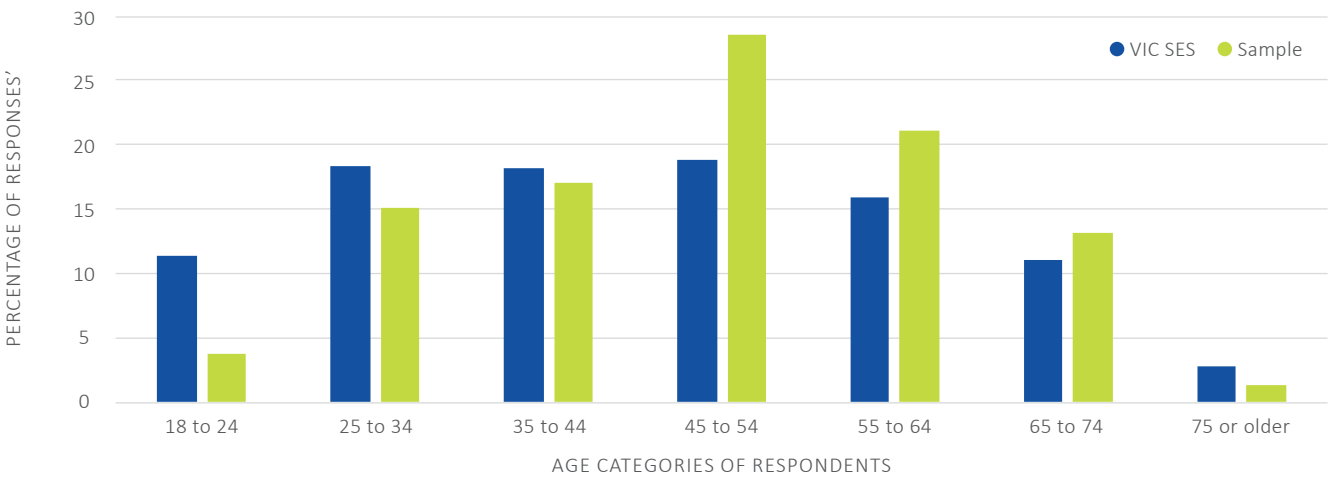

Figure 1: Age profile of the study sample compared to the VICSES.

Based on this, survey participants were asked to recall how many times they had driven (or been driven) through floodwater in the last two years in an SES vehicle. Responses were 'never', '1–2 times', '3–6 times' and 'more than 6 times'. Participants were asked to recall a situation in which they had driven (or been driven) through floodwater. Ideally, this would be their most memorable experience in the last few years.

Analysis

Results are presented in three sections. The first section is the frequency of the act of driving through floodwater in VICSES vehicles and simple statistical analysis to explore relationships between demographic variables and driving through floodwater. The second section is a summary or 'snapshot' of the contexts and conditions in which respondents reported driving through floodwater. This includes characteristics of the water depth and flow as well as the operational context and the location. The third section explores relationships between demographic and other variables and the 'higher-risk' and 'lower-risk' situations in which respondents entered floodwater.

Although the sample size was adequate for analysis, it represents an estimated 8.2 per cent of the VICSES personnel overall (20.5 per cent of career staff and 7.2 per cent of the volunteer contingent). The statistical findings are viewed as robust but are indicative of the sample rather than representative of the organisation or similar organisations across Australia.

Results

Respondent profile

Participants were asked how many times they had driven through floodwater in an SES vehicle *as a driver* as well as how many times they had been driven through floodwater in an SES vehicle *as a passenger* in the last two years. Results showed that 41 per cent of respondents with approval to drive SES vehicles (n=140) had driven through floodwater as a driver (see Figure 2) and 39 per cent of all respondents (n=150) had been driven through floodwater as a passenger. In total, just under half of the respondents (46 per cent, n=174) had entered floodwater in the last two years as either a driver or a passenger.

Chi-square analysis was used to investigate relationships between demographic variables and the act of driving through floodwater in an SES vehicle. A selected set of these analyses is summarised in Table 1.

Table 1 shows some significant relationships identified between the independent variables and driving through floodwater. Somewhat surprisingly, there was no significant relationship with age, but there was with gender and with the length of service of volunteers. Females were less likely to have driven through floodwater, however, volunteers with increasingly greater lengths of service were more likely to have driven through floodwater in the last two years. Although not shown in Table 1, differences were identified between career staff and volunteers. The length of service of career staff did not show significant relationships with driving through floodwater.

The variables 'Get deployed in floods and storms' and 'Hours driven each week' were found to relate to driving through floodwater. Those who were not deployed in floods and storms were less likely to have driven through floodwater, while those who drove more hours per week were more likely to have driven through floodwater.

Relationships were noted between driving through floodwater in an SES vehicle and variables relating to private vehicles and the types of vehicles driven. Unsurprisingly, those who usually drive larger SES vehicles are more likely to have driven through floodwater in an SES vehicle in the last two years. One of the strongest relationships with driving through floodwater in an SES vehicle was the frequency with which respondents drove through floodwater in their private vehicle. Those who had driven through floodwater a large number of times in the last two years were also more likely to have driven through floodwater in a work vehicle. No relationship was found with the type of private vehicle usually driven. Although the raw data in Table 1 suggests that a higher proportion of those who drive a private 4WD vehicle are likely to have driven through floodwater, the overall relationship with drive operation failed, marginally, to reach the accepted threshold for statistical significance (p=0.05).

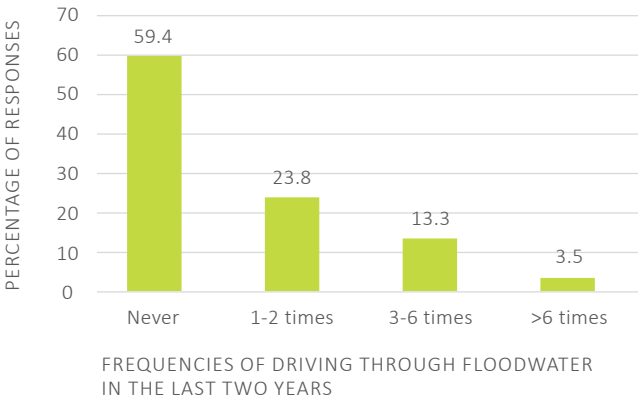

Figure 2: Frequency of driving through floodwater in an SES vehicle as a driver in the last two years (n=140).

When people drive through floodwater

To collect information about the conditions and contexts in which people drive through floodwater, survey participants were asked to recall 'the most memorable occasion in the last few years' when they drove (or were driven) through floodwater in an SES vehicle. A total of 180 (47 per cent) recalled such an event and provided the details. The timeline for this question was not limited explicitly to two years. Just over a third (37 per cent, n=66) recalled and detailed an event within the last two years, 29 per cent (n=53) recalled an event in the last 3–5 years and 33 per cent (n=60) recalled an event that occurred more than 5 years ago. Figure 3 represents a snapshot of some of the detailed information provided by respondents.

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Table 1: Breakdown of demographic variables and experience of driving through floodwater in SES vehicles.

Had driven through floodwater in the last two years (as driver)						
	Yes		No			
Independent variables	**n**	**%**	**n**	**%**	**Total**	**χ^2 (*P* value)**
Gender						
Male	122	45.0	149	55.0	271	9.903 (*P*<0.01)
Female	17	24.3	53	75.7	70	
Age						
<35	28	45.2	34	54.8	62	1.165 (*P*=0.884)
35-44	24	41.4	34	58.6	58	n.s.
45-54	39	40.2	58	59.8	97	
55-64	27	36.5	47	63.6	74	
65+	21	42.9	28	57.1	49	
Get deployed in floods and storms						
Yes	127	42.7	170	57.2	297	5.002 (*P*<0.01)
No	12	25.5	35	74.4	47	
Length of service (volunteer)						
Up to 5 years	23	25.8	66	74.2	89	22.323 (*P*<0.001)
6-10 years	35	38.9	55	61.1	90	
11-20 years	41	47.7	45	52.3	86	
>20 years	37	63.8	21	36.2	58	
Hours driven each week						
<2 hours	5	29.4	12	70.6	17	12.762 (*P*<0.01)
2-7 hours	38	30.9	85	69.1	123	
8-14 hours	40	40.4	59	59.6	99	
15+ hours	56	53.3	49	46.7	105	
Type of SES work vehicle driven most often						
Passenger vehicle	22	26.2	62	73.8	84	18.664 (*P*<0.001)
Light truck/dual cab	38	43.2	50	56.8	88	
Medium/heavy truck	69	56.1	54	43.9	123	
Other	10	37.0	17	63.0	27	
Driven through floodwater in own private vehicle in last two years						
Never	31	21.4	114	78.6	145	54.143 (*P*<0.001)
1-2 times	52	43.7	67	56.3	119	
3-6 times	36	72.0	14	28.0	50	
>6 times	20	71.4	8	28.6	28	
Own private vehicle (drive operation)						
2-wheel drive (2WD)	57	37.0	97	63.0	154	5.641 (*P*=0.06)
4-wheel drive (4WD)	61	49.6	62	50.4	123	n.s.
All wheel drive (AWD)	21	35.0	39	65.0	60	

Events reported by respondents comprised a combination of characteristics. Although Figure 3 amalgamates these, this 'snapshot' is a useful summary of situations where SES personnel in vehicles entered floodwater. An image of a car (bottom right, Figure 3) was used in the survey to provide a reference for respondents and help bring consistency to responses about floodwater depth in centimetres. Most events reported involved entering shallow water (60 per cent in 30 cm or less) although 12 per cent of respondents estimated water depth deeper than 60 cm. Water flow was typically still or slow. Most incidents as reported took place in rural locations and in 4WD vehicles (69 per cent). The weather was typically clear or with only light rain. Two-thirds took place in daylight (good light) and 14 per cent occurred at night with no street lighting. Most events occurred on highways or major roads (43 per cent) or minor, residential roads (44 per cent) and 89 per cent on a 'normal stretch' of road, rather than a low-water crossing, bridge, or causeway (9 per cent). There was no signage in 74 per cent of events, although road closure signs were reported in 13 per cent, and flood warning signage in 8 per cent.

Events rarely took place with only one driver in the vehicle. In most events, the other occupants were SES colleagues (91 per cent). Passengers were reported to have influenced the decision to drive through floodwater in 31 per cent of events. In 88 per cent of events, it was reported that others in the vehicle felt similarly about the level of risk of driving through the floodwater. Forty-seven respondents provided free text (unguided) comments about the interactions with passengers at the time of the event. In more than half the text comments there was reference to discussions between vehicle occupants and agreement to continue through the floodwater. Seven respondents mentioned actions taken to assess the risk, such as walking through the water or conducting a dynamic risk assessment. Seven respondents mentioned the urgency of the situation and their perceived operational pressure to continue. A few respondents mentioned the additional experience of other people in the vehicle who they deferred to or any lack of agreement or coercion. Quotes from respondents include:

After discussion we all agreed that we could give it a go.

I discussed with the driver whether we could make it across and we agreed we could, based on our knowledge of the area when it was dry.

The passengers were very keen on an alternative route but the driver proceeded into the flood water.

[We] Played down the danger, except for one who expressed concern, and we all, me included to my eternal shame, dismissed her concerns.

Initially the driver was encouraged to proceed, but [at the next deeper water crossing] the passengers stopped the driver who was going to keep going.

The data presented in Figure 3 shows a snapshot of the situation reported by respondents. The largest proportion of events were when respondents were undertaking an emergency response. These were occasions 'not under lights and sirens' (61 per cent). Another 10 per cent were on routine work and 10 per cent were on emergency response 'under lights and sirens'. When there were other emergency services personnel around (in 49 per cent of the reported events), the majority (83 per cent) were also driving through floodwater. In situations where there were members of the public present (59 per cent of the reported events), 55 per cent of respondents also drove through the water and 27 per cent showed a mix of behaviours.

Higher-risk events

Considering the contexts and conditions when personnel entered floodwater some situations were, likely, more risky than others. Therefore, working with VICSES, criteria were identified that could be applied to each reported event to classify those likely to be 'higher risk'. For this analysis, entering floodwater was classified as 'higher risk' if it met any of the following criteria:

- the water was rapid or swift flowing
- the water was 95 cm or deeper
- the water was on a ford, weir or low-water crossing AND the water was deeper than 45 cm
- the water has medium or moderate flow AND was deeper than 45 cm
- the water was deeper than 30 cm AND the respondent was in an SES passenger vehicle.

These criteria were applied to the 180 provided events of entering floodwater in SES vehicles. Using these criteria 19.4 per cent of events (n=35) were designated 'higher risk' and 80.6 per cent of events (n=145) were 'lower risk'.

Chi-square analysis was used to determine relationships between the 'higher risk' events and demographic and other variables. A selected set of summary data and analysis is presented in Table 2. The sample size is very small and the analysis is indicative only.

Analysis of the higher and lower-risk events identified some relationships with demographic variables. Statistically significant relationships were found for gender and the influence of passengers. Females were more likely to report higher-risk events. On investigation, females who reported higher-risk events were also significantly more likely to have been a passenger in the vehicle. Passengers were found to influence the decision to drive through floodwater. Survey results showed a higher proportion of respondents reported being influenced by passengers in the higher-risk events.

Table 2 summary data indicated that higher-risk events were reported more frequently in rural and remote areas and by those aged 45–54. However, overall numbers were small, or absent, in some categories and the statistical test was unreliable. All demographic variables were tested in this analysis but none had a relationship with higher-risk events.

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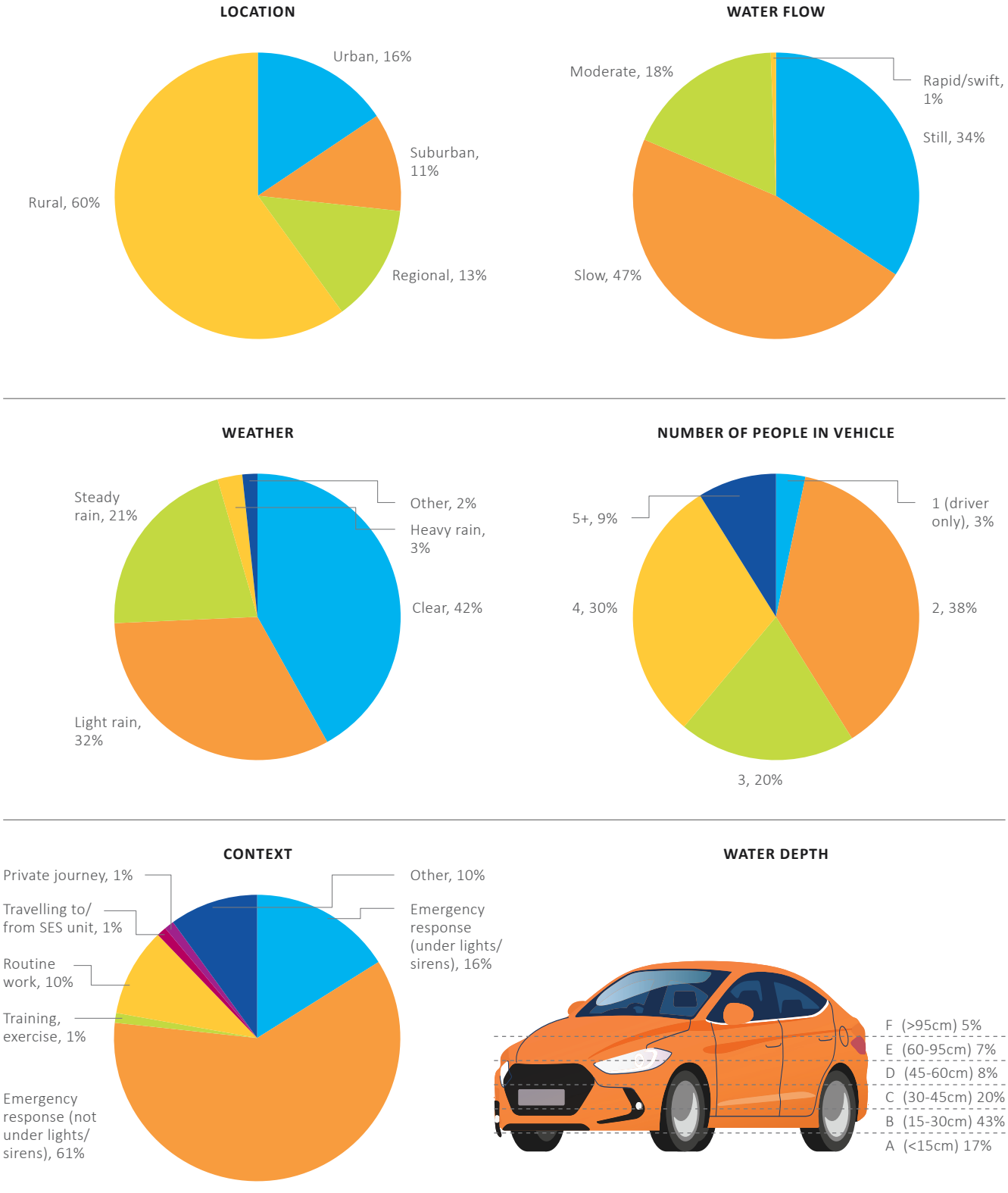

Figure 3: Snapshot of situations of entering floodwater as drivers or passengers in SES vehicles (n=180).

In the survey, participants were asked the extent to which a number of aspects influenced their decision to drive through floodwater. They were presented with a list of 18 items. These related to the journey (e.g. urgency, lack of alternative route), their ability and experience (e.g. SES training, confidence), the influence of others (e.g. other road users, vehicle occupants) and work-related pressures (e.g. desire to complete duty). Respondents indicated the extent to which each item influenced their decision using a rating scale from 1 ('not at all') to 7 ('a great deal'). Independent samples t-tests were used to compare the mean ratings for the higher-risk and lower-risk events to explore aspects that had greater influence on risk taking. Figure 4 summarises data for the four items where there were statistically significant differences between mean ratings. Differences in mean ratings for all other items were not significant.

Figure 4 shows that the influence of other people in the vehicle plays a greater role in higher-risk events. This concurs with earlier findings. The variable, 'Knowing the road well', had less influence in higher-risk events. Although having a generally lower level of influence, 'Organisational pressure to complete my duty' had a stronger influence in higher-risk events. On a positive note, 'Excitement' of driving through floodwater had very little influence overall but did have a statistically significant difference between lower and higher-risk events.

Discussion

The survey data indicated a number of interesting and useful findings. Generally, the act of entering floodwater in SES vehicles could be regarded as commonplace, with just under half the survey sample driving, or being driven, through floodwater in the last two years. The profiling analysis identified some groups that are more likely to drive through floodwater and who could benefit from further training or safety awareness about alternative actions to entering floodwater. Interestingly, those who had driven through floodwater in an SES vehicle are likely to drive through floodwater in their own vehicle, which suggests a pattern and acceptance of behaviour. This finding points to mitigating actions to disrupt habitual driving behaviour and encourage other considered actions.

The conditions and contexts data provide an aggregated view of driving through floodwater and help identify the circumstances in which it is more likely to occur. The influence of passengers emerged as a recurring feature in the data. Most events involved the presence of passengers in the vehicle and passengers were found to influence decisions to drive through floodwater, including in higher-risk events. Open text responses were not provided by all respondents. Of those who commented, they generally highlighted passengers as a 'resource'; that they allowed discussion and assessment of the risks and provided knowledge and experience, rather than being a source of

Table 2: Selected χ^2 analysis of higher-risk and lower-risk events with demographic variables.

Classified risk level of reported event						
	Higher risk		Lower risk			
Independent variables	**n**	**%**	**n**	**%**	**Total**	**χ^2 (*P* value)**
Gender						
Male	23	15.9	122	84.1	145	7.737 (*P*<0.01)
Female	12	37.5	20	62.6	32	
Age						
<35	7	21.2	26	78.8	33	8.440 (*P*=0.08)
35-44	7	25.0	21	75.0	28	
45-54	12	25.0	36	75.0	48	
55-64	9	22.5	31	77.5	40	
65+	0	0	28	100.0	28	
Location						
Urban	0	0	28	100.0	28	9.405 (*P*<0.05)
Suburban	3	15.0	17	85.0	20	
Regional	7	29.2	17	70.8	24	
Rural/Remote	25	23.1	83	76.9	108	
Did passengers in the vehicle influence the decision to drive into the floodwater?						
Yes	16	29.6	38	70.4	54	4.948 (*P*<0.05)
No	18	15.1	101	84.9	119	

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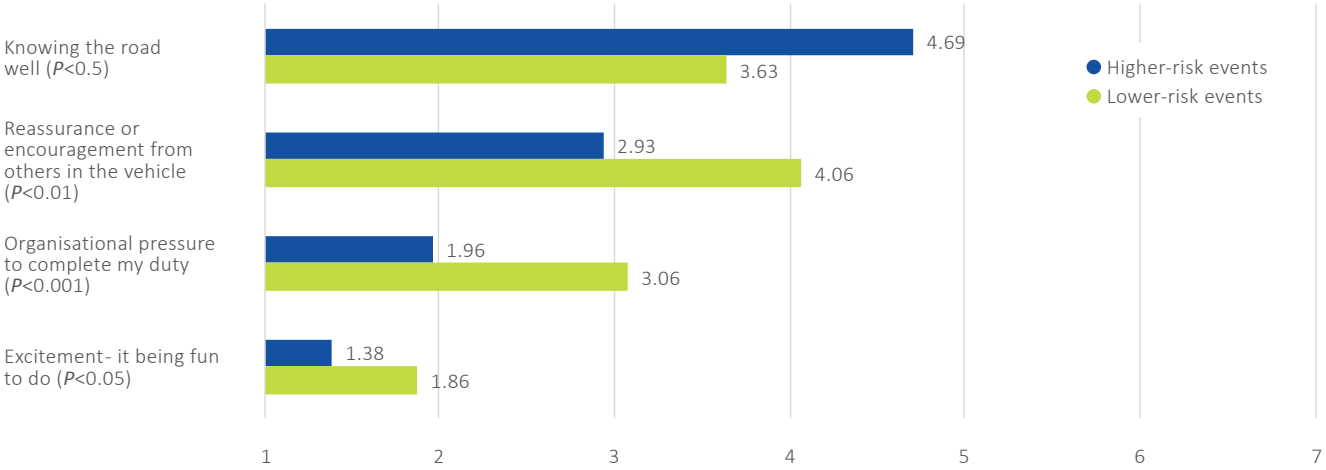

Figure 4: Aspects that influenced a decision to drive through floodwaters (n=174).

coercion or encouragement to take risks. However, it seems possible that social factors, inside and outside the vehicle, influence decisions in both positive and negative ways.

Similarly, perceived organisational pressure was mentioned in open comments of the survey. This related to the nature of activities taking place when driving through floodwater and was an influencing factor on the decision to drive through floodwater in higher-risk situations. While relevant, it may serve as post hoc justification for actions taken. A sense of urgency and purpose will always be part of SES duty. This is a possible area of investigation in relation to how it is used to rationalise or promote risky decision-making.

Study strengths and limitations

This study was supported by VICSES, including its senior management. Survey development had expert input to make it relevant to VICSES personnel. The survey data are detailed and the information gives it great utility. The use of a co-developed floodwater definition and a reference image for estimating water depth were important additions that improved data quality. However, although the sample size was good, the response rate was suboptimal and there is potential for both selection bias and recall bias. Recollection of events of driving through floodwater may be skewed to salient, and possibly extreme, events rather than 'typical' events. For these reasons, it is important to interpret the data as representative of the sample rather than of the VICSES population *per se*.

Focusing on higher-risk events was a constructive approach for utilisation of the study findings. However, a number of assumptions were made to categorise the riskiness of events that may not accurately reflect individual events in the data. In addition, sample size limitations mean that analysing higher-risk events needs to be interpreted with caution. Merging data from this study with data collected from other jurisdictions may overcome some of these limitations in future analysis.

VICSES utilisation of research

Encountering floodwater on roads is a common occurrence for VICSES personnel when responding to flood and storm situations. VICSES has developed operational doctrine to support members in assessing and managing the risk associated with floodwater (Victoria State Emergency Service 2018). In addition, VICSES launched a set of revised organisational values in 2018 and incorporated 'Safety Drives Our Decisions' to reflect the importance of safety to the organisation. This was rated by personnel as one of the highest of the five VICSES values.

Responses from personnel to encountering floodwater in this study provided a mix of cases that are consistent with the principles articulated in VICSES doctrine and cases that are inconsistent with these principles. This suggests a need to remind SES personnel that they are vulnerable to the potential risks posed by entering floodwater in their work and in private vehicles. This message is conveyed in the Victoria Government and VICSES awareness campaign, '15 to FLOAT'.[2] A positive indication is that many respondents commented on explicit risk assessment and management measures they and their crews took during the recalled events described in the survey. However, as VICSES doctrine was only available for the previous year, it is probable that the recalled instances in this study took place prior to the VICSES doctrine being available. This is reinforced by there being only a relatively small number of flash-flood events and major broad-scale overland and riverine flooding last occurred in 2010–2012.

The findings from this research indicate that work to revise and enhance operational doctrine would provide advice on alternatives for entering floodwater. This advice could be alternate route planning by incident management teams and the greater use of rescue boats and helicopters.

2 15 to FLOAT. At: http://15tofloat.com.au/.

The findings indicate that an approach focused on education of personnel with long service with VICSES or who frequently enter floodwater in their private vehicles would be beneficial. Also, the role of passengers in influencing the decision of a driver warrants further investigation. It is important that VICSES personnel understand that their actions can lead to influencing community members who may take similar actions.

Data from a 2020 national public survey on entering floodwater included additional insights into driver-passenger dynamics that could inform VICSES training and public communication (Taylor *et al.* 2020). Approaches VICSES may take include developing training using virtual and augmented-reality systems that can replicate life-like hazard environments. This blended learning, combining electronic methods to represent flood and storm hazards, could incorporate learnings from this research. In addition, implementing broader workplace health and safety and risk assessment training would stimulate team discussion and build agreement. The findings of this research are being provided to VICSES personnel through regional forums to raise awareness of the danger of entering floodwater. These forums are an opportunity for discussion and learning about the principles of VICSES doctrine and their safe application.

Future research

This study is one of four being conducted by other SES in New South Wales, the Australian Capital Territory and South Australia. When jurisdictions complete reporting, the data will be merged (n=1200, approximately) and re-analysed. This will allow advanced statistical analysis to be undertaken. Work will continue with end users to identify additional uses of the data; for example, developing scenario vignettes for training based on actual events. In addition, as VICSES improves its workplace safety, these data may be a useful baseline from which to measure future change. The data reported in this paper relates to one part of three main sections of the survey. Other sections include a measure of workplace safety culture and the anticipated willingness to drive through water on the road in different scenarios. Both will be of value to end users.

Research is underway to test and validate a computer-based assessment of how SES members use cues in the environment to assess floodwater hazards on roads. This has potential for use in training and assessment of SES personnel. The focus of the last phase of the project is on utilising the evidence-based data from a number of studies and working with research end users to co-develop national flood risk communication guidelines.

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References

Ahmed MA, Haynes K & Taylor M 2020, *Vehicle-related flood fatalities in Australia, 2001–2017. Journal of Flood Risk Management. doi: 10.1111/jfr3.12616*

Australian Water Safety Council 2016, *Australian Water Safety Strategy 2016–2020. Sydney, Australia*.

Becker JS, Taylor HL, Doody BJ, Wright KC, Gruntfest E & Webbe, D 2015, *A Review of People's Behavior in and around Floodwater. Weather, Climate and Society, vol. 7, no. 4, pp.321–332. doi.org/10.1175/WCAS-D-14-00030.1*

Haynes K, Coates L, van den Honert R, Gissing A, Bird D, Dimer de Oliveira, D'Arcy R, Smith C & Radford D 2017, *Exploring the circumstances surrounding flood fatalities in Australia—1900–2015 and the implications for policy and practice. Environmental Science and Policy, vol. 76, pp.165–176. doi: 10.1016/j.envsci.2017.07.003*

Taylor M, Tofa M, Fountain L & Haynes K 2020, *Public Survey of Driving and Recreating in Floodwater. Flood risk communication Research into Practice Brief No. 4. April 2020. Bushfire and Natural Hazards Cooperative Research Centre. At: www.bnhcrc.com.au/resources/guide-fact-sheet/6870.*

Victoria State Emergency Service 2018, *SOP028 VICSES Vehicles Entering Floodwater. Version 1.0, July 2018. Melbourne, Australia*.

Victoria State Emergency Service 2019, *VICSES Annual Report 2018–19. At: www.ses.vic.gov.au/who-we-are/publications*.

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‘They’re going to arrive, ready or not’: hill-based residents capacity to support the evacuated after earthquake and tsunami

Abstract

The city of Napier is located on the east coast of New Zealand’s North Island and is vulnerable to earthquake and tsunami. In the event of a tsunami, people need to evacuate inland or to higher ground. Napier Hill is the only high ground in close proximity to Napier and up to 12,000 people would have to evacuate there within 20 minutes of a tsunami warning. This study worked with residents on Napier Hill to understand their willingness and capacity to support evacuees in such a scenario. Focus groups were held with a sample of residents in July 2019 and this was followed by a survey. Analysis showed that residents were generally happy to host evacuees and offer support if they could. However, individual support efforts would likely only be sufficient for the first few days. Long-term success in evacuee support would require strategic thinking and collaborative planning between emergency management agencies and local neighbourhood groups.

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Introduction

Offshore to the east of the North Island of New Zealand lies the Hikurangi subduction zone and many crustal faults capable of producing damaging tsunami (Clark *et al.* 2019). Consequently, New Zealand’s east coast is vulnerable to tsunami due to its proximity to the Hikurangi subduction zone. Napier is a major city in this region with a population of around 66,000. It is a low-lying, agricultural area and most people live within identified tsunami evacuation zones (Figure 1) and on low-lying land (Figure 2). The surrounding topography does not provide high ground for easy on-foot evacuation and the few very tall buildings able to withstand tsunami inundation make mass evacuation there untenable (MCDEM 2018).

Figure 1 shows the immediate coastal area of Hawke’s Bay with Napier on the coast. The coloured zones represent the maximum area to evacuate should a large tsunami be generated close to New Zealand. Areas of red show the Red Zone. This is the most immediate evacuation zone (including the beach, foreshore and marine environment), which should be evacuated in any tsunami threat to the Hawke’s Bay coastline. The Orange Zone (plus the Red Zone) is evacuated if there is a major threat from a distant-source tsunami and near-source tsunami risk. The Yellow Zone (as well as Red and Orange zones) should be self-evacuated if a long or strong earthquake has been felt. This zone system provides a trigger mechanism for officials and also informs residents of their location in relation to tsunami risk.

Figure 2 shows that land elevations from the coastline to 1.5 metres above sea level are particularly exposed to tsunami risk, as even small-sized tsunamis can inundate these areas.

Napier Hill, which comprises Bluff Hill and Hospital Hill, is the only area of ‘tsunami safe’ ground immediately adjacent

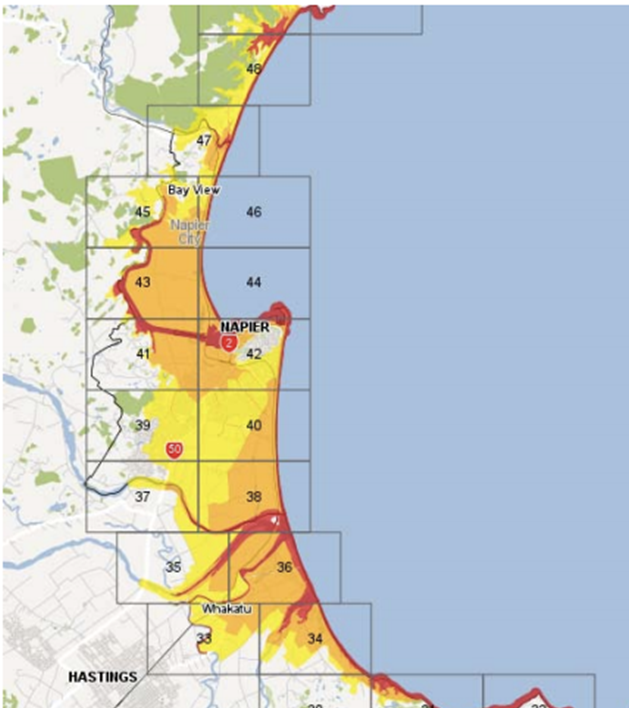

Figure 1: Modelling shows the tsunami inundation risk zones around Napier and extending into low-lying areas.

Source: Hawke's Bay Regional Council and Hawke's Bay Civil Defence Emergency Management Group

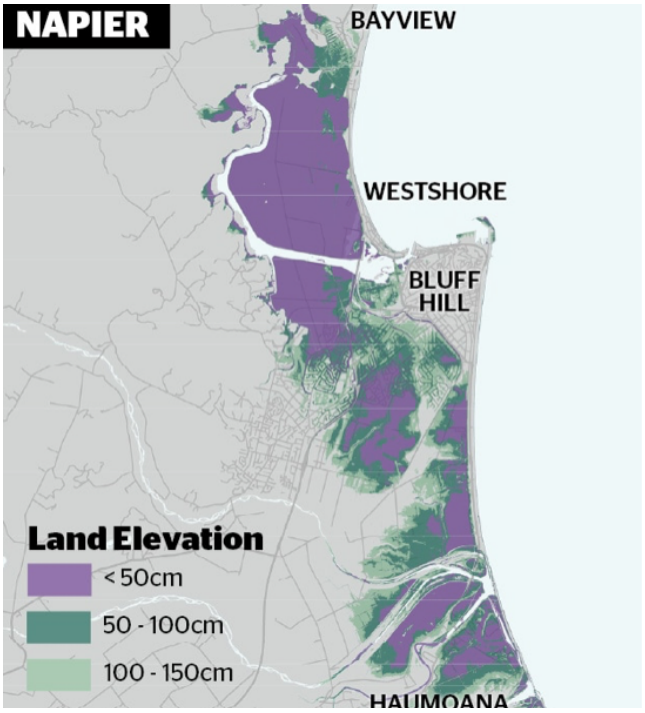

Figure 2: Land elevations around Napier show that elevations below 1.5 metres are particularly exposed to tsunami risk.

Source: Sharpe 2015

to the city. This is the primary evacuation destination for up to approximately 12,000 people who could evacuate on foot to Napier Hill within 20 minutes of an earthquake warning (Power *et al.* 2019). When Napier Hill residents and evacuees are combined, it is possible that approximately 15,000–20,000 people could retreat to Napier Hill. Evacuees would be distressed, separated from families and their loved ones and some could be badly injured (Hawke's Bay CDEM 2019, Malone *et al.* 2011). They would likely be carrying very few resources to survive the following days. A scenario-based method was applied to examine the capacity for supporting evacuees on Napier Hill. Such an influx puts strain on the local Napier Hill community as well as local infrastructure and services.

Method

This study used three focus groups and a public survey with Napier Hill residents in July 2019 to understand their perspectives on supporting evacuees. Each focus group had between 19 and 22 people and sessions ran for 1.5 hours using a scenario-based outline. The scenario was based on a credible magnitude 8.9 earthquake and tsunami from the Hikurangi subduction zone (as outlined in Power *et al.* 2018). Participants could reflect on the scenario and discuss their priorities and how they could support evacuees. A mapping exercise was used where participants could identify strategically valuable locations on Napier Hill.

A follow-up email was sent to participants that linked to a six-question survey of predominantly free-response questions about how residents might respond to and support evacuees. Participants were encouraged to share the survey and to ask other people (e.g. neighbours and friends) on Napier Hill to participate (N=68). Data from the focus groups and the survey were analysed using qualitative thematic analysis (Rubin & Rubin 2011).

This research followed Massey University Human Ethics processes (low risk notification number: 4000021400).

Findings

Discussions from the focus groups revealed that participants supported hosting evacuees and offering assistance, similar to the support experienced by residents of Christchurch after the earthquakes of 2010 and 2011 (Burton *et al.* 2015). Participants initially indicated that they would be willing to host people for 'as long as possible'. However, after reflection, changed this to 'as long as we have resources' (as expressed by Female Resident 6, Focus Group 2). Participants also identified various issues related to hosting evacuees. These are summarised in Table 1.

Data gathered from the follow-up survey supported focus group findings. However, there was a difference in terms of the broadness of community outlook. In the focus groups, participants came together to discuss issues in a cooperative, solution-focused way, which often highlighted connections and

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Table 1: Summary of issues related to hosting evacuees as identified by focus group participants.

Issues	Potential issues
Evacuation process issues	• people not knowing what route to use • stopping in the wrong places • getting stuck in culs-de-sac • not knowing where to congregate • would access-ways remain intact • increased number of cars.
Hosting evacuees	• coordinating and registering evacuees • prioritising accommodation and support • concerns about hosting certain demographics, such as potentially dangerous people or people with specific care needs like the elderly • different levels of host accommodation (e.g. rooms in a house or tents) • the reduced ability to host people if infrastructure and homes were damaged by many probable landslides and ruptures.
Meeting the needs of evacuees	• managing casualties (severely injured and dying people) • providing health needs (initial first aid through to ongoing support) • social and psychological support and managing shock • providing survival needs (e.g. water and food, sanitation, medical) • meeting the needs of vulnerable people (e.g. the elderly and children) • dealing with aggressive, angry or stressed evacuees.
Information and communication issues	• how to reconnect separated families • how to coordinate a local response without access to conventional communications.
Need for planning	• evacuation planning • regional and city Civil Defence and Emergency Management response and recovery plans • local community plans ('hubs'[1] and resources, places to gather, places to store resources) • identifying skills available to assist with response and recovery • supporting community leadership • training for community members.

responsibilities for others. In comparison, the survey generally elicited self- or family-focused responses. This aligns with the findings of Sim (2001) who concluded that 'focus groups explore collective, not individual phenomenology' (p.351).

Response timeframes

An overview of participant concerns across an estimated three-week response timeframe is provided in Figure 3.

Initial response: day 1

The initial response of residents was empathetic and concerns were focused on the wellbeing of themselves, their families and evacuees. Many participants identified the need to provide evacuees with support and basic needs (i.e. first aid, fresh water, food, accommodation). Across all focus groups, participants identified the need for a pre-planned and coordinated approach to register evacuees so that there was a record of who they were and where they would be located on Napier Hill.

Participants identified the need to pool resources as a community and come together to support evacuees. Overall, most participants and survey respondents indicated their willingness to provide shelter and to support evacuees within the limits of their resources. For example, one person (Female Resident 9, Focus Group 2) suggested that they would be '… willing to support evacuees until the food runs out'. Retirees and pensioners who attended the focus groups stated concerns for their personal safety and indicated that what they could offer to others was limited (i.e. limited supplies due to affordability). For other participants, they were focused on supporting their family unit and they saw it as a government responsibility to provide wider support. Focus group discussions indicated that there was not a community shared expectation for providing support to evacuees. In addition, any response to offer support to evacuees would currently be ad hoc and would rely on the generosity of individuals.

Longer-term response: week 1

During focus group discussions, participants determined they could host varying numbers of evacuees in a basic way for three days and up to one week. But if this period were to be extended to three weeks, there would be significant challenges. To clarify, participants were comfortable to host evacuees for up to 48 hours but, for longer periods, were concerned about how they would support their own needs alongside those of evacuees given current levels of preparedness.

Figure 4 shows that the concerns participants expressed about hosting evacuees over extended timeframes related to providing basic needs like health care and injury management as well as social-psychological support. Participants also highlighted the

1 The term 'community hubs' was introduced to the focus groups in a general sense. People were asked to indicate 'hubs' where people might gather, coordinate activities and support each other. Refer to commentary on the use of the term hub in the discussion section below.

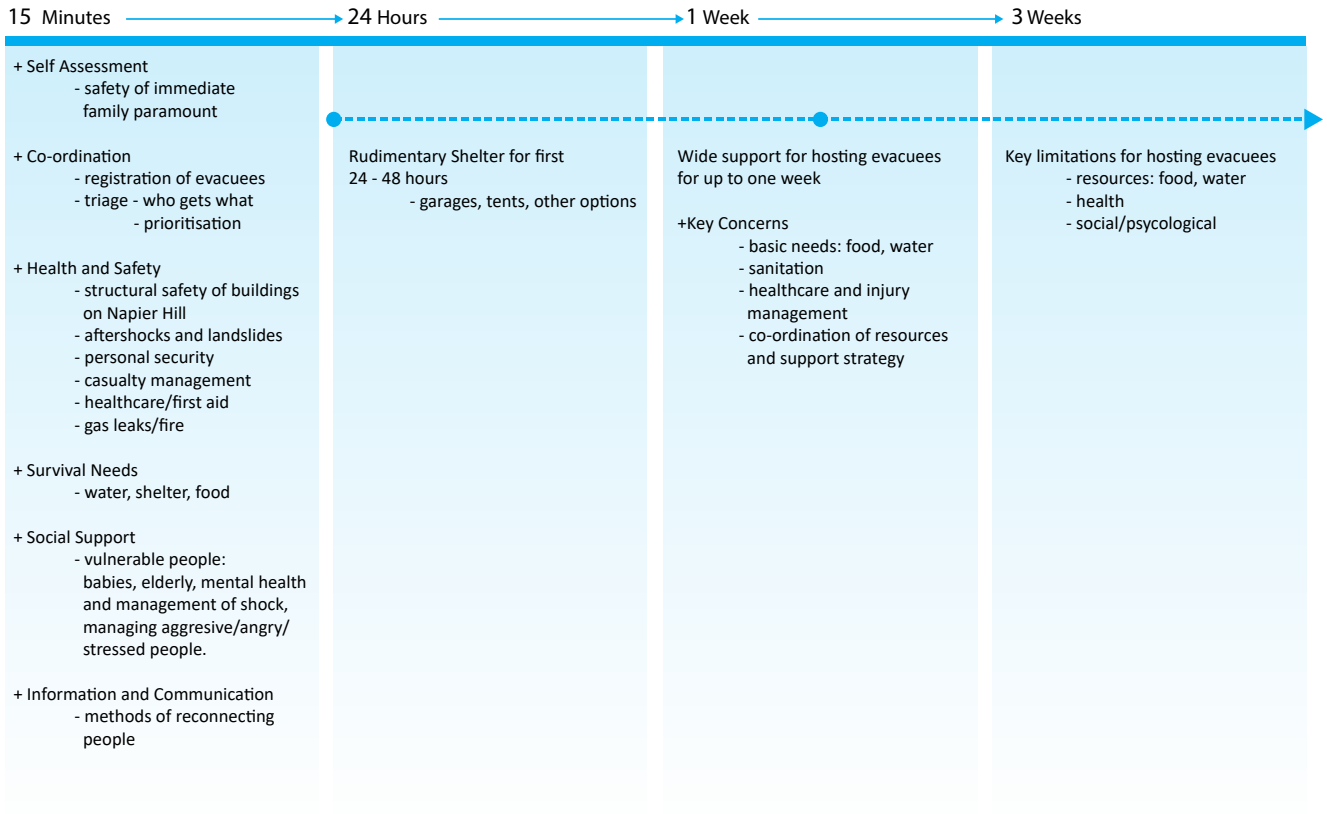

Figure 3: Initial response timeframes and correlated critical needs identified in focus group discussions.

need for a coordinated approach. It was considered a major task to coordinate people and limited resources. Participants suggested that existing Napier Hill groups or leaders could develop such a strategy and existing neighbourhood support groups were specifically mentioned. Both the Hawke's Bay CDEM Group and Napier City Council were supportive of such collaborative development and co-design of planning processes with residents to improve effective management of future evacuees.

Discussion

Community-led risk reduction

The findings show that collaborative scenarios can catalyse agencies working with communities on complex, multi-scale response planning issues (Davies *et al.* 2015; Whittaker, McLennan & Handmer 2015). Paton and colleagues (2017) note that community-based planning is often a desired outcome in response planning. However, achieving community buy-in and community-led outcomes is often met by obstacles independent of the hazard context. For examples see case studies in earthquake and tsunami preparedness and planning by Vallance (2013)) and in the Australian and Californian bushfire contexts.

In line with key principles of community engagement (Whittaker, McLennan & Handmer 2015; Wells *et al.* 2013; Becker *et al.* 2013), this study demonstrated the value of creating a space for solutions-focused dialogue and collaboration with communities. Whittaker, McLennan and Handmer (2015) emphasise:

…given the increasing disaster risk worldwide due to population growth, urban development and climate change, it is likely that 'informal' volunteers will provide much of the additional surge capacity required to respond to more frequent emergencies and disasters in the future.

(Whittaker, McLennan & Handmer 2015, p.358)

Therefore, supporting the development of collective capacity within local communities is critically important, because:

…ordinary citizens who volunteer their time, knowledge, skills and resources to help others in times of crisis represent an immense resource for emergency and disaster management.

(Whittaker, McLennan & Handmer 2015, p.366)

Leading community members through a scenario was effective for focused engagement and rapidly captured participant attention due to the enormity of the potential scenario. However, it was important to facilitate the sessions towards focused discussions and practical solutions for effective outcomes (McIvor & Paton 2007, Paton *et al.* 2006). Laminated

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maps of Napier Hill were used to assist discussions, encourage engagement and maintain focus in exercises like participatory mapping (Cadag & Gaillard 2012).

Planning

Effective planning prior to an event was a key priority raised by all focus group and survey responses. This reiterates literature insight (Whittaker *et al.* 2020). Participants indicated that planning was required at multiple levels, from personal planning through to community-based planning and upskilling. Many participants emphasised that existing Neighbourhood Support[2] groups could play a significant role in evacuation planning and response coordination. Research into community experiences following the 2011 Christchurch and 2016 Kaikōura earthquakes supports this finding and emphasise the importance of local responses (Carter & Kenney 2018, Kenney & Phibbs 2015, Paton, Mamula-Seadon & Selway 2013) including neighbourhood groups (Stallard 2013) in responding rapidly. It follows that localised community leadership and planning should be pursued and supported by relevant agencies (Kwok *et al.* 2018; Becker, McBride & Paton 2013).

This research highlighted a range of benefits for empowering and bolstering existing networks:

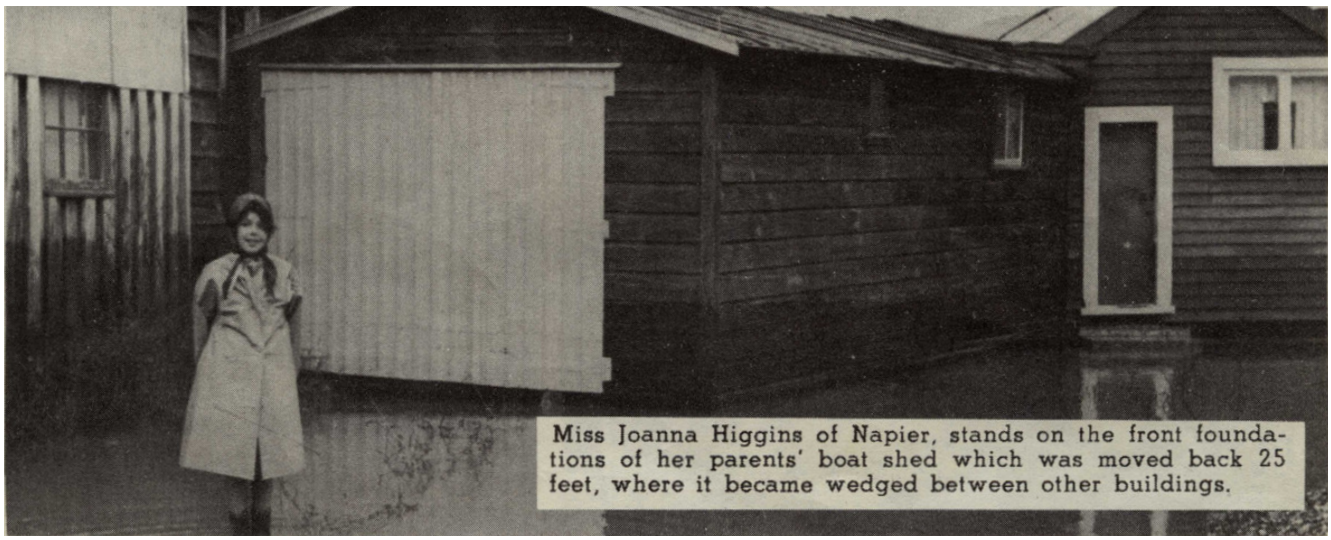
- Community leadership is essential and local leaders generally know their communities better than response agency employees.
- Local groups make it easy to identify important skillsets in the community (e.g. several doctors and other healthcare professionals live on Napier Hill).
- Grassroots strategies are more readily supported locally, compared to strategies that are proposed or imposed by 'outside' agencies.
- There is the potential to train community members in a way that builds capacity to share responsibilities when an event occurs. Decentralisation spreads the workload, but trust between agencies and local groups is required.
- Decentralising some responsibilities that currently sit with response agencies that enables community leaders to buy-in and bring about change at the local level would be beneficial. Participants considered that localised response planning and relationship building would achieve better outcomes that are influenced less by local agencies.

These benefits encourage emergency management practitioners and managers to rethink the decentralisation of responsibilities from an empowerment perspective. It could be a controlled process of empowering people to think and behave differently and become better prepared for disruptive events.

Taking responsibility

In New Zealand, the Civil Defence and Emergency Management (CDEM) response and planning was traditionally aligned with top-down approaches administered by emergency services and the New Zealand Defence Force. However, CDEM functions under the *Civil Defence and Emergency Management Act 2002* indicate that decentralisation is a core government objective (Mamula-Seadon & McLean 2015). At a regional level, this decentralisation has occurred with varied success and CDEM functions remain, to a large degree, expert and agency-led rather than driven by communities.

2 Neighbourhood Support is a New Zealand community-led movement that brings people and neighbourhoods together to create safe, resilient and connected communities (www.neighbourhoodsupport.co.nz/). For this study, a broader concept of neighbourhood support is emphasised that empowers alternative, self-organised community groups operating beyond the formalised Neighbourhood Support network.



In May 1960, Napier experienced a tsunami that inundated much of the boat harbour.

Image: Russell Spiller (reproduced with permission)

The decentralisation responsibilities and 'sharing the workload' in an event were common themes raised in the focus groups. In particular, although the terminology and concept of a community 'hub' is not currently used in material produced by agencies in Hawke's Bay, focus group participants discussed this concept. In several examples, participants suggested that existing Neighbourhood Support groups could be activated and become 'response groups or hubs'. Currently, some Neighbourhood Support groups on Napier Hill are more active than others so the introduction of greater planning for major events could re-invigorate less-active groups.

Using local capacity is well supported by New Zealand Civil Defence. However, resourcing and bolstering existing groups and networks, while often context specific, remains under-researched. Aligned with Whittaker, McLennan and Handmer (2020), locally grounded research provides better understanding of the complexity of community dynamics and needs. These can include:

- community context (i.e. the socio-demographic characteristics of a community)
- community perceptions of risk, including awareness and attitudes towards risk reduction activities
- the information and sources communities are using to plan and prepare
- community expectations regarding warnings, information and centralised support
- communication needs.

When considering the mobilisation of community-based planning, Neighbourhood Support groups are recognised by, and often well connected to, diverse subsets of communities. This means they could function effectively as links to such groups in agency-led response planning and bring valuable community insight and resources. They could also broker buy-in from other sections of communities to enhance knowledge, social capital and empowerment (Izadkhah & Hosseini 2010). In other countries, neighbourhood networks have been effective in response and recovery situations (e.g. Fisker-Nielsen 2010, Mavrodieva *et al.* 2019). This offers practical proof of the efficacy of Neighbourhood Support groups.

Conclusion

This study used focus groups and a follow-up survey of residents on Napier Hill to gather their perspectives and capacity to support a significant evacuation from the city of Napier should a tsunami strike the coast. As might be expected, the initial response of participants was for collaboration and a willingness to support evacuees in the immediate term. However, for periods of three weeks or greater, participants recognised issues that could impede their capacity to offer ongoing support and the value of that support to evacuees. There is strong evidence that community-led risk reduction planning involves more community members, identifies local needs and abilities and critical enabling resources and prepares communities better for disaster events. New Zealand's structure of Neighbourhood Support groups offers great potential to take on more responsibility for risk identification, emergency planning and response and recovery planning.

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References

Becker JS, McBride SK & Paton D 2013, *Improving community resilience in the Hawke's Bay: a review of resilience research, and current public education, communication and resilience strategies, GNS Science report 2012/38, GNS Science, Lower Hutt.*

Burton JRA, Mora K, Rive GC & Thomas JAT 2015, *Can the displaced overstay their welcome? Temporary accommodation and billeting in the Canterbury, New Zealand earthquake sequence. International Journal of Emergency Management, vol. 11, no. 3, pp.240–261.*

Cadag JRD & Gaillard JC 2012, *Integrating knowledge and actions in disaster risk reduction: the contribution of participatory mapping. Area, vol. 44, no. 1, pp.100–109.*

Carter L & Kenney C 2018, *A tale of two communities: B-race-ing disaster responses in the media following the Canterbury and Kaikoura earthquakes. International Journal of Disaster Risk Reduction, vol. 28, pp.731–738.*

Clark K, Howarth J, Litchfield N, Cochran U, Turnbull J, Dowling L, Howell A, Berryman K & Wolfe F 2019, *Geological evidence for past large earthquakes and tsunamis along the Hikurangi subduction margin, New Zealand. Marine Geology, vol. 412, pp.139–172. doi.org/10.1016/j.margeo.2019.03.004*

Davies T, Beaven S, Conradson D, Densmore A, Gaillard JC, Johnston D, Milledge D, Oven K, Petley D, Rigg J, Robinson T, Rosser N & Wilson T 2015, *Towards disaster resilience: A scenario-based approach to co-producing and integrating hazard and risk knowledge. International Journal of Disaster Risk Reduction, vol. 13, pp.242–247.*

Fisker-Nielsen AM 2012, *Grassroot responses to the Tohoku earthquake of 11 March 2011: overcoming the dichotomy between victim and helper. Anthropology Today, vol. 28, no. 3, pp.16–20.*

Izadkhah YO & Hosseini M 2010, *Sustainable neighbourhood earthquake emergency planning in megacities. Disaster Prevention and Management, vol. 19, no. 3: pp.345–357.*

Kenney CM & Phibbs S 2015, *A Māori love story: Community-led disaster management in response to the Ōtautahi (Christchurch) earthquakes as a framework for action. International Journal of Disaster Risk Reduction, vol. 14, pp.46–55.*

Kwok AH, Paton D, Becker JS, Hudson-Doyle EE & Johnston DM 2018, *A bottom-up approach to developing a neighbourhood-based resilience measurement framework. Disaster Prevention and Management, vol. 27, no. 2, pp.255–270. doi: 10.1108/DPM-07-2017-0169*

Malone PA, Pomeroy EC & Jones BL 2011, *Disoriented Grief: A Lens through Which to View the Experience of Katrina Evacuees. Journal of Social Work in End-of- Life & Palliative Care, vol. 7, no. 2–3, pp.241–262.*

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Mamula-Seadon L & McLean I 2015, *Response and early recovery following 4 September 2010 and 22 February 2011 Canterbury earthquakes: Societal resilience and the role of governance. International Journal of Disaster Risk Reduction, vol. 14, no. 1, pp.82–95*.

Mavrodieva AV, Daramita RIF, Arsono AY, Yawen L & Shaw R 2019, *Role of civil society in sustainable urban renewal (Machizukuri) after the Kobe Earthquake. Sustainability, vol. 11, no. 2, p.335*.

McIvor D & Paton D 2007, *Preparing for natural hazards: normative and attitudinal influences. Disaster Prevention and Management, vol. 16, no. 1, pp.79–8*.

Ministry of Civil Defence and Emergency Management 2018, *Assessment and Planning for Tsunami Vertical Evacuation Director's Guideline for Civil Defence Emergency Management Groups. At: www.civildefence.govt.nz/cdem-sector/guidelines/assessment-and-planning-for-tsunami-vertical-evacuation/.*

Paton D, Kelly G, Burgelt PT & Doherty M 2006, *Preparing for bushfires: understanding intentions. Disaster Prevention and Management: an international journal*.

Paton D, Johnston D, Rossiter K, Buergelt P, Richards A & Anderson S 2017, *Community understanding of tsunami risk and warnings in Australia. Australian Journal of Emergency Management, vol. 32, no.1, pp.54–59. At: https://knowledge.aidr.org.au/resources/ajem-jan-2017-community-understanding-of-tsunami-risk-and-warnings-in-australia/.*

Paton D, Mamula-Seadon L & Selway KL 2013, *Community resilience in Christchurch: adaptive responses and capacities during earthquake recovery. GNS Science report 2013/37. At: www.gns.cri.nz/static/pubs/2013/SR%202013-037.pdf, pp.1–24*.

Power WL, Boersen K, Thomas K-L, Tilley L, Hudson-Doyle EE, Kaiser LH, Lukovic B, Heron DW, Wilson TM, Leonard GS & Johnston DM 2019, *Quicker and safer tsunami evacuations through agent-based modelling. GNS Science miscellaneous series 134, pp.1–59 . doi:10.21420/9H4N-TH30*

Power W, Kaneko Y, Becker J, Lin S-L, Holden C & Mueller C 2018, *Hikurangi Response Plan – Developing a scenario for an Mw 8.9 Hikurangi earthquake, including tsunami modelling and a preliminary description of impacts. GNS Science consultancy report 2018/168. At: www.eastcoastlab.org.nz/assets/Uploads/CR2018-168-Hikurangi-Response-Plan-4.pdf, pp.1–39*.

Sharpe M 2015, *Large parts of Napier are vulnerable to sea level rise, according to report (19 November 2015). At: www.stuff.co.nz/environment/climate-news/74172819/.*

Sim J 2001, *Collecting and analysing qualitative data: issues raised by the focus group. Journal of Advanced Nursing, vol. 28, no. 2, pp.229–456*.

Stallard K 2013, *Neighbours and Social Capital in the wake of the Christchurch Earthquakes (Doctoral dissertation, University of Otago).*

Stephens SL, Adams MA, Handmer J, Kearns FR, Leicester B, Leonard J & Moritz MA 2009, *Urban–wildland fires: how California and other regions of the US can learn from Australia. Environmental Research Letters, vol. 4, no. 1, pp.1–4*.

Hawke's Bay CDEM 2019, *Rapid Disaster Relief: Responding to People's Needs in a Catastrophe – How Would New Zealand Cope? Hawke's Bay Civil Defence Emergency Management Group. At: www.civildefence.govt.nz/assets/Uploads/CDEM-Resilience-Fund/2018-19/2018-17x-rapid-disaster-relief.pdf, pp.1–53*

Rubin HJ Rubin IS 2011, *Qualitative Interviewing. The Art of Hearing Data. Thousand Oaks: SAGE*.

Vallance SA 2013, *Waimakariri District Council's integrated, community-based recovery framework. Commissioned Report for Waimakariri District Council, May 2013.*

Wells KB, Tang J, Lizaola E, Jones F, Brown A, Stayton A, Williams M, Chandra A, Eisenman, D, Fogleman S & Plough A 2013, *Applying Community Engagement to Disaster Planning: Developing the Vision and Design for the Los Angeles County Community Disaster Resilience Initiative, vol. 103, no. 7, pp.1172–1180. doi: 10.2105/AJPH.2013.301407*

Whittaker J, Haynes K, Tofa M & Taylor M 2020, *Understanding bushfire risk , warnings and responses: a study of the 2018 reedy swamp fire. Research for the NSW Rural Fire Service (Bushfire and Natural Hazards CRC)*.

Whittaker J, McLennan B & Handmer J 2015, *A review of informal volunteerism in emergencies and disasters: Definition, opportunities and challenges. International Journal of Disaster Risk Reduction, vol. 13, pp.358–368*.

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Abstract

This paper reviews findings from a research project examining the role insurance cover (or the lack thereof) plays in disaster recovery. It considers the implications of insurance within a shared-responsibility model for emergency management and disaster mitigation policy and practice. A key finding shows how insufficient understanding of Bushfire Attack Level ratings is exacerbating the problem of underinsurance. The insurance industry has the ability to improve community recovery through greater disaster preparedness efforts. What is needed in Australian emergency management policy is an increased emphasis on disaster mitigation spending, as well as a more holistic understanding of recovery, in which insurance is understood as one tool within a complex process.

Why insurance matters: insights from research post-disaster

Peer Reviewed

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Introduction

Insurance is an important element in Australia's *National Strategy for Disaster Resilience* (Attorney-General's Department 2011a, 2011b) that reflects a shift towards shared responsibility for disaster mitigation, preparation, response and recovery between governments, communities and householders (Booth & Tranter 2017, de Vet *et al.* 2019). Ideally, home and contents insurance supports households to rebuild more quickly, reducing the financial effects and the overall stress experienced after disaster events (Dixon, Shochete & Shakespeare 2015). However, questions exist over the sustainability of insurance as a significant element of emergency management policy (Booth & Harwood 2016; O'Hare, White & Connelley 2016).

This paper summarises three aspects of insurance that are particularly relevant to emergency management and disaster policy and practice. The first is an emphasis on mitigation spending rather than on response and recovery and the role of insurers in a shared-responsibility model. The second is how a lack of understanding of Bushfire Attack Level (BAL) ratings by householders worsens the problem of under-insurance. Third is the role of insurance in bushfire recovery processes.

Arguments derive from findings within a broader research project[1] examining the impact of insurance (or the lack thereof) on people's experiences of disasters. The aim is to understand how being insured can build personal resilience yet increase vulnerability and how to overcome such challenges. For example, O'Hare, White & Connelley (2016, p.1175) described insurance as 'maladaptive' and serving 'to structurally embed risky behaviour'. In a changing climate, the influence of insurance has been found to worsen social inequity by locking in uneven layers of risk within communities (Booth 2018). Most policy foci on insurance emphasise post-disaster responses that rebound to the status quo. They impede opportunities for progressive models of adaptation, such as pre-disaster mitigation strategies that could reduce both the risk and effects of disasters (de Vet *et al.* 2019).

1 Australian Research Council Discovery Project, 'When Disaster Strikes: Geographies of house and contents under-insurance' (DP170100096).

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Of equal concern are the large numbers of households that are uninsured or underinsured (Quantum Market Research 2013). This leaves people exposed to the financial burden of disasters and the related impacts on physical and mental health. These problems can be exacerbated by new housing developments in high-risk areas (Bond & Mercer 2014) and the increasing costs of disasters linked to climate change (Hughes & Fenwick 2015). These changes may place insurance beyond the financial reach of an increasing number of householders. The role of insurance in disaster risk reduction therefore needs to be well understood by policy makers and emergency management practitioners.

Research method

This research first draws on an analysis of official reports and inquiries, policy documents and academic studies into disaster mitigation as they relate to three Australian disaster events (Black Saturday 2009, Queensland floods 2011, Cyclone Yasi 2011) (de Vet *et al.* 2019). This work highlighted how an over-reliance in government strategies on people having insurance can have negative outcomes for financial security as well as for people's physical and mental health.

We then examine the empirical research we conducted after the 2013 bushfires in the Blue Mountains of New South Wales (de Vet & Eriksen 2020, Eriksen & de Vet, in review). Four years after the 2013 bushfires destroyed 203 homes and damaged a further 287 homes in the Blue Mountains, 16 interviews were conducted with 17 residents and two local support organisations (Step by Step and Legal Aid NSW). The semi-structured interviews were audio-recorded, transcribed verbatim and thematically coded in the qualitative data analysis software program QSR NVivo v.11. This study was approved by the University of Wollongong Human Research Ethics Committee (2017/323),

All of the households interviewed had some level of home or contents insurance. Five households experienced partial loss and seven endured a total loss of their homes. This work highlights the unintended insurance consequences of BAL ratings and the need for emergency management policy and practice to support the complex psychosocial needs, which get tangled with insurance and homemaking in disaster recovery.

The insurance lifecycle and disaster risk reduction

As described by de Vet and colleagues (2019), the rising costs of disasters have prompted increased debate about how disaster funding should be allocated. In Australia, funding is heavily weighted towards response and recovery, with only three per cent of disaster-related government expenditure going towards mitigation (Coppel & Chester 2014). 'Hard' mitigation measures, including flood levees, and 'soft' mitigation measures, including information provision and building control measures, have been shown to ultimately reduce overall disaster costs (Shreve & Kelman 2014). According to the Australian Business Roundtable for Disaster Resilience and Safer Communities, an increase of AUD$250 million p.a. in mitigation would more than halve the predicted US$29 billion cost of disasters by 2050 (Deloitte Access Economics 2013). Beyond the financial benefits, mitigation also reduces the likelihood of loss of life, physical injury and long-term mental health effects of disasters, including impacts on emergency management staff and volunteers. Australian national resilience strategies nonetheless remain focused on spending on reactionary activities.

For all levels of governments, this approach assists to balance budgets, but limits opportunities for policy reform (McGowan 2012). Coppel and Chester (2104, p.13) argue that government preference for post-disaster spending is the result of 'political opportunism and short-sightedness'. Politicians pledging and deploying personnel and resources post-disaster are opportunities for governments to appear generous and strong. At the same time, Australian Government policies place increasing accountability on other stakeholders, as emphasised by the notion of 'shared responsibility'. The *National Strategy for Disaster Resilience* states 'communities, individuals and households need to take greater responsibility for their own safety and act on information, advice and other cues provided before, during and after a disaster' (Attorney-General's Department 2011a, p.2).

While the specific allocation of duties within a 'shared-responsibility' model remains somewhat ill-defined and the subject of debate, largely absent from discussion has been the role of insurers. Faced with the issue of underinsured in bushfire-affected communities, the Insurance Council of Australia argued that it was the responsibility of governments, not insurers, to better inform householders about policies that might affect insurance levels (Madigan 2016). However, de Vet and co-authors (2019) outline some practical ways the insurance industry could enhance mitigation about cylcones, bushfires and floods.

Cyclones

Unlike floods and fire, there are no large-scale, government-funded hard mitigation projects deliverable on public land that can reduce the force of cyclonic winds (although the construction of seawalls can mitigate cyclone-related inundation). While home retrofits to improve a building's capacity to withstand cyclone conditions are effective, they are also expensive and could be beyond the means of many householders. This may exacerbate inequitable degrees of risk within communities. Government subsidies for mitigation measures as well as research and community engagement programs on cost-effective retrofits could reduce inequity and increase resilience (Kanakis & McShane 2016). Steps by insurers to reduce costs of cyclone damage could include:

- reducing premiums to householders who undertake retrofits (this pricing mechanism is already offered by some insurers and could be expanded)
- advising householders on actions they can take to improve their cyclone preparedness to reduce their risk and, thus, their insurance premiums.

Floods

In many regions of Australia, government investment in hard mitigation tactics has significant capacity to reduce community vulnerability to floods, more so than any individual household measure. Assuming government investment in flood mitigation, insurers can enhance resilience through appropriate pricing mechanisms. For example, after floods in Roma, Queensland in 2011, the local government constructed a levee planned to protect 483 homes from a 1-in-100 year flood (Urbis 2014). Insurance companies subsequently offered insurance cover for previously high-risk properties in the Roma area and reduced premiums for others. Given that 'cheaper' housing stock is often available in high-risk areas (Eriksen *et al.* In Press), this combination of government funding and insurance re-pricing can reduce flood risk inequity by offering protection for householders with lower financial capacity.

Bushfires

Bushfire-prone areas in Australia are generally covered by soft mitigation measures that include community preparedness programs, urban development restrictions, building regulations and hazard-reduction activities. Hard mitigation measures include home retrofitting of sprinkler systems and fire-resistant materials. The cost of these measures can reinforce uneven layers of disaster risk. Home retrofitting can be expensive, time-intensive and complex. Financial support for retrofitting and research into cheaper materials and designs could reduce risk across a community and, as a consequence, reduce insurance costs. Appropriate pricing mechanisms by insurers, including premium reductions on retrofitted homes, is a way to encourage investment in mitigation measures. This is particularly so when provided in conjunction with information outlining site-specific mitigation actions.

In reviewing policy documents and reports on mitigation, de Vet and co-authors (2019) concluded:

- pre-disaster mitigation intercepts and reduces the likely financial, health and wellbeing impacts of cyclones, bushfires and floods
- reduced costs benefit insurers, who should encourage mitigation measures through insurance premium discounts, information provision and investment in the development of cheaper mitigation options
- effective mitigation is highly dependent on hazard type, as it shapes people's capacity and role in a shared-responsibility model
- inequity of government support across hazard types needs addressing to improve insurance access and affordability
- mitigation measures are likely to increase insurance affordability and accessibility and contribute to long-term insurance system sustainability.

How BAL ratings increase vulnerability

BAL ratings are a key policy mechanism, enforced by state and local governments, to mitigate the risks to property in bushfire-prone areas. A property's BAL is calculated using property slope, distance from vegetation, surrounding vegetation type and the Fire Danger Index in order to assess exposure to direct flame, radiant heat or ember attack. The Australian Standard AS3959 (Standards Australia 2009) outlines the specific building materials and methods required for the (re)building or renovation of homes in bushfire-prone areas according to a property's BAL rating. Most homes pre-date Australian Standard AS3959 and so are not built to standard (Penman *et al.* 2017). Meeting these standards when rebuilding or repairing homes is often more expensive than expected due to the specified use of bushfire-resistant building materials and methods (Lucas, Eriksen & Bowman 2020). While estimates vary, costs may range from an estimated $16,000 for BAL 12.5 to more than $250,000 for new builds with the highest rating of BAL-FZ (AAMI 2015).

According to de Vet and Eriksen (2020), many property owners in high-risk areas remain unaware of their property's BAL rating and the implications for rebuild and repair costs. Local governments and insurance companies have largely failed to provide adequate resources to allow residents to understand the BAL rating system, access the BAL rating of their home or to calculate likely costs. Only one of the 14 households in the Blue Mountains study was aware before the fire that their property's BAL rating would increase the cost of a rebuild. Three participants found that they were significantly underinsured as a direct result of rebuilding to BAL standards.

A lack of adequate information on BAL-related costs, along with a failure by insurers to offer risk-reflexive pricing to encourage mitigation, ultimately increased the vulnerability of residents in the Blue Mountains. For example, one couple believed that insurance was necessary in a high-risk area, stating 'If you're not insured, then you're an idiot'. They were certain that their home insurance policy would be sufficient to rebuild. However, they discovered they were underinsured by an estimated $280,000. They had relied on online calculators provided by their insurer and were unaware that BAL building requirements were not included in the calculator's assessments.

The effects of underinsured are not simply financial but can have debilitating consequences on the emotional wellbeing of people. The rebuilding process potentially adds layers of loss and trauma for people already dealing with loss of their home in the fire and the slow and complex processes of disaster recovery.

In order to reduce the likelihood of negative outcomes, de Vet and Eriksen (2020) recommended possible changes in policy and practice:

- by insurance companies:
  - Provision of information about BAL ratings to their customers (or potential customers) through online calculators and sales advice documentation.
  - Addition of a BAL12.5 rating as a minimum calculated cost for policies in bushfire-prone areas.
  - Greater market availability of full-replacement home insurance.

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- Appropriate coverage of alternative building technologies, materials and designs.

- by governments:
  - Greater acknowledgment of, and response to, the consequences of BAL ratings on (in)adequate levels of insurance.
  - Increased household knowledge of BAL ratings in bushfire-prone areas, for example, via newsletters, social media posts and by including information leaflets with rates notices.
  - Consideration of an automated BAL assessment process through digital mapping technology.
  - Consideration of a BAL 'greenslip' system, similar to Compulsory Third Party Insurance for car owners.

Wellbeing, insurance and homemaking are entwined

In-depth examinations of the impact of insurance on disaster recovery reveal how insurance is too often assessed purely in financial terms, without proper consideration of its role in people's wellbeing (Eriksen & de Vet, in review, Eriksen & Simon 2017). People must navigate the sometimes difficult insurance and rebuilding decisions in the aftermath of a highly challenging and potentially traumatic experience. While many participants in the Blue Mountains study reported positive dealings with insurance companies and described the invaluable role of insurance in assisting them reach stability and security, others noted significant challenges that were re-traumatising or that hindered the recovery process. These experiences suggest more holistic approaches to the recovery process that understand insurance as a tool within that process but not as a remedy.

In assessing the role of insurance in their recovery, Blue Mountains residents discussed a range of issues beyond whether or not their policies covered their financial needs. The ease (or otherwise) of the claims process and of personal interactions with insurance company staff were of great importance. Some claims were processed efficiently and with great care. One participant was so grateful for the response from their insurer that they gave the agent a bunch of flowers. Post-disaster, insurance provided 'peace of mind' and aided in the ability to 'move on'. For all participants, insurance enabled rebuilds to be completed within 8 to 24 months and many new homes provided greater stability, with positive benefits for wellbeing. Insurance claims also enabled the building of homes with more space, greater energy efficiency, better appliances and other improved features. Some participants found that their homes increased in financial value once rebuilt.

These positive experiences were not universal. Insurers, at times, failed to adequately adapt their services to support clients recovering from traumatic experiences. Participants' experiences were not uniform and, more often than not, depended on personal and situational circumstances. This included diverse encounters with fire, including being caught inside a burning house, evacuating while recovering from a caesarean birth and

Figure 1: Bushfire Attack Level ratings indicate a building's potential exposure to bushfires and the severity.

carrying a 12-day old baby, and supporting a multi-generational household through recovery as a single parent. In the days, weeks and months after these traumatising events, rebuilding a home was overwhelmingly stressful. Everyday tasks developed new complexity. Participants reported health diagnoses, such as Post Traumatic Stress Disorder, cancer, autoimmune disorders and depression.

In some of these cases, insurance claims processes intensified personal struggles. For example, one insurer pressured a participant to make decisions quickly with little information at a time when they were mentally and emotionally unable to do so. Another participant found the post-fire experience more distressing than the event itself, describing the insurance assessor as 'really bossy and pushy and arrogant'. Better training for insurance company staff (and others working with traumatised clients) would assist insurers to reduce the distress of people in recovery as well as prevent the potential vicarious traumatisation of insurance staff.

These experiences offer valuable insights into how emergency management, disaster recovery and insurance providers might understand their roles in supporting the emotional, as well as the financial, wellbeing of their clients. Bushfire recovery is a complex process involving multiple factors beyond the financial focus of insurance. Four years after the Blue Mountains fires, five of the 17 residents interviewed described themselves as still struggling emotionally and physically as a result of the bushfires. This was not a struggle that they thought would be over soon. Insurance had, to varying extents, aided in the recovery of most by helping people to rebuild or repair property. However, greater psychosocial support was needed in order to address the enduring consequences of people's trauma and loss.

Australian governments rely on charities and other not-for-profit organisations to provide such psychosocial support (Eriksen 2019). These organisations are, however, often underfunded (Australian Red Cross National Disaster Resilience Roundtable 2014) and their roles are inadequately accounted for in disaster management frameworks (VCOSS 2017). Addressing these problems in policy is an important step towards holistic support for communities affected by disasters. The experiences of residents in the Blue Mountains (Eriksen & de Vet, in review), and more recently in many other parts of Australia (Lucas, Eriksen & Bowman 2020) suggests the need for a more holistic approach to emergency management. Insurance should be situated as one element in a range of disaster risk reduction strategies, assisting people to navigate the complex terrain of disaster mitigation, response and recovery.

Conclusion

The centrality of the role of insurance to Australia's disaster resilience strategy is based, first, on a model that emphasises post-disaster response over pre-disaster mitigation and, second, on the framework of shared responsibility that inadvertently shifts costs onto households and away from government. As a result, opportunities to prevent disasters or to reduce their effects through hard and soft mitigation measures are lost.

This ultimately increases the costs of disasters and escalates the harmful, non-financial impacts on households as well as on emergency management practitioners and volunteers on the front line. With housing development expanding into at-risk areas and the increasing intensity and frequency of extreme weather events, this model is arguably unsustainable.

This is not to say that insurance should have no role in emergency management policy and practice. As the Blue Mountains study shows, insurance provides valuable support in helping people rebuild and, when conducted sensitively and with appropriate consideration of ongoing distress, aids in both financial and emotional recovery. Instead, insurers should take a greater role in mitigation measures, including through education and engagement programs and by offering reductions in premiums on retrofitted homes. By actively working to reduce costs through pre-disaster spending, insurers can support the ongoing sustainability of their industry while reducing impacts on communities.

Most significantly, a re-imagined role for disaster insurance could acknowledge that recovery from the trauma of bushfires, floods, cyclones and other hazards is far more than a financial process. While arguing for a greater emphasis on pre-disaster spending, a shift in post-disaster response that acknowledges the value of psychosocial support services is also needed. A holistic approach to disaster recovery should reduce consequences through mitigation, address the social inequities that increase vulnerability, adequately fund the work of post-disaster support agencies and, in doing so, acknowledge the complexity of physical, mental and emotional recovery processes.

References

AAMI 2015, *Check that Your Home is Properly Covered in the Event of a Bushfire: Changes to the National Building Code. At: www.aami.com.au/home-insurance/bushfire-prevention.html.*

Attorney-General's Department 2011a, *National Strategy for Disaster Resilience. Canberra: Australian Government. Council of Australian Governments. At: https://knowledge.aidr.org.au/resources/national-strategyfor-disaster-resilience/.*

Attorney-General's Department 2011b, *National Strategy for Disaster Resilience: Building our Nation's Resilience to Disasters. Council of Australian Governments. At: https://knowledge.aidr.org.au/media/2153/nationalstrategyfordisasterresilience.pdf.*

Australian Red Cross National Disaster Resilience Roundtable 2014, *Beyond the Blanket: The Role of Not-For-Profits and Non-Traditional Stakeholders in Emergency Management. Melbourne: Australian Red Cross National Disaster Resilience Roundtable.*

Bond T & Mercer D 2014, *Subdivision Policy and Planning for Bushfire Defence: A Natural Hazard Mitigation Strategy for Residential Peri-Urban Regions in Victoria, Australia. Geographical Research, vol. 52, no. 1, pp.6–22.*

Booth K 2018, *Profiteering from disaster: why planners need to be paying more attention to insurance. Planning Practice and Research, vol. 33, no. 2, pp.211–227.*

Booth K & Tranter B 2018, *When disaster strikes: Under-insurance in Australian households. Urban Studies, vol. 55, no. 14, pp.3135–3150.*

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Booth K & Harwood A 2016, *Insurance as catastrophe: A geography of house and contents insurance in bushfire-prone places. Geoforum, vol. 69, pp.4–52.*

Coppel C & Chester K 2014, *Natural disaster funding arrangements: Productivity commission inquiry report. Productivity Commission. At: www.pc.gov.au/inquiries/completed/climate-change-adaptation/report/climate-change-adaptation.pdf.*

Deloitte Access Economics 2013, *Building our nation's resilience to natural disasters. At: http://australianbusinessroundtable.com.au/our-research [18 March 2019].*

de Vet E, Eriksen C, Booth K & French S 2019, *An Unmitigated Disaster: Shifting from Response and Recovery to Mitigation for an Insurable Future. International Journal of Disaster Risk Science, vol. 10, pp.179–92.*

de Vet E & Eriksen C 2020, *When insurance and goodwill are not enough: Bushfire Attack Level (BAL) ratings, risk calculations and disaster resilience in Australia. Australian Geographer, vol. 51, no. 1, pp.35–51.*

Dixon KM, Shochet IM & Shakespeare-Finch J 2015, *Stress during the rebuilding phase influenced mental health following two Queensland flood disasters more than the event itself. In: Australian and New Zealand disaster and emergency management conference, Gold Coast, Australia, 3–5 May.*

Eriksen C 2019, *Coping, caring and believing: The embodied work of disaster recovery workers. Emotion, Space and Society, 32(100592). doi.org/10.1016/j.emospa.2019.100592*

Eriksen C & de Vet E (in review) *Untangling insurance, rebuilding and wellbeing in bushfire recovery. Geographical Research (ref. GEOR-2020-020: accepted pending revisions 20 June 2020).*

Eriksen C & Simon G 2017, *The Affluence-Vulnerability Interface: Intersecting Scales of Risk, Privilege and Disaster. Environment and Planning A: Economy and Space, vol. 49, no. 2, pp.293–313.*

Eriksen C, Simon GL, Roth, F, Lakhina SJ, Wisner B, Adler C, Thomalla F, Scolobig A, Brady K, Bründl M, Neisser F, Grenfell M, Maduz L & Prior T In Press, *Rethinking the interplay between affluence and vulnerability to aid climate change adaptive capacity, Climatic Change, ref. CLIM-D-20-00132R1 (accepted 31 July 2020).*

Hughes L & Fenwick J 2015, *The Burning Issue: Climate Change and the Australian Bushfire Threat. Climate Council of Australia Limited. At: www.climatecouncil.org.au/resources/burningissuereport2015/.*

Kanakis K & McShane C 2016, *Preparing for disaster: Preparedness in a flood and cyclone prone community. Australian Journal of Emergency Management, vol. 31, no. 2, pp.18–24.*

Lucas C, Eriksen C & Bowman D 2020, *A crisis of underinsurance threatens to scar rural Australia permanently. The Conversation, 7 January 2020. At: https://theconversation.com/a-crisis-of-underinsurance-threatens-to-scar-rural-australia-permanently-129343.*

Madigan D 2016, *Mark Dreyfus sparks war of words with insurance industry over Blue Mountains bushfires. The Blue Mountains Gazette, 21 April 2016. At: www.bluemountainsgazette.com.au/story/3863519/dreyfus-sparks-war-of-words-with-insuranceindustry-over-blue-mountains-bushfires/ [25 September 2018].*

McGowan J 2012, *A missed opportunity to promote community resilience?—The Queensland Floods Commission of Inquiry. Australian Journal of Public Administration, vol. 71, no. 3, pp.355–363.*

O'Hare P, White I & Connelly A 2016, *Insurance as Maladaptation: Resilience and the 'Business as Usual' Paradox. Environment and Planning C: Government and Policy, vol. 34, no. 6, pp.1175–1193.*

Penman TD, Eriksen C, Horsey C, Green A, Lemcke D, Cooper P & Bradstock RA 2017, *Retrofitting for Wildfire Resilience: What is the Cost? International Journal of Disaster Risk Reduction, vol. 21, pp.1–10.*

Quantum Market Research 2013, *The Understand Insurance Research Report. Melbourne: Report for the Insurance Council of Australia.*

Shreve CM & Kelman I 2014, *Does mitigation save? Reviewing cost-benefit analyses of disaster risk reduction. International Journal of Disaster Risk Reduction, vol. 10, pp.213–235.*

Standards Australia 2009, *A.S.3959–2009: Construction of Buildings in Bushfire Prone Areas. Sydney, Australia: SAI Global Limited.*

Urbis 2014, *Economic benefits of flood mitigation investments. Brisbane: Urbis. At: www.pc.gov.au/inquiries/completed/disaster-funding/submissions/submissions-test2/submission-counter/subdr176-disaster-funding-attachment.pdf [2 January 2018].*

Victorian Council of Social Services 2017, *Building Resilience Communities: Working with the community sector to enhance emergency management. Melbourne, February. At: https://apo.org.au/sites/default/files/resource-files/2017-03/apo-nid89656.pdf [8 May 2020].*

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Abstract

An effective way to reduce the impacts of natural hazards on communities is by mitigating the risks. However, mitigation requires time and resources, which are usually limited. To use resources effectively, planners and managers are best prepared when they know their options and which of these options provides the best value for money. When there is not enough information, or an analysis would take several months or years to complete, having access to quick economic analyses in weeks rather than months would be very useful. This paper describes a Quick Economic Analysis Tool, developed at the University of Western Australia, to conduct quick analyses. A case study is used of two prescribed burn annual rates and are compared with results of an in-depth analysis of the application of different prescribed burn annual rates over the long-term that took several years to complete. The results from the quick analysis, despite a few differences, were comparable to results from an in-depth analysis and provided enough information to determine the value for money that each prescribed burn annual rate generated. This study showed that the quick analysis tool would allow fire managers to identify options worthy of business cases and to capture the information needed to increase confidence in their decisions.

Economic analysis of natural hazard mitigation using the Quick Economic Analysis Tool

Peer Reviewed

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Introduction

Governments operate within limited budgets and they need to decide how to best allocate resources for effective mitigation activities of natural hazards. To be effective, natural hazard managers need to compare the costs and benefits of different options and identify the option that provides the best value for money. Ideally, this would be done through a comprehensive economic analysis that provides information on the net benefits of each option and the value for money expected from each dollar invested.

However, conducting this type of in-depth economic analysis can take a long time, from several months to several years (Florec *et al.* 2020; Penman, Bradstock & Price 2014). Even integrating new information, such as intangible (non-market) values, into an already completed analysis can take several months (Florec, Chalak & Hailu 2017). However, natural hazard managers may need economic information in a much shorter timeframe.

If there was a tool to help them get quick and accurate option(s) likely to generate the best returns on investment and the additional information needed, this could significantly speed up the decision-making process. It would also allow for decisions to be based on evidence and that trade-offs between different options are fully understood.

Such a tool has been developed for this purpose. The Quick Economic Analysis Tool (QEAT) is a spreadsheet-based model allowing a quick and rough overview of the value for money managers can expect from investing in various mitigation options. It includes tangible (market) and intangible (non-market) values that can be affected by natural hazards.

QEAT provides a way for planners and managers to conduct analyses in weeks (rather than months or years) to identify:

- the options that are worth developing business cases for
- the type of information needed to improve decisions and the confidence in them.

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To test the tool, results obtained from a quick economic analysis of bushfire management in the south-west of Western Australia using QEAT were compared with the results of a comprehensive economic analysis already conducted. That analysis had taken four years to complete (Florec *et al.* 2020). This paper provides a summary of the arguments for and against using QEAT to evaluate mitigation options.

Methods

The Quick Economic Analysis Tool

QEAT is a spreadsheet that allows the user to insert relevant parameters and easily and quickly calculate benefit-cost ratios (BCRs) and net present values (NPVs). In this format, the value for money generated by the different options can be quickly compared. A sensitivity analysis can also be conducted to test the robustness of the results.

QEAT users must be clear about the counterfactual, that is, the baseline scenario to which the mitigation options are compared. For example, doing nothing, business as usual or other. This has the potential to increase transparency and reduce confusion sometimes associated with economic analyses of natural hazards. This occurs when practitioners are not clear about how the benefits are calculated.

The mathematical formulation of the model embedded in QEAT is:

- Compare option 1 to option x:
  - using net benefits:

$$\begin{aligned} &\text{Net benefits option 1} = (AAL_B - AAL_{option1}) - Cost_{option1} \\ &\text{Net benefits option 2} = (AAL_B - AAL_{option2}) - Cost_{option2} \\ &\text{Net benefits option x} = (AAL_B - AAL_{optionx}) - Cost_{optionx} \end{aligned} \quad (1)$$

where Average Annual Losses *(AAL)* for the baseline *(B)* or for any option are calculated as:

$$AAL_B = \sum_{i=1}^{n} \sum_{j=1}^{m} n_{i(B)j} Z_j P(i,B) \quad (2)$$

$$AAL_{option} = \sum_{i=1}^{n} \sum_{j=1}^{m} n_{i(option)j} Z_j P(i,option) \quad (3)$$

  - and using BCRs:

$$\begin{aligned} &\text{BCR option 1} = \frac{(AAL_B - AAL_{option1})}{Cost_{option1}} \\ &\text{BCR option 2} = \frac{(AAL_B - AAL_{option2})}{Cost_{option2}} \\ &\text{BCR option 3} = \frac{(AAL_B - AAL_{optionx})}{Cost_{optionx}} \end{aligned} \quad (4)$$

In equation (2), $n_{i(B)j}$ is the percentage of asset *j* destroyed by natural hazard event *i* for the baseline scenario *(B)*, Z_j is the value (in dollars) of asset *j*, and *P(i,B)* is the probability of event *i* occurring under the baseline scenario *(B)*.

In equation (3) the same parameters are used but for a scenario where one of the options is implemented. The implementation costs of each option ($Cost_{option}$) correspond to the annual costs of operations plus the initial fixed costs to set up the mitigation strategy.

Case study

In Western Australia, the south-west forests are managed by the Department of Biodiversity, Conservations and Attractions (DBCA). The South West region (see boundaries of the three forest regions in Figure 1) is approximately 1.88 million hectares and contains a mix of forests, coastal mallee shrublands and heathlands, agricultural land as well as residential areas. It has a Mediterranean-type climate with hot dry summers and mild wet winters. Bushfires of different severity occur every year in the region, particularly in the hotter months between October and May when the vegetation is dry and rainfall is minimal. The region has a long history of prescribed burning and complex fire management issues because of the combination of different land uses and tenures, where assets are intermingled with flammable vegetation.

Details of the analysis

Two prescribed burning annual rates were tested. These were prescribed burning five per cent and ten per cent of public land managed by the DBCA. These targets were selected as they were proposed in the literature as appropriate risk reduction targets for this region and for other regions in Australia. The ten per cent target corresponds to the area that would need to be treated annually in order to reach the areal extent necessary to protect communities, the environment and biodiversity (Burrows & McCaw 2013); while the five per cent target has been suggested for other regions in enquiries conducted after large and economically significant fire events (Teague, McLeod & Pascoe 2010). The counterfactual (to which mitigation strategies are compared) was doing nothing; that is, no prescribed burning. A 20-year timeframe was used for the analysis with a discount rate of seven per cent.

To populate the input parameters in QEAT, historical data for the south-west of Western Australia for the past 60 years was used. Most of the data is publicly available and included lives lost, properties destroyed, and, in some cases, area burnt. However, some of the data (hectares burnt and location of the area burnt) was obtained from DBCA. Although the level of prescribed burning applied in the wider south-west region has varied greatly over the last 80 years, several large wildfires have caused significant damages in the region:

- In 1961, 160 houses were destroyed and the town of Dwellingup was destroyed.
- In 1978, two lives were lost and six buildings destroyed; a narrow escape for four major towns.

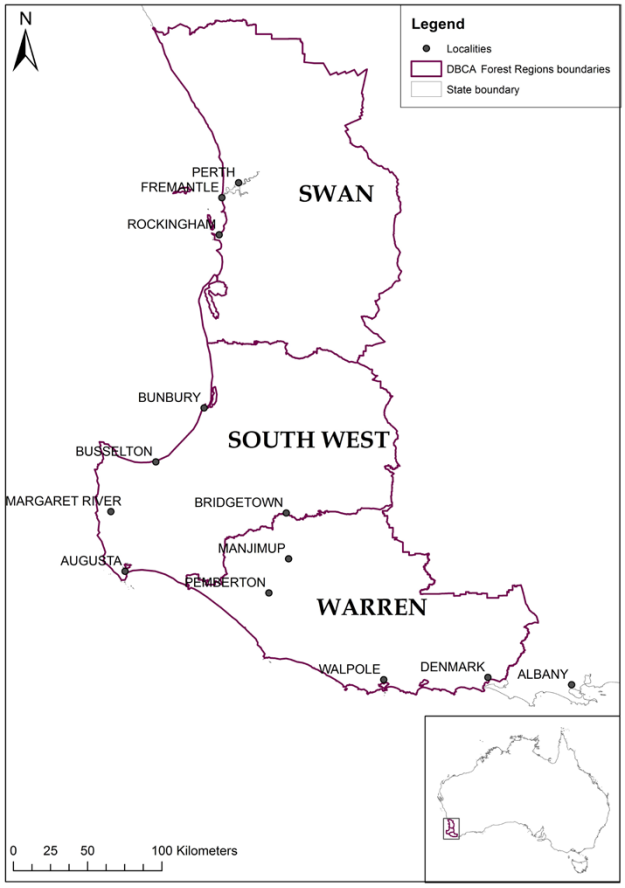

Figure 1: The south-western forest regions managed by the Department of Biodiversity, Conservation and Attractions.

- In 1997, two lives were lost, 21 injuries and 17 houses destroyed.
- In 2003, two lives were lost, more than two million hectares of forest were destroyed.
- In 2007, 16 houses destroyed in Dwellingup, three lives lost and a major highway closed for two weeks generating significant losses to some industries.
- In 2011, 34 houses were destroyed.
- In 2015, four lives were lost and a major highway was closed for several days, generating losses to the dairy industry.
- In 2016, two lives were lost, 181 properties were destroyed and the town of Yarloop was destroyed.

Table 1 shows the values used for each type of asset and their respective sources.

Results

Table 2 shows the results obtained from QEAT. These results show that without mitigation, average annual losses could amount to $167 million. Most of the losses (61 per cent) stem from damage to buildings (residential, commercial and industrial buildings combined) followed by agricultural losses (about 25 per cent) and effects on human health (about nine per cent).

The results for the two prescribed burn scenarios (five and ten per cent of public land prescribed burnt) in Florec and colleagues (2020) are shown in Table 3. The categories of assets included there are different from those included in QEAT, where four categories were evaluated instead of five. The categories 'urban' and 'nature and conservation' included in Florec and colleagues (2020) roughly correspond to the 'buildings' and 'environment' categories in this study, respectively. The category 'infrastructure' was not included in Florec and colleagues (2020). The main addition in this study was the improvement in information gained on non-market values for 'human health' and the 'environment'. These were extracted from the Value Tool for Natural Hazards (Gibson *et al.* 2018), which is a database of non-market values relevant to natural hazards.

The results in Table 3 indicate that average annual losses without mitigation could amount to AU$232 million, which is about 21 per cent higher than the result from QEAT. The proportion of damage attributed to each category differs between QEAT and Florec and colleagues (2020). A much higher proportion of the losses in Table 3 stem from:

- damage to buildings of about 73 per cent of total damages
- environmental damages of about 14 per cent of losses, which is greater than what is indicated by QEAT
- agricultural damages of about six per cent, which is substantially less than what is indicated by QEAT.

Acknowledging these points of difference, there is a high degree of complementarity in the results, particularly from the perspective of the outcomes that would inform decision-making. Both models indicate that the implementation of the two prescribed burn scenarios (five per cent and ten per cent) in the case study area generated substantial benefits. Estimates from QEAT showed lower benefits from prescribed burning than those estimated by Florec and colleagues (2020). Therefore, the benefit-cost ratios from QEAT are also lower. Both prescribed burn scenarios generated good value for money in the case study area (i.e. BCRs were substantially higher than 1). Based on the BCRs, the five per cent scenario generated more value per dollar invested than the ten per cent scenario in both models. This suggests that prescribed burning has diminishing marginal returns; that is, after a certain point, every additional dollar invested in prescribed burning generates smaller and smaller benefits (which is consistent with previous studies (Mercer *et al.* 2007, Butry *et al.* 2010). However, based on NPVs, the ten per cent scenario provided better outcomes than the five per cent scenario (i.e. higher NPV), which makes it a more attractive strategy if the costs can be afforded.

Sensitivity analysis

Another important output of QEAT is the information it provides to planners and managers on the confidence they can have in the results and the information they need to increase that confidence. Results from a sensitivity analysis performed in QEAT for this purpose are shown in Table 4 and Table 5 for the five per cent and ten per cent prescribed burn scenarios, respectively.

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Table 1: Value of different assets.

Type	Asset	Value[A]	Description	Source
Tangible (market) assets				
Buildings	Residential	660,000	$/building	Dunford, Power & Cook (2014)
	Commercial	7,100,000	$/building	Dunford, Power & Cook. (2014)
	Industrial	2,300,000	$/building	Dunford, Power & Cook. (2014)
Infrastructure	Roads (bridges)	1,500,000	$/bridge	Main Roads Western Australia approximate cost of replacing the Samson Bridge, damaged in the Yarloop fire in 2016.
	Rail	NA	$/km	NA
	Power lines	46,500	$/km	Ausgrid (2019)
	Power poles	10,000	$/pole	Ausgrid (2019)
Agriculture	Horticulture	3,000	$/ha	Australian Bureau of Statistics (2017)
	Grazing and cropping	1,000	$/ha	Australian Bureau of Statistics (2017)
	Vineyards	50,000	$/ha	AHA Viticulture (2006)
	Plantation forestry	9,000	$/ha	Gibson & Pannell (2014)
Other	Water catchments	NA	$/ha	NA
Intangible (non-market) assets				
Human health	Life	4,900,000	$/fatality	Office of Best Practice Regulation (2019)
	Minor injury	26,000	$/injury	Value Tool database (Gibson *et al.* 2018)
	Hospitalised injury	73,000	$/injury	Value Tool database (Gibson *et al.* 2018)
	Serious injury	250,000	$/injury	Value Tool database (Gibson *et al.* 2018)
Environment	Threatened species	49	$/species/ household	Value Tool database (Gibson *et al.* 2018)
	Native vegetation	146	$/ha	Value Tool database (Gibson *et al.* 2018)

[A] *All values are in 2018 AUD, rounded to two significant figures.*

Although the results appear robust (i.e. the proportional change in the results is generally a lot smaller than the proportional change in the parameter), some parameters deserve attention. The asset categories in QEAT included the category 'buildings', which has a much stronger effect on the results than any other asset category. This was expected as the value of buildings is high compared to other assets and bushfires destroy buildings. The category 'human health' (life and injuries) also has high value, but loss of life and injuries caused by bushfires tend to be less common in the case study region, and therefore have less of an effect on the results. For fire managers, this means that having better information on how effective prescribed burning is for protecting buildings can provide better confidence levels in decisions and better allocation of funding for prescribed burning.

Another interesting parameter is the effectiveness of prescribed burning, or the capacity of the practice to reduce bushfire risk. For the five per cent prescribed burn, a change in the effectiveness of prescribed burning has a relatively high impact on the results; more so if the effectiveness is decreased. However, for the ten per cent strategy, a change in the effectiveness of prescribed burning has less impact on the results. For a fire manager, this means that if there are constraints on the area that can be burned and the area that can be treated is relatively small, treatments need to be targeted at protecting high-value assets. Thus, any changes in losses avoided have a high impact on the return on investment. But if larger areas can be burned, then the effectiveness of prescribed burning in reducing damage has a more moderate impact on the results and the confidence in the return on investment is higher.

Changes to prescribed burning costs have a very high impact on the results. Therefore, to increase the confidence in decisions for prescribed burns, it is important to have accurate data on costs of prescribed burning and to understand how these costs change for different prescribed burning activities.

Table 2: Results with and without mitigation.

Item	Estimate (AUD millions)	
Average annual losses (without mitigation)	$167	
Buildings	$102	
Infrastructure	$2	
Agriculture	$43	
Human health	$15	
Environment	$5	
	Prescribe burning 5%	**Prescribe burning 10%**
Average annual losses (with mitigation)	$62	$19
Buildings	$31	$7
Infrastructure	$1	$0
Agriculture	$26	$10
Human health	$3	$1
Environment	$2	$1
Average annual benefits	$105	$148
Present value of benefits	$1,117	$1,567
Present value of costs	$28	$55
Net present value	$1,089	$1,512
Benefit-cost ratio	40	28

Table 3: Results with and without mitigation from an existing published study.

Item	Estimate (millions)	
Average annual losses (without mitigation)	$232	
Nature and conservation	$33	
Plantation forestry	$15	
Agriculture	$15	
Urban	$170	
	Prescribe burning 5%	**Prescribe burning 10%**
Average annual losses (with mitigation)	$79	$18
Nature and conservation	$14	$3
Plantation forestry	$5	$1
Agriculture	$7	$3
Urban	$54	$11
Average annual benefits	$153	$214
Present value of benefits	$1,619	$2,271
Present value of costs	$28	$55
Net present value	$1,591	$2,215
Benefit-cost ratio	58	41

Source: Florec *et al.* (2020)

Conclusion

The QEAT was used to conduct a quick analysis of two prescribed burning annual rates in the south-west of Western Australia. Results were compared with an in-depth analysis undertaken between 2012 and 2016. Despite some differences, the results from the QEAT were comparable to those of the in-depth analysis and provided sufficient information to determine the value for money that each annual rate generated. A sensitivity analysis conducted using QEAT demonstrated its capacity to show the types of additional information needed to increase the confidence in decisions made for prescribed burns. For the case study used, these were the data on the effectiveness of prescribed burning in reducing risk to buildings, data on the effects of prescribed burning when fuel loads are high in the region and data on prescribed burning costs. Using QEAT, rapid and accurate information on the costs and benefits of different mitigation options can be obtained, thereby saving time and money to agencies that need this information. By understanding the confidence that can be attributed to different mitigation decisions and prioritising the additional data needed to increase the confidence in those decisions, the use of QEAT can improve outcomes for disaster risk reduction across Australia and possibly for other countries.

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Table 4: Sensitivity analysis prescribed burning five per cent.

Parameter change[A]	Average annual benefits	Present value of benefits	Present value of costs	Net present value	Benefit-cost ratio	Proportional change in BCR
Base results	$105	$1,117	$28	$1,089	40	
Increase in asset values by 50%						
Buildings	$141	$1,495	$28	$1,467	54	25%
Infrastructure	$106	$1,126	$28	$1,098	40	1%
Agriculture	$114	$1,208	$28	$1,180	43	8%
Human health	$112	$1,182	$28	$1,154	42	5%
Environment	$107	$1,133	$28	$1,105	41	1%
Decrease in asset values by 50%						
Buildings	$70	$739	$28	$711	26	-51%
Infrastructure	$105	$1,108	$28	$1,080	40	-1%
Agriculture	$97	$1,026	$28	$998	37	-9%
Human health	$104	$1,101	$28	$1,073	39	-1%
Environment	$105	$1,117	$28	$1,089	40	0%
Increase in` prescribed burning effectiveness[B]						
by 10%	$112	$1,182	$28	$1,154	42	6%
by 25%	$121	$1,280	$28	$1,252	46	13%
by 50%	$136	$1,444	$28	$1,416	52	23%
Decrease in prescribed burning effectiveness[C]						
by 10%	$99	$1,051	$28	$1,024	38	-6%
by 25%	$90	$953	$28	$926	34	-17%
by 50%	$75	$790	$28	$762	28	-41%
Increase in prescribed burning costs						
by 10%	$105	$1,117	$31	$1,086	36	-10%
by 25%	$105	$1,117	$35	$1,082	32	-25%
by 50%	$105	$1,117	$42	$1,075	27	-50%
Decrease in prescribed burning costs						
by 10%	$105	$1,117	$25	$1,092	45	10%
by 25%	$105	$1,117	$21	$1,096	53	25%
by 50%	$105	$1,117	$14	$1,103	80	50%
Increase in discount rate						
Discount rate 10%	$105	$898	$23	$875	40	0%
Discount rate 13%	$105	$741	$19	$722	40	-1%
Decrease in discount rate						
Discount rate 4%	$105	$1,433	$36	$1,397	40	0%
Discount rate 1%	$105	$1,902	$47	$1,855	40	1%

[A] Only the parameter indicated on each row is changed.
[B] Damages are increased by a further 10%, 25% or 50%.
[C] Damages are decreased by a further 10%, 25% or 50%.

Table 5: Sensitivity analysis prescribed burning ten per cent.

Parameter change[A]	Average annual benefits	Present value of benefits	Present value of costs	Net present value	Benefit-cost ratio	Proportional change in BCR
Base results	$148	$1,567	$55	$1,512	28	
Increase in asset values by 50%						
Buildings	$195	$2,069	$55	$2,014	38	24%
Infrastructure	$149	$1,579	$55	$1,524	29	1%
Agriculture	$164	$1,739	$55	$1,684	32	10%
Human health	$155	$1,643	$55	$1,588	30	5%
Environment	$150	$1,587	$55	$1,532	29	1%
Decrease in asset values by 50%						
Buildings	$100	$1,064	$55	$1,009	19	-47%
Infrastructure	$147	$1,555	$55	$1,500	28	-1%
Agriculture	$132	$1,394	$55	$1,339	25	-12%
Human health	$141	$1,491	$55	$1,436	27	-5%
Environment	$146	$1,546	$55	$1,491	28	-1%
Increase in` prescribed burning effectiveness[B]						
by 10%	$150	$1,587	$55	$1,532	29	1%
by 25%	$153	$1,618	$55	$1,563	29	3%
by 50%	$158	$1,669	$55	$1,613	30	6%
Decrease in prescribed burning effectiveness[C]						
by 10%	$146	$1,547	$55	$1,491	28	-1%
by 25%	$143	$1,516	$55	$1,461	28	-3%
by 50%	$138	$1,465	$55	$1,410	27	-7%
Increase in prescribed burning costs						
by 10%	$148	$1,567	$61	$1,506	26	-10%
by 25%	$148	$1,567	$69	$1,498	23	-25%
by 50%	$148	$1,567	$83	$1,484	19	-50%
Decrease in prescribed burning costs						
by 10%	$148	$1,567	$50	$1,517	32	10%
by 25%	$148	$1,567	$41	$1,526	38	25%
by 50%	$148	$1,567	$28	$1,539	57	50%
Increase in discount rate						
Discount rate 10%	$148	$1,259	$44	$1,215	28	0%
Discount rate 13%	$148	$1,039	$37	$1,002	28	-1%
Decrease in discount rate						
Discount rate 4%	$148	$2,010	$71	$1,940	28	0%
Discount rate 1%	$148	$2,669	$93	$2,576	29	0%

[A] Only the parameter indicated on each row is changed.
[B] Damages are increased by a further 10%, 25% or 50%.
[C] Damages are decreased by a further 10%, 25% or 50%.

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Glossary of economic terms

Benefit-cost ratio: Indicator used in benefit-cost analyses to measure the potential value for money that can be obtained from alternative investment options. It is calculated by dividing the benefits of an investment option by its costs. The BCR value (less than, equal to, or higher than 1) represents the benefits that can be expected for every dollar invested. For instance, a BCR value of 3:1 means that for every dollar invested, the option generates $3 in benefits.

Present value: The current value of a future sum of money or a future stream of cash flows for a given period and a specified rate of return. Because money has interest-earning potential, the value of a sum of money today (present value) is usually less than its future value.

Discount rate: The rate of return used to calculate present values. The discount rate selected for the analysis has an important impact on the results: the higher the discount rate, the lower the present value.

Net benefits: Calculated by subtracting the costs from the benefits.

Net present value: Calculated by subtracting the present value of costs from the present value of benefits.

Sensitivity analysis: A test of the robustness of the results of a study. A sensitivity analysis evaluates how the uncertainty in the results of a mathematical model can be attributed to different sources of uncertainty in its inputs.

Market values: Assets for which reconstruction costs or total value can be readily estimated in dollars, because these items are exchanged in markets and already have prices (i.e. items that are normally bought or sold).

Non-market values: Also referred to as social and environmental assets, non-market values concern those things that are not exchanged in markets (i.e. are not normally bought or sold) and therefore do not have a price (e.g. biodiversity, life).

References

AHA Viticulture 2006, *Regional viticulture and climate control - Margaret River. Final report to the Grape and Wine Research and Development Corporation. Dunsborough, Western Australia.*

Ausgrid 2019, *Private pole and powerline repair costs. At: www.ausgrid.com.au/In-your-community/Bushfire-prevention/Private-Poles-and-powerlines/Private-Pole-repair-costs [22 July 2019].*

Australian Bureau of Statistics 2017, *Agricultural Commodities Australia 2016–2017. Catalogue 71210DO001_201617.*

Burrows N & McCaw L 2013, *Prescribed burning in southwestern Australian forests. Frontiers in Ecology and the Environment, vol. 11, no. s1, pp.e25-e34.*

Butry DT, Prestemon JP, Abt KL & Sutphen R 2010, *Economic optimisation of wildfire intervention activities. International Journal of Wildland Fire vol. 19, pp.659–672.*

Dunford MA, Power L & Cook B 2014, *National Exposure Information System Building Exposure - Local Government Area. Canberra, ACT: Geoscience Australia.*

Florec V, Burton M, Pannell D, Kelso J & Milne G 2020, *Where to prescribe burn: the costs and benefits of prescribed burning close to houses. International Journal of Wildland Fire, vol. 29, pp.440-458. doi.org/10.1071/WF18192*

Florec V, Chalak M & Hailu A 2017, *Integrating intangible values in economic analyses of flood mitigation: A case study of the Brown Hill and Keswick creeks catchment in Adelaide. Australian Journal of Emergency Management, vol. 32, no. 4, pp.30–36.*

Gibson FL & Pannell DJ 2014, *Integrated economic assessment of fire risk management strategies: case studies in Central Otago, New Zealand, and Mount Lofty Region, South Australia. Final Report for the Integrated Assessment of Prescribed Burning Project, Bushfire CRC, Melbourne.*

Gibson FL, Rogers AA, Hawkins JI & Pannell DJ 2018, *Value Tool for Natural Hazards: Database Version 1. Bushfire and Natural Hazards CRC Report 362, The University of Western Australia, Crawley Western Australia.*

Mercer DE, Prestemon J P, Butry DT & Pye JM 2007, *Evaluating alternative prescribed burning policies to reduce net economic damages from wildfire. American Journal of Agricultural Economics, vol. 89, pp.63–77.*

Office of Best Practice Regulation 2019, *Best Practice Regulation Guidance Note: Value of statistical life. Department of the Prime Minister and Cabinet, Australian Government.*

Penman TD, Bradstock RA & Price OF 2014, *Reducing wildfire risk to urban developments: Simulation of cost-effective fuel treatment solutions in south eastern Australia. Environmental Modelling and Software, vol. 52, 166–175.*

Teague, McLeod & Pascoe 2010, 2009 *Victorian Bushfires Royal Commission Final Report. Melbourne, Australia: Victorian Bushfires Royal Commission.*

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Abstract

Disastrous bushfires in the summer of 2019–2020 in Australia were part of a series of climate-related emergency events previously unimagined. Australia, coming out of its worst-recorded drought, has been hit by long-running bushfires, floods, coastal erosion and the global COVID-19 pandemic. To combat concurrent and compounding events like these, emergency services personnel and police, including paid and volunteer-led teams, had to adapt their response and recovery activities. For the first time, these activities were supported by a large Australian Defence Force contingent. Many emergency management teams were also supplemented by international colleagues, thus forming integrated and multi-agency teams. In such response environments, team leaders applied learning and experience they had developed in operational settings to be effective in response and recovery efforts. The human capacities of leaders are different and are founded on recruiting, cultural background, training, education and experiential opportunities. Recognising each person's leadership capacity can be difficult and can reduce the efficiency of response and recovery. This paper examines current options and arrangements that exist through national and international certification systems. The purpose is to establish a simple and recognisable understanding of emergency managers' skills. This paper draws from research that examines the human-capacity leassons from past events that develop future emergency managers.

Professionalism: certification for emergency management leaders

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Introduction

Emergency and incident management directly effects all communities. Emergency events occur daily and range from minor and routine incidents affecting one or two people, to major events that affect suburbs, communities, regional areas, entire states and countries. The people who manage the response require knowledge, skills and abilities, referred to here as 'human capacities'. These capacities allow them to overcome or minimise the effects of the emergency by directing the coordinated activities of responding personnel. Initial research undertaken in this study examined the 'Australian Emergency Manager'. This study exposed certification as a concept required for human-capacity building. Thus, the topic of certification will be explored within the broader consideration of emergency management 'professionalism'.

Background

The literature chosen for this study examined human capacities of individuals who undertake leadership responsibilities during an emergency – the emergency manager. The scope chosen was broader than the scope of 'emergency management literature' to recognise the non-emergency management skills and concepts of the Australian Emergency Manager. This subset of the literature focused on the question of certification as a part of the overall description of the emergency manager.

The terms 'emergency management' and 'incident management' in Australia have been agreed and are defined in the Australian Disaster Resilience Glossary (Australian Institute for Disaster Resilience n.d.). The terms are often used interchangeably and have some state-based legislative variations. Emergency management is the range of measures that address all phases of emergencies, including prevention, preparedness, response and recovery. Incident management relates to the actions taken during the response and recovery phases. The primary difference is the full focus on prevention and preparedness activities within emergency management as compared with the response and recovery, which is the focus of incident management.

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Descriptions applied to emergency management include profession, professional, professionalism, professionalisation, vocation and vocational. These descriptions have various meanings across the academic and general communities and their use can be contentious (Peterson 1976). This is also reflected in the emergency management sector.

Definitions

A 'profession' is described as a group of people who have higher standing based on levels of formal training (Birkett & Evans 2005), their social function (Buijs 2005), self-regulation (Freidson 1984) or expert knowledge (Gorman & Sandefur 2011).

A 'professional' is described as someone who has a higher level of knowledge, an academic degree, a recognised label, who self regulates their work and is committed to their client (Bearden 2002). Alternatively, the descriptor may encompass being paid for work or providing a consistent level of performance (Buijs 2005), making ethical decisions (Carlan & Lewis 2009), having devotion to a role or occupation (Flexner 2001), being responsible to a professional association, being recognised for training or skills (Hallam 2002, Hansbury 1963) and being more than a specialised worker (Freidson 1984).

A further term used is 'professionalism', which describes the outcome of the process of professionalisation (Birkett & Evans 2005). It can be a level of service (Lanyon 2010) or an ongoing, continually developing discourse that occurs during the process of professionalisation (Miller 2011).

In summary, a recognised profession takes occupational status to a new level. The criterion applied recognises that a profession, when compared to a vocation, is a complex occupational environment. A professional has higher levels of autonomy and a greater defined level of knowledge that guides their actions. A vocation can be a position (e.g. within a church) or as a career choice or occupation (Buijs 2005). The term 'professionalisation' is used to describe the deliberate journey from a vocation towards a profession. Undertaking this journey of professionalisation requires understanding of the human capacities of a professional.

Pathways to professionalism

Progression includes vocational and tertiary education, certifications, credentials and education as compared to the development and application of skills and experience that is built up over time. Cully (2005) indicated there is no direct link between qualification and competence to carry out a task. However, it has been shown that measurement of competence and standards of practice are critical to the work of a professional (Murphy & McLaws 1999, Alexander 2003). Valloze (2009) argued that competence is a means of creating a stronger profession but, at the same time, its breadth of application can be harder to demonstrate across a broad range of skills (Pijl-Zieber *et al.* 2014).

The education and training systems in Australia accommodate diversity, support consistent outcomes and align with international systems (Australian Qualifications Framework Council 2013). The delivery of 10 levels of education, between a certificate level 1 and a doctoral or level 10 qualification, is undertaken by registered training organisations that deliver curricula leading to consistent qualifications. The vocational sector, which is different from the occupational descriptor of vocation as a type of work, includes government-funded providers and private registered training organisations. These institutions provide levels 1–8 certifications and tertiary institutions or universities provide levels 6–10 qualifications (Australian Qualifications Framework Council 2013). The qualifications and the organisations that deliver them are well described, regulated and split into delivery sectors. Levels of training are mapped to levels of qualification. However, the issue of experience is not as well described within the educational systems in Australia.

Experience and qualifications could be considered as extremes for individuals who undertake command during emergencies, but there is a range of positions between these two points, with those positions often described using the word 'competency'. Competency in practice domains such as nursing is considered more important than qualifications or experience individually (Murphy & McLaws 1999). Australian infection-control practitioners consider the development of a credentialing process based on a combination of both qualifications and experience (i.e. competence) to be more important than just qualification or experience (Murphy & McLaws 1999).

Certification is sometimes used in parallel to, or instead of, credentialing and can occur outside of a qualification framework (Cully 2005). Certification can be applied to a particular skill within a qualification framework or an examination process (Messina 1979, O'Donnell & Dunlap 2014), as a measure of both qualification and experience (Haas, Orav & Golgman 1995) or as part of a discussion about ongoing competence (Schmal & Derrevere 2012).

Galbraith and Gilley (1986) described professional certification within the American adult education and human resource development fields as part of the 'evolutionary process of professionalisation'. They also described stages within the professional certification process (Galbraith & Gilley 1986). The process they describe contains stages from identifying a need and prospective candidates; establishing procedures, core educational or competency requirements and assessment criteria; marketing, evaluation, review and re-marketing. As such, many of the steps mirror the broad descriptors of a professional and professionalisation described (Galbraith & Gilley 1986). This model separates professional certification from other means of credentialing such as accreditation and licensing. Galbraith and Gilley (1986) also state that while accreditation and licensing (or credentialing) may be required to enter a profession in America, professional certification is a voluntary system, regulated by the profession, with a view of improving the competency of individuals.

A study by Cumberland, Petrosko and Jones (2018) of service-related industry professionals examined six years of candidate and graduate perceptions of an industry associations certification program. The study examined the motivations of people who had

undertaken the certification process. They found key motivations for undertaking certification were growth, self-development, knowledge, respect and career advancement (Cumberland, Petrosko & Jones 2018).

Ruiz-Molina and colleagues (2019) examined professional certification in a European context. They surveyed over 2,600 professionals in multiple countries to examine the value attached to certification. They found that the perceived value of certification was based on attributes of the certification scheme and the candidate's personal characteristics. In particular, the study found certification schemes that were difficult, fair, credible, innovative and internationally recognised were more likely to attract candidates. The greatest influencing factor was the future usefulness of the certification (Ruiz-Molina *et al.* 2019). It was found that it was not only university graduates who sought certification, but also people with other experiences or qualifications. The study identified that a certification's recognition of employment and experience as a substitute for formal training validated experience held by the candidate in lieu of formal training (Ruiz-Molina *et al.* 2019).

Schmal and Derrevere (2012) identified that certification in a nursing palliative care environment had benefits for both the individual and the employer. They found that nurses who undertook a rigorous and recognised certification process reported personal benefits including knowledge validation, increased earnings and career opportunities and a sense of personal achievement. Employers preferred certified staff as it increased overall internal clinical competence in a cost-effective manner. This was regarded as a marketable benefit for the organisation (Schmal & Derrevere 2012).

Certification is recognised in other fields to support the professionalisation of occupations. Child and Youth Care Professional Certification has been applied in North America to unify various sub-specialties around common knowledge and skills (Curry *et al.* 2010). The field of ecological restoration has developed a certification program to increase professional standards (Nelson *et al.* 2017). Education has a system for school principals as a means to acknowledge skill and experience to improve education quality (Gajardo & Carmenado 2012).

Certification is being used within emergency management in a move towards professionalisation (Wilson & Oyola-Yemaiel 2001) where the basis of certification is training. When that training is combined with systems of selection and experience, it can form the basis of certification. The International Association of Emergency Management (IAEM) certification is an example of a process in action for individuals in the United States of America (Wilson & Oyola-Yemaiel 2001).

The need for, and application of, certification in various sectors has led to the production of an Australian Standard. Australian/New Zealand Standard 'Conformity Assessment – General established requirements for bodies operating certification of person' AS/NZS ISO/IEC 17024:2013) in 2013. This standard is identical to the European Standard and establishes criteria to be applied by certification bodies in Australia (Standards Australia 2013a).

While this standard exists, in Australia, Standards are not law but may be called up in legislation (Standards Australia 2013b).

On examination, the literature here showed there are consistencies and inconsistencies in the use, definition and application of terms describing an emergency manager. The vocation-profession discussion describes the competing view of a profession, acting like a professional, the journey along the path of professionalism and undertaking this journey from a starting point of vocational training or tertiary education and qualifications. This intersects with the qualification-experience view about the need to have qualifications or experience when managing an emergency or incident and the various frameworks in Australia that influence that discussion.

Qualification is based, in part, on the recognition of competencies in an academic environment. That qualification may include experience, but qualification does not automatically lead to certification. Certification is evidence that the various steps within the professionalisation process have been collected and collated. This allows an individual to seek recognition of a defined set of qualifications (including competencies), knowledge, skills, abilities and experience to be recognised as a professional. The Australian Standards regime can be used to determine conformity of a certification scheme.

Emergency management certification regimes

Four emergency management certification regimes were identified that build on the concepts described in the literature. The Australasian Fire and Emergency Service Authorities Council (AFAC) is a member-based organisation that has a purpose to be the custodian of 'contemporary fire and emergency service knowledge and practice' (Australasian Fire and Emergency Service Authorities Council 2017). AFAC produced the Emergency Management Professionalisation Scheme (EMPS) in 2015. The scheme recognises that emergency management is not considered a profession in Australia, but that a certification scheme is a foundation for becoming recognised (Australasian Fire and Emergency Service Authorities Council 2018). The EMPS contains standards for certification of incident management roles, describes an assessment of technical competence and role experience and includes application and final certification processes. EMPS applies a code of ethics and recertification that certified members must comply with to maintain their certification (Australasian Fire and Emergency Service Authorities Council 2018).

The Emergency Management Accreditation Program (EMAP) is an independent American organisation that fosters excellence in emergency management programs by applying and assessing against a standard (Emergency Management Accreditation Program 2019). EMAP is recognised as a Standard Developing Organization by the American National Standard Institute (ANSI). It produced the 2016 Emergency Management Standard as the basis for the accreditation program (Emergency Management Accreditation Program 2016). EMAP's aim is to accredit programs against their standard and does not certify individuals. The

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Table 1: Comparison of certification schemes.

Scheme	Accreditation or certification	Target group	Incident management or emergency management	Complaint with AS/NZS ISO/IES 17024:2013	Currently in use in Australia
EMPS	Certification	Individuals	Incident	Not stated	Yes
EMAP	Accreditation	Organisations	Emergency	Not stated	Unknown
CEM® / AEM®	Certification	Individuals	Emergency	Not stated	Yes
TQC	Certification	Individuals	Emergency	Not stated	Being developed

EMAP Commission leads the development of the program with members from the National Emergency Management Association, International Association of Emergency Managers (IAEM) and an international and American Federal Agency representative (Emergency Management Accreditation Program 2016).

The International Association of Emergency Managers (IAEM) is an international member-based organisation that promotes the Principles of Emergency Management (International Association of Emergency Managers 2020b). IAEM created a Certified Emergency Manager® and Associate Emergency Manager Program®. The IAEM CEM® and AEM® certifies individuals who meet knowledge, experience, work history, training, education and professional contribution criteria (International Association of Emergency Managers 2020a).

The International Emergency Management Society (TIEMS) is an individual member-based organisation. TIEMS focuses on education, training and certification of emergency and disaster managers (The International Emergency Management Society 2020a). TIEMS developed and is testing the TIEMS Qualifications Certification(TQC) for individuals working within the emergency and disaster management sectors (The International Emergency Management Society 2020b). The certification process is based on European Union standards and includes education, participation, contribution, experience and competency with an exam to support the process of certification. Table 1 compares aspects of each of the four certification schemes.

Certification in Australia

The two schemes currently operating in Australia are the AFAC EMPS and the IAEM CEM®. They both aim to build and support the longer-term professionalisation of the emergency management sector and are targeted at individuals. While the EMPS program is aimed at AFAC member agency staff to certify incident management skills, the IAEM CEM® program is open directly to individuals and certifies a broader range of emergency management skills. The TIEMS TQC will support professionalisation and be open to individuals to certify a broader range of emergency management skills.

Discussion

In Australia, the emergency management role is not yet considered a profession. However, there is a broad desire to undertake the professionalisation process. Certification is generally recognised to support the recognition of a profession. The two certification schemes currently operating in Australia both support the overall aim of professionalisation. TIEMS TQC further supports the professionalisation of the sector. Each scheme appeals to different segments of the emergency management community, however, none address all needs of all participants. While organisations (government and non-government) and industry groups that lead aspects of emergency management in Australia adopt and support the provision of a professional service, individuals within those organisations need to contribute to this vision. Certification of emergency managers through an appropriate scheme supports the vision of a professional emergency management sector.

Certification arose from a broader study underway examining the human capacities of the Australian Emergency Manager. Undertaking the process of certification would allow emergency managers to support professionalisation of their industry. While each of the schemes available (or under development) in Australia contains gaps, in total, they can be applied by a wide range of individual emergency managers.

Conclusion

Australian emergency management has sought to travel down a path of professionalisation of the sector. Professionalisation has been shown to be supported by certification of individuals. Unfortunately, certification of individuals within the Australian emergency management sector has not been broadly adopted. If improvements in the service provided to communities is sought, it becomes incumbent upon the emergency management sector, and those individuals within it, to consider certification as part of ongoing professionalisation.

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References

Alexander D 2003, *Towards the development of standards in emergency management training and education. Disaster Prevention and Management: An International Journal, vol. 12, pp.113–123.*

Australasian Fire and Emergency Service Authorities Council 2017, *More about AFAC. At: www.afac.com.au/auxiliary/about [23 May 2020].*

Australasian Fire and Emergency Service Authorities Council 2018, *Becoming a registered or certified practitioner. Melbourne Victoria: Australasian Fire and Emergency Service Authorities Council.*

Australian Institute for Disaster Resilience n.d., *Australian Disaster Resilience Glossary. Melbourne, Victor. At: https://knowledge.aidr.org.au/glossary [24 May 2020].*

Australian Qualifications Framework Council 2013, *Australian Qualifications Framework. Second Edition, January 2013 ed. Adelaide South Australia.*

Bearden F 2002, *What is a professional? Advisor Today, no. 97, p.82.*

Birkett WP & Evans E 2005, *Theorising professionalisation: a model for organising and understanding histories of the professionalising activities of occupational associations of accountants. Accounting History, vol. 10, pp.99–127.*

Buijs JA 2005, *Teaching: Profession or Vocation? Catholic Education: A Journal of Inquiry and Practice, vol. 8, 326–345.*

Carlan PE & Lewis JA 2009, *Dissecting Police Professionalism: A Comparison of Predictors Within Five Professionalism Subsets. Police Quarterly, vol. 12, pp.370–387.*

Cully M 2005, *What it's worth: establishing the value of vocational qualifications to employers, Adelaide, NCVER. At: www.ncver.edu.au/research-and-statistics/publications/all-publications/what-its-worth-establishing-the-value-of-vocational-qualifications-to-employers.*

Cumberland DM, Petrosko JM & Jones GD 2018, *Motivations for Pursuing Professional Certification. Performance Improvement Quarterly, vol. 31, pp.57–82.*

Curry D, Eckles F, Stuart C & Qaqish B 2010, *National child and youth care practitioner professional certification: promoting competent care for children and youth. Child welfare, vol. 89, pp.57–77.*

Emergency Management Accreditation Program 2016, *2016 Emergency Management Standard ANSI/EMAP 4–2016.*

Emergency Management Accreditation Program 2019, *Our Mission. At: https://emap.org/index.php/what-is-emap/our-mission [23 May 2020].*

Flexner A 2001, *Is Social Work a Profession?: Sage Publications.*

Freidson E 1984, *The Changing Nature of Professional Control. Annual Review of Sociology, vol. 10, pp.1–20.*

Gajardo FG & Carmenado IdlR 2012, *Professional Certification for School Principals: Approach of a Competence Based Profile for Education Quality Improvement. Procedia - Social and Behavioral Sciences, vol. 46, pp.917–925. doi.org/10.1016/j.sbspro.2012.05.224*

Galbraith MW & Gilley JW 1986, *Professional Certification: Implications for Adult Education and HRD. Information Series, no. 307.*

Gorman EH & Sandefur RL 2011, *"Golden age," Quiescence, and Revival: How the Sociology of Professions Became the Study of Knowledge-Based Work. Work and Occupations, vol. 38, ni. 3, pp.275–302.*

Haas JS, Orav EJ & Goldman L 1995, *The Relationship Between Physicians' Qualifications and Experience and the Adequacy of Prenatal Care and Low Birthweight. American Journal of Public Health, vol. 85, pp.1087–1091. At: https://ajph.aphapublications.org/doi/10.2105/AJPH.85.8_Pt_1.1087.*

Hallam J 2002, *Vocation to profession. Journal of Organizational Change Management, vol. 15, pp.35–47.*

Hansbury J 1963, *Technical Teaching - Vocation or Profession? Education + Training, vol. 5, pp.22–26.*

International Assosciation of emergency Managers 2020a, *Certification Intro. At www.iaem.org/certification/intro [23 May 2020].*

International Association of Emergency Managers 2020b, *History of IAEM. At: www.iaem.org/History-of-IAEM [23 May 2020].*

Lanyon IJ 2010, *Continuing Professional Development: A Critical Element for Professionalisation of Policing. Australasian Policing, vol. 1, pp.25–30.*

Messina JJ 1979, *Why Establish a Certification System for Professional Counselors? A Rationale. American Mental Health Counselors Association Journal, vol. 1, no. 1, pp.9–21.*

Miller L 2011, *Professionalization, leadership and management in the early years, London, SAGE.*

Murphy CL & McLaws ML 1999, *Credentialing, diversity, and professional recognition—foundations for an Australian infection control career path. American Journal of Infection Control, vol. 27, pp.240–246.*

Nelson CR, BowerS K, Lyndall JL, Munro J & Stanley JT 2017, *Professional certification in ecological restoration: improving the practice and the profession. Restoration Ecology, vol. 25, pp.4–7.*

O'Donnell PS & Dunlap LL 2014, *Training, Degrees, and Credentials in the Hiring of School Psychologists. Psychology in the Schools, vol. 51, pp.608–624.*

Peterson DR 1976, *Is psychology a profession? American Psychologist, vol. 31, pp.572–581. doi.org/10.1037/0003-066X.31.8.572*

Pijl-Zieber EM, Barton S, Konkin J, Awosoga O & Caine V 2014, *Competence and competency-based nursing education: finding our way through the issues. Nurse Education Today, vol. 34, pp.676–8.*

Ruiz-Molina M-E, Gil-Saura I, Berenguer-Contri G & Auch C 2019, *Determinants of behavioral intentions towards a professional certification scheme at European level. European Journal of Training and Development, vol. 43, pp.719–735.*

Schmal BA & Derrevere SK 2012, *The Vital Role of Professional Certification. Journal of Hospice & Palliative Nursing, vol. 14, no. 3, pp.182–183. doi:10.1097/NJH.0b013e318255945b*

Standards Australia 2013a, *Conformity assessment - General requirements for bodies operating certification of persons. Sydney, New South Wales: Standards Australia.*

Standards Australia 2013b, *Standards and the Law. Standards Australia. At: www.standards.org.au/StandardsDevelopment/What_is_a_Standard/Pages/Standards-and-the-Law.aspx#.*

The International Emergency Management Society 2020a, *About TIEMS. At: www.tiems.info/index.php/about-us/about-tiems [23 May 2020].*

The International Emergency Management Society 2020b, *TIEMS TQC Certification. At: www.tiems.info/index.php/education/overview [23 May 2020].*

Valloze J 2009, *Competence: A concept analysis. Teaching and Learning in Nursing, vol. 4, no. 4, pp.115–118. doi.org/10.1016/j.teln.2009.02.004*

Wilson J & Oyola-Yemaiel A 2001, *The evolution of emergency management and the advancement towards a profession in the United States and Florida. Safety Science, vol. 39, nos. 1–2, pp.117–131.*

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Resilience in NSW: the need for a comprehensive, coherent emergency planning framework

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Abstract

The NSW Government has committed to the *National Strategy for Disaster Resilience* (Attorney-General's Department 2011) that encourages local communities to prepare for emergencies through disaster risk reduction and by building resilience. However, legislative obligations for emergency management in NSW remain focused on the responsibility of the emergency services organisations for specific hazards while these organisations advocate for community engagement. Community resilience requires individuals and organisations to take on more responsibility for preparing for emergencies. However, an 'all hazards' framework to support planning for emergencies has not been made available. By default, most communities expect emergency services organisations to tell them what to do. This creates a contradictory situation where emergency services organisations promote community resilience but resources to support planning are lacking. This can undermine a commitment to community resilience. Once an incident begins, the Australasian Interservice Incident Management System provides a tried and tested method to deal with emergencies based on the 'all hazards' approach. No similar approach has been developed to help communities make plans prior to an emergency. This paper examines current structures in NSW. It proposes that a framework, developed to address bushfire threats to schools in the Blue Mountains of NSW, could be the basis of an 'all hazards' planning framework.

Community resilience

With the experience of the 'Black Summer' bushfires of 2019–20, and as the number of serious climate-related incidents increases, emergency services organisations are making thorough preparations for managing emergencies. In NSW, many local councils and their local emergency management committees have made efforts to assist businesses and community groups, including schools and hospitals, to put emergency plans in place. For example, NSW Health provides emergency support to medical facilities and, more recently, school authorities have been proactive to assist school leadership teams to have emergency plans in place (McArthur 2019, p.67). In emergency services organisations, the approach has traditionally been 'top down', reflecting their institutional responsibilities. However, this is not the only approach. The Australian Institute for Disaster Resilience (AIDR) promotes disaster resilience (Australian Institute for Emergency Management n.d.a). The NSW Office of Emergency Management has developed a framework of mitigation as opposed to recovery and response (Office of Emergency Management 2017a, p.2). Given the scale and diversity of emergency events, including the COVID-19 pandemic, are these approaches sufficient?

While the COVID-19 pandemic is, at the time of writing, a global and national emergency, the scope of this paper is on the legislative and administrative arrangements that support community resilience in NSW. This paper provides an outline of the administrative framework for emergency management provided by NSW legislation governing emergency services organisations. Much of this legislation predates the concept of community resilience.

NSW emergency services legislation

Emergency services organisations in NSW are funded to meet their legislative obligations. The *State Emergency and*

Rescue Management Act 1989 (SERMAct) and the Acts governing Fire and Rescue NSW, NSW Police, NSW Rural Fire Service and NSW State Emergency Service define emergency management arrangements in NSW. These agencies have discrete, primary obligations as well as general obligations when emergencies require interagency cooperation. These general obligations, which apply more to significant incidents, are not funded by NSW Treasury to the same degree as the primary responsibilities of agencies (McConnell & Drennan 2006, p.63).

The SERMAct defines the architecture of emergency management in NSW. This 30-year-old Act, compared to current discourses and approaches, is distinguished by particular features: no reference to Commonwealth support, interstate cooperation confined only to rescue (*State Emergency and Rescue Management Act 1989*, Sect 58) and the lack of reference to 'resilience'. While the lack of attention to Commonwealth assistance and the limited scope of interstate cooperation may reflect a perspective when the Act was drafted, the lack of reference to resilience, particularly community resilience, underlines that 'resilience' is a comparatively recent development.

NSW Police

The *Police Act 1990* (NSW) defines the mission and functions of the NSW Police and includes 'the provision of essential services in emergencies' and that the provision of police services in emergencies and rescue operations is subject to the *State Emergency and Rescue Management Act 1989*' (*Police Act 1990*, Sect 6). These functions refer to the State Emergency Operations Controller (*State Emergency and Rescue Management Act 1989*, Sect 18), the provision of executive support to regional emergency management committees and operations controllers and the coordination of rescue operations and evacuations (*State Emergency Service Act 1989*, Sect 18, 32, 50, 60L, 61D). While police have very clear functions in an emergency, their obligations prior to an emergency event are to ensure a capacity to fulfil their functions should an emergency eventuate.

Fire and Rescue NSW

The *Fire and Rescue NSW Act 1989* establishes the purposes of Fire and Rescue NSW (FRNSW). The functions of the Commissioner are to 'take all practicable measures for preventing and extinguishing fires and protecting and saving life and property in case of fire in any fire district'. The term 'fire district' under this Act refers to cities and towns. The Commissioner may dispatch units outside fire districts and is required to take directions and to provide assistance in accordance with the SERMAct (*Fire and Rescue NSW Act 1989*, Sect 5A). To support its activities, FRNSW provides community education as part of its fire prevention strategy (Fire and Rescue NSW 2019a).

NSW Rural Fire Service

The *Rural Fires Act 1997* (NSW) defines the activities of the Rural Fire Service (RFS). The RFS functions are detailed in section 9 of the Act and are to provide 'rural fire services' for NSW, which are defined in terms of 'prevention, mitigation and suppression of fires in rural fire districts' and 'the protection of infrastructure and environmental, economic, cultural, agricultural and community assets from destruction or damage arising from fires in rural fire districts'. The RFS is also required to provide 'advisory services' and 'as directed by the State Emergency Operations Controller, to deal with an emergency where no other agency has lawful authority to assume command of the emergency operation'. There are also obligations to assist the State Emergency Operations Controller and to assist other emergency services organisations at their request (*Rural Fires Act 1997*, Sect 9). These obligations empower the RFS to undertake community engagement activities more so than other agencies.

NSW State Emergency Service

The *State Emergency Service Act 1989* (NSW) defines the functions of the NSW State Emergency Service (SES). Section 8 of the Act states that SES functions are 'to protect persons from dangers to their safety and health, and to protect property from destruction or damage, arising from floods, storms and tsunamis'. Like the other agencies, the SES is required to support the State Emergency Operations Controller, consistent with the requirements of the SERMAct, and to support other emergency services organisations at their request. The SES's sole requirement for community engagement relates to its need 'to co-ordinate the evacuation and welfare of affected communities' (*State Emergency Service Act 1989*, Sect 8).

NSW Health

The *Public Health Act 2010* (NSW) defines the responsibilities of the Minister of Health in relation to emergencies. Under this Act, the Minister for Health and Medical Research may declare any part of NSW as a 'public risk area' and may take measures to reduce or remove risks to public health (*Public Health Act 2010*, Sect 7 (3)). However, such declaration and measures have no effect in any part of the state 'for which a state of emergency exists under the State Emergency and Rescue Management Act 1989' (*Public Health Act 2010*, Sect 7(6)). The Act permits the minister to act when an emergency has been declared under the SERMAct (*Public Health Act 2010*, Sect 8). The Act does not lay emphasis on emergencies to the same degree as the other hazards-related Acts. These limited powers were insufficient to address the COVID-19 pandemic and the *COVID-19 Legislation Amendment (Emergency Measures) Act 2020* was passed by the NSW Parliament in March 2020. This Act enables criminal trials to be conducted 'in a way that is appropriate given the public health emergency caused by the COVID-19 pandemic' (*COVID-19 Legislation Amendment (Emergency Measures) Act 2020*, Division 1).

Resilience NSW

Resilience NSW, formerly the NSW Office of Emergency Management (OEM), sits within the NSW Department of Justice. Resilience NSW is the secretariat and delivery arm of the SERMAct (Office of Emergency Management 2019a). Resilience

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NSW administers the New South Wales State Emergency Management Plan (EMPLAN) required by the SERMAct and its subordinate sub-plans (Office of Emergency Management 2019b). The EMPLAN and sub-plans are the framework that enables NSW to prepare for and respond to emergencies using a prevention-preparation-response-recovery approach (NSW Government 2018, Sect 110). The EMPLAN specifies that 'Agencies will engage with the community and stakeholders which will improve community understanding of these arrangements and promote disaster resilience' (NSW Government 2018, Sect 116).

The EMPLAN and sub-plans address specific hazards and also include 'supporting plans'. Some refer to services like energy, telecommunications and the environment but one refers to health services (Office of Emergency Management 2019c). Under this plan are the *Evacuation Decision Guidelines for Private Health and Residential Care Facilities* (NSW Government 2016). This guideline includes a decision-making 'algorithm' and is the sole document that aims to assist non-government organisations to respond to emergencies. OEM recognises the need to address other community needs and seeks community feedback (Office of Emergency Management 2019d).

Implicit in the NSW arrangements is the assumption that the community (i.e. individuals and organisations) will take directions from the agencies. In an emergency, this may be reasonable but in large-scale situations, particularly during the onset of an emergency, waiting to be told what to do may not be adequate. Resilience is designed to mitigate this reliance but there is an inherent tension implicit in expecting individuals and communities to take responsibility while also expecting them to take directions from authorities (Lukasiewicz *et al.* 2017, p.309).

Community resilience

Community resilience is a relatively recent discourse in emergency management, as evidenced by its omission in the SERMAct and other supporting Acts. A 1998 document for school principals refers to resilience (Emergency Management Australia 1998). In addition, Buckle (1999, p.26) examined Australian disaster experience and argued that understanding resilience within a community would enable targeted interventions to reduce vulnerability. The concept of resilience appears in international literature (Cutter *et al.* 2008; Haddow *et al.* 2011; Council on School Health 2008, p.900; Jimerson *et al.* 2005, p.296; Kano & Bourque 2007, p.215; MacNeil & Topping 2008, Phelan 2008, p.199; Twigg 2009).

In Australia, Holmgren (2009, p.16) reviewed the experience of the communities of Daylesford and Hepburn during the Black Saturday bushfires of 2009 and argued that 'in the final analysis households and communities will be resilient, or not, based on their own motivations and actions, not by the authorities waving magic wands'. The interest in resilience was due to emergency services agencies being found to be unable to provide the level of community protection needed. McLennan and Handmer (2012) questioned the feasibility of resilience, as it related to 'responsibility sharing' between individuals and communities, and government agencies that are in a better positions to identify and manage risks (McLennan & Handmer 2012).

In 2011, the *National Strategy for Disaster Resilience* established the roles of government, expressed in terms of 'individuals' and 'communities' and 'having clear and effective education systems' (Attorney-General's Department 2011, p.v). The document argues for 'shared responsibility', climate change as a long-term threat, 'resilient communities' and seeks partnerships and networks 'from all levels of government, business, the not-for-profit sector'. This is supported by a Companion Booklet (Attorney-General's Department 2012, p.6). The aim of the strategy is empowering individuals and communities:

- *Local communities are engaged and have knowledge and expertise of local risk, how a disaster resulting from that risk would affect the local community and how potential treatments can be harnessed, to mitigate the risks.*
- *Accurate and authoritative risk information is provided, tailored to the needs of the audience, and the tools to interpret and act on that information, are available.*
- *Communities are aware of vulnerable elements of the community and consider their needs in the development of programs and plans.*
- *The community develops a strong understanding of the financial implications of disasters, options such as insurance are available to reduce the financial burden, and there are more choices and incentives to mitigate financial risks to households and businesses.*
- *Individuals and businesses have a strong understanding of the availability and coverage of insurance, including the risks that are included and excluded from their existing insurance policies.*
- *Information is available to enable individuals to make objective assessments about the defensibility of properties and communities from potential hazards and communicated appropriately.*
- *Programs and activities in schools and the broader community actively encourage volunteering.*
- *Significant providers of goods and/or services to the community undertake business continuity planning.*

(Attorney-General's Department 2011 p.1–10).

The intended outcomes are that communities understand hazards, identify mitigations and have plans (Attorney-General's Department 2012, p.20). The strategy is supported by the *National Strategy for Disaster Resilience: Community Engagement Framework Handbook 6* (Australian Emergency Management Institute 2013).

In 2014, Emergency Management Australia closed the Australian Emergency Management Institute as a separate facility in Victoria. The subsequent establishment of the AIDR has raised questions about cost and responsibility shifting from the Australian Government to states and territories (Sharma 2014). AIDR is under contract to the Australian Government and began operations in 2015. Its efforts concentrate on knowledge

dissemination and professional development for the emergency management sector (Australian Institute for Disaster Resilience n.d.b). Of particular importance are the AIDR handbooks that include emergency management (under review in 2020). AIDR promotes knowledge acquisition and dissemination in relation to disaster resilience. Its programs include initiatives for schools, addressing primarily children's understanding of emergencies using the Disaster Resilience Education Strategy Group (Australian Institute for Disaster Resilience n.d). In contrast, the New Zealand Resilient Organisations, established under a government grant, takes a different approach to resilience by focusing on how organisations are managed rather than focusing on the emergencies (Resilient Organisations 2020).

Implementing a national policy in NSW

NSW has committed to community resilience and work has been done by the emergency services organisations to this end. FRNSW has community information programs and promotes the use and maintenance of home smoke alarms, bushfire plans and escape plans from homes (Fire and Rescue NSW 2019b). The RFS has established messaging that promotes bushfire planning (NSW Rural Fire Service n.d.a). The SES informs people about 'local risk' (NSW State Emergency Service n.d.). Emergency NSW promotes preparedness in its 'Get Ready' campaign for individuals, local councils, community service organisations and businesses (Office of Emergency Management 2019).

Of these campaigns, the most comprehensive support is provided for businesses in the form of a guide with detailed advice on emergency preparations (NSW Department of Industry 2018). However, regardless of the achievements of these approaches, there is a weakness because these programs are agency centric and lack a common conceptual framework for emergency planning. The work of NSW emergency services organisations is admirable. However, effective emergency plans should address all hazards and all risks. A common response framework can only exist once emergencies begin (Australasian Fire and Emergency Service Authorities Council 2013). A recognition of the need for a more comprehensive approach is provided by a new framework to promote improved capability by the NSW 'emergency sector' (Resilience NSW 2020).

In Australia, a possible national conceptual framework and support materials for resilience are available from the Australian Council for Social Service (ACOSS). These materials are part of a 2015 Resilient Community Organisations initiative and, at the time of print, many of the website links were not active. Regardless, the key concepts in the framework are:

Step 1: Leadership
Step 2: Building Networks
Step 3: Know Your Risks
Step 4: Manage Your Risks
Step 5: Preparing Others
Step 6: Learning and improving (ACOSS 2015).

Resilient Community Organisations used the then current ISO 31000:2009 for risk management and included a plan template (Resilient Community Organisations 2015). This was aimed at community organisations, but the framework would be transferrable to other organisations using a prevent- prepare-respond-recover framework. AIDR provides resources that support risk assessment including the *National Emergency Risk Assessment Guidelines* (NEFAG) that are based on AIDR's handbooks 10 and 10.1. These handbooks refer to AS/NZS ISO 31000:2009 and could supersede the ACOSS online resources (Australian Institute for Disaster Resilience 2016).

A strength of the ACOSS approach is its understanding of the importance of organisational leadership in ensuring that emergency planning is done and kept current. The limitations of the ACOSS framework are its assumptions that other organisations need not know what the emergency services organisations do. While the Australian Government does not provide an up-to-date framework, the NSW Government could develop an emergency planning framework for organisations.

Based on experience and using a case study of the 2019 Hawkesbury Road Project, the planning framework's key elements could be:

- understanding emergencies, including the importance of leadership
- knowing the role of emergency services organisations
- knowing the hazard potential and vulnerability in locations based on history and demography
- conducting risk assessments
- creating emergency management plans based on risk assessments
- negotiating the plan with communities to promote resilience
- testing and improving the plan as a continual, cyclic process.

The Hawkesbury Road Project

In 2019, the Hawkesbury Road Project was a collaboration between an RFS Brigade and a school education agency to help school principals decide whether to close or evacuate a school under threat from fire (McArthur 2019, p.67). The project drew on the knowledge and experience of an RFS Brigade in the Blue Mountains to assist local schools to make emergency plans in line with reasonable expectations of the RFS and its understanding of bushfire behaviour. The project culminated in a greatly enhanced mutual understanding between the schools and the brigade.

A key insight of the project was that emergencies arising from natural causes are almost always geographical and can be repeated events. The project's methodology constructed a 'bridge' between the knowledge and experience of emergency services organisations and the community institutions. This bridge served to decrease the schools' dependence on agency 'top-down' direction by building the expertise of 'situational awareness' for school leaders.

If this approach was expanded to a state-wide implementation it would require agreement between emergency services organisations on common hazards messaging. To some extent, NSW emergency services organisations already operate in this fashion. For example, there is common messaging for bushfire

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threats developed by the RFS and used by FRNSW (Fire and Rescue NSW 2019c). Within NSW's emergency arrangements, the ideal body to coordinate such an initiative would be Resilience NSW, which would address interagency issues (Granot 1997).

A final element is the adoption of a common framework for the promotion of organisational resilience in emergencies. This requires an acceptance of the legitimacy of responses to emergencies by communities and community organisations. The assumption that communities should wait to be told what to do may not work when communities are partly responsible for their safety (Lukasiewicz *et al.* 2017, p.309). For incident controllers, the decisions of community organisations, (e.g. businesses, welfare organisations, hospitals, aged care facilities and schools) need to be given greater consideration.

Conclusion

In NSW, the framework for responsibilities has been mainly 'top down' and reflects legislated responsibilities. The commitment of the NSW Government to the *National Strategy for Disaster Resilience* requires different levels of engagement with an expanded group of stakeholders. An essential element is an integrated, coordinated framework for community organisations to develop plans that reflect their risks and the hazards to which they are potentially exposed. While observations outlined here refer to the NSW approach to implementing Australia's *National Strategy for Disaster Resilience*, there is value in considering how communities in other states and the territories are supported. In 2020, NSW appointed the former Commissioner of the RFS, Mr Shane Fitzsimmons, to lead the newly established Resilience NSW. The focus of this agency on preparation and recovery is an opportunity to improve the coordinated frameworks for emergency planning and response in NSW.

References

ACOSS 2015, *What is Resilient Community Organisations? At: https://resilience.acoss.org.au [29 March 2020].*

ACOSS 2015, *Disaster Plan for Community Organisations. At: https://resilience.acoss.org.au/site/assets/uploaded/f7dc0adf-disaster-plan-for-community-organisations-template-final_v12_aug16.docx [29 March 2020].*

ACOSS 2015, *Policies and Procedures for Disasters and Emergencies. At: https://resilience.acoss.org.au/the-six-steps/managing-your-risks/policies-and-procedures-for-disasters-and-emergencies [29 March 2020].*

ACOSS 2015, *Risk Management: An Introduction. At: https://resilience.acoss.org.au/site/assets/uploaded/8c5a265a-an-introduction-to-risk-manaagement.pdf [29 March 2020].*

Attorney-General's Department 2011, *National Strategy for Disaster Resilience, Canberra. At: https://knowledge.aidr.org.au/resources/national-strategy-for-disaster-resilience/.*

Attorney-General's Department 2012, *National Strategy for Disaster Resilience: Companion Booklet, Canberra. At: https://knowledge.aidr.org.au/media/2154/nationalstrategyfordisasterresilience-companionbooklet.pdf.*

Australasian Fire and Emergency Service Authorities Council 2013, *The Australian Inter-Service Incident Management System East, Melbourne.*

Australian Emergency Management Institute 2013, *National Strategy for Disaster Resilience: Community Engagement Framework Handbook 6, Canberra. At: https://knowledge.aidr.org.au/resources/handbook-6-community-engagement-framework/.*

Australian Institute for Disaster Resilience n.d.a, *About AIDR. At: www.aidr.org.au/about-aidr/ [29 March 2020].*

Australian Institute for Disaster Resilience n.d.b, *AIDR Strategy 2018–2021. At: www.aidr.org.au/media/5683/aidr-on-a-page.pdf [29 March 2020].*

Australian Institute for Disaster Resilience 2016, *AIDR eLearning. At: http://elearning.aidr.org.au/index.php [29 March 2020].*

Australian Institute for Disaster Resilience (n.d.), *Australian Resilience Handbook Collection. At: www.aidr.org.au/about-aidr/ [29 March 2020].*

Australian Institute for Disaster Resilience n.d., *Education for Young People. At: www.aidr.org.au/programs/education-for-young-people-program/ [29 March 2020].*

Australian Institute for Disaster Resilience n.d., *Emergency Planning Handbook. At: www.aidr.org.au/about-aidr/ [29 March 2020].*

Buckle P 1999, *Re-defining community and vulnerability in the context of emergency management. Australian Journal of Emergency Management, Summer 1998–99, pp.21–26.*

Council on School Health 2008, *Disaster Planning for Schools. Pediatrics, vol. 122, p.895.*

Holmgren D 2009, B*ushfire Resilient Communities and Landscapes: a discussion paper for Daylesford and Hepburn townships. At: https://holmgren.com.au/wp-content/uploads/2013/02/Hepburn-BushfirePlan5.2.pdf.*

Cutter SL, Barnes L, Berry M, Burton C, Evans E, Tate E, Webb J 2008, *A place-based model for understanding community resilience to natural disasters. Global Environmental Change, vol. 18, pp.598–606.*

Emergency Management Australia 1998, *Emergency/Disaster Planning for Principals. Canberra.*

Fire and Rescue NSW 2019a, *Prevention and Community Preparedness. At: hwww.fire.nsw.gov.au/page.php?id=9189 [29 March 2020].*

Fire and Rescue NSW 2019b, *Community Fire Safety. At: www.fire.nsw.gov.au/page.php?id=879 [29 March 2020].*

Fire and Rescue NSW 2019, *Bushfire and Emergency Information. At: www.fire.nsw.gov.au/page.php?id=9209 [29 March 2020].*

Granot H 1997, *Emergency inter-organizational relationships. Disaster Prevention and Management: An International Journal, vol. 6, pp.305–310.*

Haddow GD, Bullock JA & Coppola DP 2011, *Introduction to emergency management. Butterworth Heinemann, Burlington, MA.*

Jimerson SR, Brock SE & Pletche, SW 2005, *An Integrated Model of School Crisis Preparedness and Intervention: A Shared Foundation to Facilitate International Crisis Intervention. School Psychology International, vol. 26, pp.275–296.*

Kano M & Bourque LB 2007, *Experiences with and Preparedness for Emergencies and Disasters Among Public Schools in California. NASSP Bulletin, vol. 91, pp.201–218.*

Lukasiewicz A, Dovers S & Eburn M 2017, *Shared responsibility: the who, what and how. Environmental Hazards, vol. 16, pp.291–313.*

MacNeil W & Topping K 2008, *Crisis management in schools: evidence-based prevention. Journal of Educational Enquiry, vol. 7, pp.64–94.*

McArthur T 2019, *Lessons learnt: two schools in a major bushfire. Australian Journal of Emergency Management, vol. 34, no.3, pp.67–72. At: https://knowledge.aidr.org.au/resources/ajem-july-2019-lessons-learnt-two-schools-in-a-major-bushfire/.*

McConnell A & Drennan L 2006, *Mission Impossible? Planning and Preparing for Crisis. Journal of Contingencies and Crisis Management, vol. 14, pp.59–70.*

McLennan BJ & Handmer J 2012, *Reframing responsibility-sharing for bushfire risk management in Australia after Black Saturday. Environmental Hazards, vol. 11, pp.1–15.*

NSW Department of Industry 2018, *Get Ready Business. At: www.industry.nsw.gov.au/__data/assets/pdf_file/0008/167831/Get-ready-disaster-tool-brochure.pdf [29 March 2020].*

NSW Government 2016, *Evacuation Decision Guidelines for Private Health and Residential Care Facilities. At: www.emergency.nsw.gov.au/Documents/publications/guidelines/Guideline-Evacuation-Decision-Making-Guidelines-for-Health-and-Aged-Care-Facilities.pdf [29 March 2020].*

NSW Government 2018, *New South Wales State Emergency Management Plan, Sydney. At: www.emergency.nsw.gov.au/Pages/publications/plans/EMPLAN.aspx.*

NSW Health n.d., *Emergency Management Arrangements for NSW Health. At: www1.health.nsw.gov.au/pds/ActivePDSDocuments/PD2012_067.pdf [19 May 2020].*

NSW Rural Fire Service n.d.a, *Plan and prepare. At: https://www.rfs.nsw.gov.au/plan-and-prepare. [29 March 2020].*

NSW State Emergency Service n.d., *Enter your suburb. At: www.ses.nsw.gov.au/your-local-risk/ [29 March 2020].*

Office of Emergency Management 2017a, *Emergency Risk Management Framework, Sydney. At: www.emergency.nsw.gov.au/Documents/publications/ERM-framework.PDF.*

Office of Emergency Management 2019a, *About Us. At: www.emergency.nsw.gov.au/Pages/about-us/about-us.aspx [29 March 2020].*

Office of Emergency Management 2019b, *Plans. At: www.emergency.nsw.gov.au/Pages/publications/plans/Plans.aspx [29 March 2020].*

Office of Emergency Management 2019c, *Supporting Plan. At: www.emergency.nsw.gov.au/Pages/publications/plans/supporting-plans/supporting-plans.aspx [29 March 2020].*

Office of Emergency Management 2019d, *Community Service Organisations. At: www.emergency.nsw.gov.au/Pages/about-us/about-us.aspx [29 March 2020].*

Office of Emergency Management 2019, *Get Ready. At: www.emergency.nsw.gov.au/getready [29 March 2020].*

Phelan TD 2008, *Emergency management and tactical response operations: bridging the gap. Butterworth-Heinemann/Elsevier, Amsterdam.*

Resilience NSW 2020, *A Capability Development Framework for NSW Emergency Management Sector [25 August 2020]. At: www.emergency.nsw.gov.au/Documents/Capability%20Development%20Framework%202020.pdf.*

Resilient Organisations 2020, *Resilience. At: www.resorgs.org.nz [29 March 2020]*

Sharma M 2014, *Mount Macedon disaster training campus shut down, The Australian, 19 May 2014. At: www.theage.com.au/national/victoria/mount-macedon-disaster-training-campus-shut-down-20140518-38hyp.html [29 March 2020].*

Twigg J 2009, *Characteristics of a Disaster-Resilient Community: A Guidance Note. Version 2. Interagency Group, London. At: https://discovery.ucl.ac.uk/id/eprint/1346086/1/1346086.pdf.*

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Emergency Planning Handbook

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