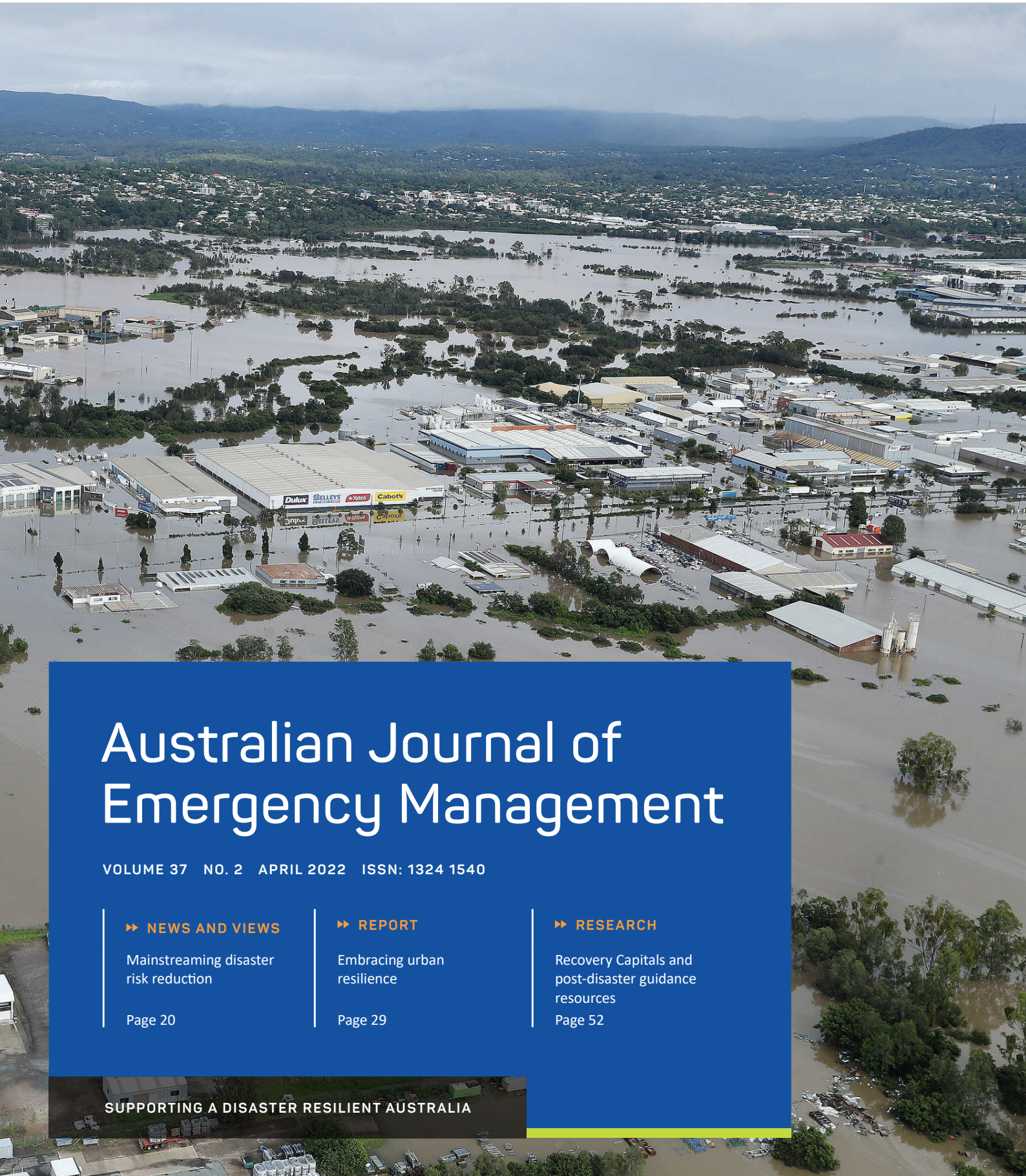
Australian Government
National Recovery and Resilience Agency

Australian Institute for Disaster Resilience



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SUPPORTING A DISASTER RESILIENT AUSTRALIA

About the journal

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

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

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Associate Professor Melissa Parsons

University of New England

Editor-in-Chief

Many locations within Australia and Aotearoa New Zealand experienced extreme flood and storm events over the summer months. I would like to acknowledge the significant efforts of the staff and volunteers in the emergency services, police, health, community, government, non-government, defence, business, media and utility sectors who gathered alongside residents of affected areas to manage the complexities of these events together.

In this issue of the *Australian Journal of Emergency Management*, Andrew Gissing (Risk Frontiers) observes the aftermath of the recent flooding in Lismore through the lens of two decades of experience researching floods in the area. Flood risk, mitigation, urban planning, emergency services and community response intersect to provide both challenges, and solutions, for Lismore and similar flood-prone settlements.

The experiences of communities following extreme flooding will be crucial to recovery. This issue of the journal features Recovery Capitals[1] joint-winner of the National Mental Health and Wellbeing award in the 2021 Resilient Australia Awards. Developed collaboratively by researchers and practitioners across Australia and Aotearoa New Zealand, Recovery Capitals is a set of evidence-based resources that assist people and organisations during recovery. Central to the development of these resources was the use of a participatory approach to capture practitioner experiences and cultural contributions supporting inclusive and holistic community-led recovery.

Readers involved in flood recovery may benefit from a further collection of flood recovery resources available through the Australian Disaster Resilience Knowledge Hub.[2]

Stepping off the floodplain, other types of natural hazards feature in this issue of the journal. A rare 'vog' event (hazy air pollution caused by volcanic gas emissions) in Aotearoa New Zealand, a heatwave refuge strategy for Blacktown (Sydney) and cutting-edge remote sensing technologies for remotely mapping bushfires highlight the diversity of practice within the emergency management sector. The participation of children and youth in disaster risk reduction and emergency management is often prominent. Congratulations to the school winners of the competition to name the National Large Air Tanker. Far from spoiling the surprise here, the name of the new tanker is revealed on page 11.

Introducing Viewpoints

Extreme weather events often galvanise attention onto the strategic intent and effectiveness of disaster risk reduction (DRR) policy. Our new Viewpoints series examines the challenges of mainstreaming DRR across policy sectors. Emeritus Professor Stephen Dovers (Australian National University) contributed a seed article proposing that 'as we don't know how effectively DRR is being mainstreamed across different policy sectors, a systematic assessment would be needed to identify areas for improvement'.

Eminent practitioners were invited to respond to Professor Dovers' proposition, discussing the sectoral opportunities and challenges of mainstreaming DRR and the idea of a systematic assessment. Mark Crosweller (Ethical Intelligence), Robert Glasser (Australian Strategic Policy Institute), Kylie Macfarlane (Insurance Council of Australia), Nico Padovan (National Recovery and Resilience Agency), Robert Webb (AFAC) and Linda Scott (Australian Local Government Association) provide thoughtful, sectoral perspectives. The influence of climate change on extreme events situates the urgency of disaster risk reduction initiatives across all sectors, but competing priorities, policy settings and governance must be analysed then navigated to achieve systemic and transformative reform. I hope that readers enjoy this new feature of the journal and are prompted to think about what mainstreaming DRR may mean in their own sector or role.

1. Recovery Capitals, at https://recoverycapitals.org.au/.
2. Australian Disaster Resilience Knowledge Hub, at https://knowledge.aidr.org.au/resources/flood-recovery-resources/.

Increasing disaster resilience for continued wellbeing and prosperity

The Hon Shane L Stone AC QC

National Recovery and Resilience Agency

There is no denying Australia's incredible natural beauty. As Dorothea McKellar wrote, it is also a country of 'droughts and flooding rains'.[1] Add to this severe storms, fires and cyclones; plus the fact that science tells us that longer, hotter summers and more extreme weather are here to stay, and you begin to understand the challenges we face.

These natural hazards become disasters when they exceed a community's capacity to cope, leading to widespread impacts on communities and losses. Since floods in north Queensland in 2019, 137 disasters have been declared in 398 local government areas with a total population affected of around 20.8 million.

In 2014, the Productivity Commission estimated that Australia was spending 97% of its disaster funding on mopping up and just 3% on getting ready.[2] While there has been some improvement since that time, there is still a long way to go. Compounding this problem is the growing economic costs of disasters. Deloitte Access Economics has estimated that this will increase to between $73 billion and $94 billion a year by 2060.[3]

More effort needs to be focused on 'getting ready'. As disaster risk grows, we need to increase our disaster resilience and reduce our exposure and vulnerability. This is essential to reduce the economic costs of natural disasters. This is critical to our continued wellbeing and prosperity.

In the summer of 2019–20, multiple fires burning across Australia heralded the beginning of the devastating bushfire season. There was significant community loss, devastation of wildlife and adverse health effects across 5 states and the Australian Capital Territory. We have survived fires before, but this event was part of the extraordinary 2019–20 high-risk weather season that also saw heatwaves, hailstorms and flooding; all on the back of the crippling drought. In many areas, the combination and successive nature of these events compounded their effect and strained existing systems and capacities. Then came the pandemic!

These events have caused us to reflect, and now act, across the full cycle of preparedness, response, recovery and building community resilience.

Informed by the Royal Commission into National Natural Disaster Arrangements, the Australian Government embarked on a coordinated and cohesive approach to emergency management. A key pillar of this response was establishing the National Recovery and Resilience Agency with a single focus on recovery and resilience, and a champion of long-term risk reduction of communities, right across Australia.

The National Recovery and Resilience Agency is responsible for around $20 billion in programs that support disaster recovery and resilience. It provides national leadership and strategic coordination in disaster recovery, resilience and risk reduction. It does this across all levels of government and within many sectors including infrastructure, emergency management, agriculture, community development, energy and the environment.

The agency works on issues of recovery and resilience capability; best-practice resilience; data, knowledge and information; mental health and wellbeing; finance counselling; pandemic assistance and community outreach. This drives systematic change to reduce disaster risks and build a disaster-resilient Australia. The agency has a real impact on the lives of people in Australia, particularly those directly experiencing disasters.

For example, the agency has responsibility for the jointly funded Commonwealth-state/territory Disaster Recovery Funding Arrangements, the Disaster Recovery Payment and the Disaster Recovery Allowance. These programs are the primary financial mechanisms for providing relief and recovery assistance to disaster-affected communities. It also supports Emergency Management Australia, which leads national disaster response during the immediate relief phase after major disaster events.

The agency is designing, managing and delivering programs to drive disaster risk reduction and support recovery. The investment is significant and a number of funding programs were recently open for applications. The $600 million Preparing Australia Program is aimed at reducing the effects of future disasters like floods, bushfires and tropical cyclones. The first $150 million was allocated to support community infrastructure like flood levees and community refuges as well as awareness, capacity building and planning activities that help communities reduce future disaster risks.

The agency supported $100 million for the National Flood Mitigation Infrastructure Program, through the Emergency Response Fund, to improve or construct essential public infrastructure to withstand severe flood events.

A further $50 million from the Emergency Response Fund is allocated for a new Coastal and Estuarine Risk Management Program. The Royal Commission into National Natural Disaster Arrangements highlighted the need to mitigate risks to low-lying coastal communities due to predicted sea-level rises and more regular and intense storms. The program targets projects such as 'grey infrastructure' like seawalls, groynes, storm surge and tidal barrages in estuaries as well as nature-based solutions such as protecting coastal wetland ecosystems to reduce the risk of inundation and shoreline erosion.

Through these programs, the National Recovery and Resilience Agency is reducing the risk and consequences of natural hazards on communities and works towards outcomes of the National Disaster Risk Reduction Framework. Released in April 2019, the framework sets out the foundational work required nationally, across all sectors, to reduce existing disaster risk, minimise new disaster risk and deliver better climate and disaster risk information.

The framework is implemented through a National Action Plan, with the first one released in May 2020. It identified initiatives that are consistent with the framework to reduce disaster risk in Australia. The second National Action Plan is underway, and I look forward to working with the Australian Institute for Disaster Resilience and many interested stakeholders on its development. It will be strategic, with a great emphasis on promoting disaster resilience investment.

Through its national network of Recovery Support Officers, the National Recovery and Resilience Agency is working side-by-side with communities that often best understand the local risks faced and their recovery needs. The agency helps them better prepare for, minimise the effects of, and recover more quickly from natural hazards. These Recovery Support Officers live in regional areas and support communities and provide a first-hand understanding of local needs, not just for current events but for all future natural hazards. This locally led approach is a guiding philosophy of the agency in both its design as well as in its implementation. We bring the lessons learnt from supporting communities across the country, we draw on the expertise of the Australian Climate Service, we make evidence-based decisions on where to focus efforts to reduce the effects of future natural disasters and we ask people 'What do you think is needed?'.

The agency also works collaboratively with state, territory and local government representatives in various ways, including through the Australia New Zealand Emergency Management Committee subcommittees to develop national frameworks and evidence-based best practices to improve community outcomes before, during and after disasters. All this capability delivers an efficient and effective locally generated recovery after disasters, with the goal of increased community resilience ahead of future natural hazards and severe weather events.

The National Recovery and Resilience Agency is not just focusing on local issues. There is much to be learnt from international best practice and experience. We collaborate with international partners to build capacity, knowledge and partnerships and to enhance Australia's standing in the international community. We support international efforts to drive and coordinate implementation of the *Sendai Framework for Disaster Risk Reduction 2015–2030* and are supporting the Asia-Pacific Ministerial Conference on Disaster Risk Reduction in Brisbane from 19–22 September 2022.

Australia is a nation of resilient, innovative and adaptive people, with a strong community spirit that supports those in need. But when natural hazards and emergencies strike, they can cost billions of dollars with catastrophic losses. The 2019–20 high-risk weather season was a wake-up call for bold, unified action. It was time to build on what worked well and to do things differently where changes were needed; and that is what the National Recovery and Resilience Agency is doing.

The agency is taking public sector disaster management capabilities to the next level by bringing together collective learnings and experiences to deliver efficiencies to the way we respond in the future. We are committed to ensuring people affected by disasters and emergencies get the support and advice they need to recover, while also delivering initiatives that reduce the risk and lessen the severity of future challenges.

We continue to face bushfires, floods, cyclones and drought, often at the same time or in quick succession. The continuing COVID-19 pandemic has made these events all the more challenging. Through the National Recovery and Resilience Agency, Australia is better positioned to address the causes of disaster risk, rather than dealing with the symptoms. This will ensure communities can endure more frequent and intense natural hazards, but also thrive and prosper in the aftermath.

To find out about the National Recovery and Resilience Agency, visit www.recovery.gov.au.

Endnotes

1. Dorothea McKellar 1904, *My country.* At: www.sl.nsw.gov.au/stories/dorothea-mackellars-my-country.

2. Productivity Commission Inquiry Report: Natural Disaster Funding Arrangements. December 2014. At: www.pc.gov.au/inquiries/completed/disaster-funding/report.

3. Special Report: Update to the economic costs of natural disasters in Australia. October 2021. At: http://australianbusinessroundtable.com.au/our-research.

Building resilience for the unprecedented

Andrew Gissing

Risk Frontiers

Walking the streets of Lismore in NSW, the smell of drying mud and the presence of fire and army trucks reminds me of the many floods I have travelled to Lismore to research over the last 2 decades. Lismore is no stranger to floods and its homes and businesses have frequently been exposed to them.

In 1974, there was severe flooding across much of Australia's eastern coastline. The height of this flood is prominently displayed across the town and, in places, the water was metres deep. Flooding in 2017 overtopped levees, flooding the entire CBD. However, many homes escaped the worst of that flood as they had been raised above the flood peak.

But this time it was different. Flooding was higher and more devastating. When I visited Lismore, 3 weeks after recent flooding, almost all businesses were closed, stores completely stripped bare and many with their fronts boarded up. In south Lismore, some buildings were destroyed and every home had a large pile of muddy possessions on the nature strip destined for landfill. Many homes were deemed uninhabitable. In north Lismore, flood depths reached the top of power poles. Similar devastation was repeated across the Richmond Valley, the epicentre of a flood emergency, stretching across south-east Queensland and NSW. Since the La Niña event was declared in November 2021, floods have claimed many lives and caused several billions of dollars in damage.

The height of the flood peak at Lismore was a new record, but the risks were foreseeable. The recent Lismore Floodplain Risk Management Study, for example, provides mapping for flood levels like those experienced in this flood. People choosing to shelter in their homes, thinking flood waters would not reach their floor level, has been a common challenge for the SES in previous floods. The chronic shortage of affordable housing and the high prices of insurance cover complicate long-term recovery efforts and are well-known issues.

We expect severe weather events to worsen. In a warming climate, the atmosphere can hold more moisture and rising sea levels will increase coastal flooding and erosion. Australia's current planning laws allow development in flood-prone areas. We cannot look to the past to predict the future. It is critical that we anticipate and prepare for the unprecedented.

Floods are perhaps the most manageable of all natural hazards. A key principle in planning for them is to consider all magnitude of floods up to the largest possible known as the Probable Maximum Flood.

Australia spends 97% of public money on recovery and only 3% on preparation and mitigation. However, flood mitigation could play a greater role in reducing flood damage and lowering insurance premiums. For example, when a levee was constructed in Roma in Queensland following the 2011 flood, insurance premiums dropped by about 50%. For this flood, levees at Grafton and Maclean

Streets in south Lismore were piled with flood-damaged materials and possessions.

Image: Andrew Gissing

House in Broadwater showing flood levels were higher than window level.

Image: Andrew Gissing

Flood waters swept through the Terrace Bar in Richmond, causing extensive damage.

Image: Andrew Gissing

prevented inundation and the operation of Wivenhoe Dam above Brisbane lowered the city's flood levels.

Levees and dams do not eliminate flooding entirely. Warning systems, emergency planning, community engagement, resilient infrastructure and the flood-proofing of structures are critical to an integrated management approach. Improvements to warning systems for flash flooding and repairing buildings with flood-resilient materials should be an immediate priority.

Some 65% of deaths have been associated with vehicles in floodwater. More must be done than simply telling motorists not to drive through floodwater. We must adopt stronger engineering, warning and enforcement approaches to complement behaviour-change programs.

Elimination of flood risk entirely is only possible by removing homes and businesses from floodplains. Land swaps, for example in Grantham after the 2011 flood, meant that there was less damage when it flooded this time. However, the purchase of flood-prone properties in Lismore alone would likely cost over one billion dollars and take decades to complete. Given the expense, voluntary purchase is typically used for only the highest risk homes. But as risks increase, such investments may become necessary.

Working with communities about flooding is important. This should include education about severe floods that have not historically happened. Community leadership to create resilient communities should be encouraged. This means, where appropriate, supporting communities to design their own resilience strategies.

Our communities have stepped up, led by community-based organisations. These organisations could be funded to build resilience within communities alongside local governments by addressing underlying vulnerabilities that worsen disaster effects. Despite calls for a full-time disaster force, the volunteer-based SES will likely remain the core of flood response efforts. They should be resourced to play a leading role as part of a nationwide, whole-of-community approach to emergency management.

Most importantly, we must address future flood risk. Typically, local governments have adopted the one-in-100-year flood to define where controls for residential development should apply. These controls must be risk-based. We must also consider policies that encourage development in flood-free or low-flood-risk areas. A substitution test, which tests if a development could occur on land of lower flood risk, similar to that used in the United Kingdom, could be considered.

This is an urgent challenge. We must prepare with individuals and communities for the inevitable and unprecedented disasters of our future. Everyone has a part to play.

Andrew Gissing is a General Manager at Risk Frontiers and an Adjunct Fellow at Macquarie University.

Volcano breath: a rare 'vog' event in the eastern Bay of Plenty, Aotearoa New Zealand

Carol Stewart

Massey University, New Zealand

Shane Iremonger

Bay of Plenty Regional Council, New Zealand

Mike Rosenberg
Graham Leonard

GNS Science, New Zealand

Whakaari/White Island, located 50 km offshore and north of Whakatāne in the eastern Bay of Plenty, Aotearoa New Zealand (Figure 1), is the country's most active volcano. For more than a century, it has been in a state of constant unrest punctuated by small but hazardous eruptions. Often, the volcano emits a plume of water vapour and gases that are visible from the mainland. Residents of Whakatāne were reminded of Whakaari's 'volcano breath' when a rare 'vog' episode occurred on 9 November 2021.

Vog (a portmanteau of the words 'volcanic' and 'fog' or 'smog') is hazy air pollution caused by volcanic gas emissions. These are primarily water vapour, carbon dioxide (CO_2) and sulfur dioxide (SO_2), with smaller amounts of other gases such as hydrogen sulfide (H_2S). In the atmosphere, SO_2 reacts with oxygen, moisture and sunlight to form tiny particles known as sulfate aerosol, which scatter light, causing a visible haze. Vog refers to the mixture of unreacted SO_2 gas, which is a strongly acidic irritant and tiny particles, which can travel deep into the lungs. Much of our knowledge about the health effects of vog comes from Hawai'i,[1] where residents of the Big Island downwind of Kīlauea volcano have lived with vog for many decades. Occasionally, vog is experienced in Honolulu, approximately 340 km away. During major eruptions of Kīlauea in 2018, vog reached the Marshall Islands, 3,700 km away.[2]

Vog is a rare phenomenon in Aotearoa New Zealand, primarily because the most actively degassing volcano, Whakaari, is located 50 km offshore and the prevailing winds are westerlies (Figure 1). However, on 9 November 2021, conditions aligned so that vog was experienced on the mainland. The *Whakatāne Beacon* described an 'eerie haze and smell of sulfur' enveloping the eastern Bay of Plenty on the afternoon of 9 November. There were widespread comments in social media of people perceiving the haze (Figure 2) and the distinctive smell, but few, if any, accounts of typical adverse health effects occurring, such as headaches, stinging eyes or shortness of breath. It is probable that the gas smelled was hydrogen sulfide (H_2S) as this gas has an extremely low odour threshold and is more stable and unreactive in the atmosphere than SO_2.

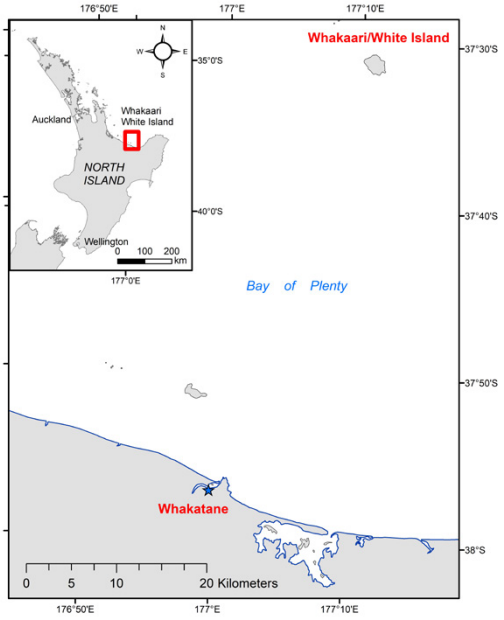

Figure 1: Location of Whakaari/White Island volcano.

Figure 2: Top image: view north from Coastlands Beach on 9 November showing effects of vog on visibility. Lower image: typical view from same location. Moutuhorā/Whale Island is visible in the lower photo and is approximately 8 km away, The Whakatāne headland, also visible in lower photo, is approximately 3.5 km away.

Images: Shane Iremonger, BOPRC

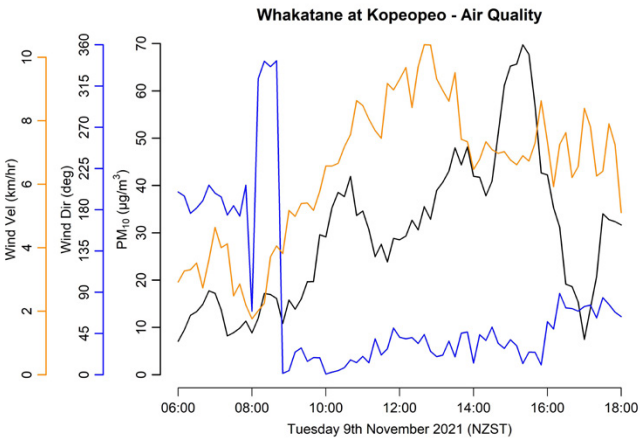

Figure 3: Wind speed (in km/hour), wind direction (in degrees) and PM_{10} concentrations (in µg/m³) at the Kopeopeo monitoring station, Whakatāne, between 6am and 6pm on 9 November 2021.

Data source: Bay of Plenty Regional Council

As vog is partially comprised of small particles, it may be detected by airborne particulate monitoring instrumentation. The Bay of Plenty Regional Council has an air quality monitoring station in Kopeopeo, Whakatāne, which collects data on windspeed and direction, air temperature, relative humidity and PM_{10} (airborne particles smaller than 10 micrometres, or 0.01 mm, diameter). On 9 November, the wind swung around to blow from the north between 8am and 9am and persisted from the north to northeast direction into the afternoon while windspeeds remained low, mostly between 5–10 km/hour. Over this time, the PM_{10} concentration built up steadily to a maximum of 70 µg/m³ at 3:20pm, after which it declined again as the wind swung around to an easterly (Figure 3).

While this maximum PM_{10} concentration was the highest 10-minute average recorded at the monitoring station over the 3-month period October to December 2021, it is unlikely to have been of much importance as a health hazard, because the 24-hour PM_{10} concentration for 9 November of 22.9 µg/m³ was comfortably below New Zealand's 24-hour National Environmental Standard of 50 µg/m³. This is generally consistent with the lack of reported adverse effects of the vog in social media accounts (e.g. GeoNet Facebook of 9 November 2021).

In addition to the light onshore winds, temporarily increased degassing from Whakaari was probably also a contributing factor. Emissions of CO_2 SO_2 and H_2S gases from Whakaari are currently assessed by GNS Science using an upwards-looking spectrometer while flying transects under the plume and by analysing samples with other spectrometers while flying through the plume at different altitudes. The 2 November 2021 gas flight reported 681 tonnes/day, over twice as high as its long-term baseline rate of 200–300 tonnes/day. This decreased to 484 tonnes/day by the next gas flight of 18 November.[3] Data collected by GNS Science during the past 10 years show that the amounts of gases discharged from Whakaari vary substantially within periods as short as a few weeks.

Future combinations of light onshore winds and increased degassing from Whakaari are likely to lead to 'volcano breath' being experienced on the New Zealand mainland again. Emergency managers can allay public concerns with the provision of evidence-based public messaging.[4] People should be advised to limit their exposure to vog by staying indoors, keeping doors and windows closed and avoiding the use of heat pumps or air-conditioning units that draw in air from outside. While indoors, people should also protect indoor air quality by not smoking or burning candles or incense and only using gas-burning appliances flued to the outside. People more sensitive and more likely to experience health effects include those with asthma or other respiratory conditions, people with cardiovascular disease, older people, babies and children and new or expectant mothers.

People concerned about their health or that of a family member during a vog episode should call their family doctor (in New Zealand) or the NZ Healthline 0800 611 116.

Endnotes

1. Hawaii Interagency Vog Information Dashboard, at https://vog.ivhhn.org/.

2. 'Vog' from Kilauea volcano blankets Marshall Islands, 3700km away. *The Guardian*, May 2018. At: www.theguardian.com/us-news/2018/may/28/kilauea-volcano-vog-marshall-islands-health-warning.

3. Whakaari/White Island: Volcanic unrest continues with steam and mud discharge, decreased gas emissions, steady vent temperatures and lake level fall, GeoNet Volcanic Alert Bulletin WI-2021/16, November 2021. At: www.geonet.org.nz/vabs/4LSxKQM4EyEUOYOkOtCTej.

4. Hawaii State Department of Health (n.d.), Protect yourself from vog. At: https://vog.ivhhn.org/vog-protection.

What's in a name? National large air tanker is named

Emergency Management Australia

Department of Home Affairs

If you ask most people who Elvis is, they'll probably answer with 'the King of Rock 'n Roll'. Ask the same question to people who have faced a wall of advancing bushfire flames, and they may well say something like 'the water-bombing helicopter that helped save my home and family'.

Over the past decade, the use of aerial firefighting has grown significantly in Australia, to the point where we now have more than 150 specialised, highly mobile aircraft positioned around the country to protect communities against bushfires. That already highly effective and sophisticated capacity has received a very major boost with the addition of the National Large Air Tanker (LAT). The LAT delivers extraordinary capabilities. This customised Boeing 737 is able to reach just about anywhere in Australia within hours and drop 15,000 litres of retardant or water on a fire when it gets there. It can do this in the edges of urban areas as well as remote and difficult-to-reach locations. It will be a major support for air and ground crews already battling a blaze and can also work in locations that other firefighting resources may not be able to access easily.

While Australia has used LATs over recent years, this aircraft is the first to be funded by the Australian Government and provides a truly national capability. That means the aircraft can be deployed to wherever it's needed whenever it's needed based on the areas at greatest risk. An annual comprehensive assessment of the fire risk will determine where it will be based, putting it closest to the areas predicted to face the greatest threat. Having a LAT based in Australia for the earlier starts and later finishes to fire seasons will help address the increasing length of these traditional bushfire seasons.

The LAT was delivered in December 2021 as part of a $4 million funding to the National Aerial Firefighting Centre.[1]

The Minister for Emergency Management and National Recovery and Resilience, Senator the Hon. Bridget McKenzie agreed that, like Elvis before it, such an impressive aircraft needed a worthy name. A competition to name the LAT was jointly organised by Emergency Management Australia, the National Aerial Firefighting Centre and the Australian Institute for Disaster Resilience. The competition was open to students from years 5 to 8 from rural and regional schools across Australia.

The LAT will fly to anywhere in Australia within hours and drop 15,000 litres of retardant or water on a fire.

Image: National Aerial Firefighting Centre

In the end, 3 schools shared the honour of naming the aircraft as all of them came up with 'Phoenix'. The Year 5 students from Bishop Druitt College in Coffs Harbour and Christian College Geelong, along with Year 7 students from St Patrick's College in Campbelltown, saw the mythological fire bird as the perfect metaphor for Australia's new aerial firefighter.

The competition called for a great name for the LAT as well as a written a rationale explaining the choice. It wasn't enough to just come up with a good name, all 3 class groups also identified an

Year 5 students, Bishop Druitt College.

Image: Bishop Druitt College

Year 5 students, Christian College Geelong.

Image: Christian College Geelong

Year 7 students, St Patrick's College.

Image: St Patrick's College

obvious parallel with the famous fire bird and its links to renewal and rising from the flames.

The Year 5 students of Bishop Druitt College explained their choice. 'The lands suffered from fire but the LAT swooped in to help put the fires out, which then gave the burnt land an opportunity to grow again'.

For their efforts, the students of Bishop Druitt College, Christian College Geelong and St Patrick's College have the honour of adding the name 'Phoenix' to the nation's history books and they will also contribute to the design of the aircraft's livery. Senator the Hon. Bridget McKenzie visited the students in Coffs Harbour to announce the winners and celebrate their success.

It's not just the year 5 and 7 students of these 3 schools who are winners from this competition. Around the nation, young people now have a greater understanding of how we fight bushfires and have spent time thinking about how we can be better prepared, as a nation and in our homes and communities.

In an ideal world, we would never need to use the 'Phoenix' and the rest of the firefighting fleet, but the reality is they will be in the air safeguarding lives and property. Future generations will have a much better idea of risk and, hopefully, what they can do to reduce risk and make communities safe and prepared.

Endnote

1. National Aerial Firefighting Centre, at www.nafc.org.au.

Beyond capturing: implementing lessons learnt from the June 2021 severe weather event in Victoria

Travis Dixon

Hepburn Shire Council

Dudley McArdle

Retired senior emergency manager

In the wake of the severe weather event that ravaged much of Victoria in June 2021, the question must be asked as to what challenges and opportunities exist for Victoria's fledgling lesson management framework. This paper discusses these challenges and opportunities from the standpoint of 2 emergency management practitioners.

Climate change is well understood. The reality is unfortunate but now unavoidable and bushfires will increase in severity and there will be a reduction in time between significant bushfire events.[1] But what are the climate change implications for other severe weather events, such as storms? Extremes will be increasingly seen across the weather spectrum including droughts, floods, storms and bushfires.[2] Australia must prepare for a bleak reality punctuated by increased occurrences of all types of severe weather events. The June 2021 severe weather event provided essential learnings that must be integrated within Victoria's emergency management framework.

In November 2015, the Victorian Government adopted the sector-wide lessons management framework known as EM-LEARN.[3] This framework has been well tested within the bushfire context and has, at face value, proven valuable. However, Victoria has been long exposed to crippling bushfires and lessons have been captured, if not learnt, time and time again, long before the implementation of the EM-LEARN framework.

The storms of June 2021 were unprecedented, yet they will be surpassed in severity in the future. The emergency sector has captured dozens of valuable learnings from storms that crippled Victoria in ways bushfire seldom does. Bushfire typically affects regional Victoria and, to an extent, the rural-urban fringe of metropolitan Melbourne, making severe weather events a faraway thought for many Melbournians. However, the storms demonstrated that Melbourne is not without its vulnerabilities with many suburbs suffering compromised critical infrastructure and widespread damage. Tens of thousands of people in Melbourne were caught unprepared for the storm, a precious lesson for agencies and the community alike. For the community, it demonstrated a need for enhanced resilience and reduced reliance on emergency services agencies and authorities. While this serves as an overarching lesson, it is impossible to simply build community resilience, as resilience is typically the product of multiple small-scale exposures. This may serve as the ultimate test of the EM-LEARN framework, likely a test that would challenge, if not overwhelm, the best lessons management framework.

In the wake of any emergency, the words 'lessons learnt' and 'lessons captured' punctuate every after-action review, often seemingly to no long-term benefit. This is due to several reasons, not least the relative immaturity of the lessons management framework within the emergency services sector. It must be acknowledged, perhaps unpopularly, that emergency management is a burgeoning profession with no form of accreditation or experience required to practice. This begs the question: who is truly best placed to implement lessons learnt? Emergency managers typically deal with rapid and high-consequence periods of perturbation. The reports that emerge in the months and years following the events typically parallel the event's magnitude, resulting in complex recommendations that skirt the line of public safety. Emergency services

agencies and authorities often have little capacity to implement complex recommendations and these recommendations, when implemented, may serve to confuse. Lessons captured, while invaluable, must be segmented into actionable recommendations that are consummate with the capability and capacity of the responsible agencies and authorities. That is, the sector must work with bite-sized pieces.

Within the scope of the June 2021 weather event, it is easy to identify lessons, as there were many. For example, the widespread telecommunication failures greatly hindered the response to the event and highlighted the sector's reliance on telecommunication systems. Likewise, particularly in the case of the township Trentham, the compounding failures of critical infrastructure (electric, road, telecommunications and water) demonstrated that current planning frameworks do not adequately accommodate for compounding failures. These are complex lessons that bridge professional disciplines and industry sectors. Therefore, the relevant recommendations must be actionable, clear and determinate.

The Australian Government has recognised the need for improved telecommunications in emergencies thanks to previous recommendations, with the rollout of the Strengthening Telecommunications Against Natural Disasters scheme.[4] However, not all areas will be serviced by this scheme, either due to failure of qualification or the responsible agency or authority declining involvement. This effectively demonstrates the limitations of recommendations in that they are just that: recommendations with no requirement for compliance beyond the public perception.

The complexity of the weather event degraded the ability to task and coordinate the activities required of the numerous agencies involved. Their ability to create and service a shared picture of the requirements was compromised by difficulties in obtaining, managing and sharing basic data. Local communities were left without clear, comprehensive information and warnings – before, during and after the event. Lessons tend to focus on what went wrong, as opposed to what went right. However, there is an inherent need within the lessons management framework to analyse the successes, partly to make lessons management a positive experience, but also to qualify, replicate and validate the implementation of recommendations resulting from lessons gone. At the time of writing, the final report into the lessons arising from the event has not been published.[5]

One positive observation was the incredible work done by the volunteer Country Fire Authority and Victoria State Emergency Services crews supported by professional staff from those agencies as well as other agencies. The emergency services sector already relies heavily on volunteers during the heat of the summer and is now being called on heavily during the winter months. There are complex lessons to learn from this, but whether they will be learnt, or even considered due to their poor political palatability, is another matter. Volunteers perform an invaluable role in Victoria's emergency management arrangements, particularly their ability to provide surge-capacity. At what stage does an elevated emergency response profile transition from 'surge-capacity' to business as usual? This is an observation that is unlikely to become a lesson.

Despite the best efforts of Emergency Management Victoria to create a whole-of-sector approach to lessons management through EM-LEARN, there should be questions asked whether the measures in place to evaluate the success of implemented recommendations are truly fit-for-purpose in the all-hazard environment. Is this because the evaluative measures themselves are weak, or because the recommendations are so large that an evaluation would amount to a research thesis?

The challenge for lessons management frameworks is that the June 2021 severe weather event was a true multi-agency event that touched every level of government. Recommendations made must be actionable, pointed and practicable subject to evaluation. Lessons captured from the June 2021 severe weather event must receive widespread implementation within the sector, recognising the complex arrangements that underpinned the response and recovery. The recommendations that will drive this implementation must be fit-for-purpose and the lessons management frameworks must be developed in preparation for a changing climate. Observations indicate nothing less than a thorough commitment from the sector to learning and improving operational practices. However, it will be the works of the next few years, based on practicable lessons, that will truly test the sector's resolve to prepare for all-hazard emergencies in a changing climate. The sector has baked its cake and can eat it too, and everyone can have a slice.

Endnotes

1. Australian Government 2020, *Royal Commission into National Natural Disaster Arrangements Report. At: https://naturaldisaster.royalcommission.gov.au [October 2020].*

2. Department of Environment, Land, Water and Planning 2021, *Victoria's Climate Change Strategy. At: www.climatechange.vic.gov.au/victorias-climate-change-strategy [October 2020].*

3. Emergency Management Victoria 2015, *EM-LEARN Framework. At: www.emv.vic.gov.au/how-we-help/reviews-and-lessons-management/lessons-management-framework-em-learn [October 2020].*

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5. Emergency Management Victoria 2021, *Update: Learning Review into June 2021 extreme weather event. At: www.emv.vic.gov.au/news/update-learning-review-into-june-2021-extreme-weather-event [December 2021].*

Standardised national training framework shines light on private sector fire resources

Lindsay McIver

Australian Bushfire Management Association

In Australia, many private, non-government and government organisations undertake public safety training for bushfire mitigation and response in accordance with the Australian Qualifications Framework (AQF). This training is often tailored for and undertaken with organisation-specific aims and objectives and can differ between organisations and state and territory jurisdictions.[1]

Along with this diversity of training, private sector engagement with local, state and territory organisations has been challenging. This is because there is no consistent standard by which to measure an individual's safety training or their competency, nor the due diligence of the training delivery business. Rather, businesses were leveraging off the standards of the states and territories that differed greatly and, in most cases, were not relevant.

A new national training framework has been endorsed by the Australian Bushfire Management Association (ABMA) in consultation with the sector. The framework provides a standardised training and competency benchmark that will demonstrate an individual's qualifications, competency and fitness for work in roles within the bushfire management industry.

The new minimum national standard

In April 2021, the ABMA rolled out the National Training and Competency Framework for the Australian Bushfire Red Card™ (ABRC). The card was specifically designed to provide:

- a standardised national training framework based on industry standards and expectations
- role-specific levels and classifications aligned to skill sets endorsed by the ABMA
- a defined career pathway using roles within the bushfire management industry
- transparency for competency and fitness for work using the Red Card that will be replicated as a digital card
- verification of competency to employers, incident management teams and stakeholders via unique QR codes on the Red Card
- an annual verification of competency and renewal of red cards prior to the fire season
- work health safety due diligence for training, competency and fitness for work
- recognition by local councils, fire agencies and stakeholders to streamline procurement processes
- alignment with the US National Wildfire Coordinating Group (NWCG - USA) standards for international resource sharing.

Australian Bushfire Red Card

Image: Australian Bushfire Management Association

Training delivery and assessment of units of competency are all-inclusive within the framework and are attained through authorised Registered Training Organisations (RTO) with the AQF training component currently within their respective scope of registration.

The ABMA ensures integrity, security and ongoing governance and compliance of the ABRC by endorsing LRM Training Services (RTO#32552) as the exclusive ABRC issuing organisation. This is in accordance with the licensed Red Card trademark.

NWCG – USA alignment

The new framework is mapped to the NWCG - US standards for wildfire training (see Table 1). This was achieved in consultation with the US National Wildfire Suppression Association to enable efficient and transparent resource sharing on an international scale. A priority was training and competency levels of personnel to permit assimilation of firefighting teams.

The framework will be presented at the NWCG - US for formal recognition to enable personnel from Australia to seamlessly operate on firegrounds in America as quickly as possible and to minimise possible lag time in training gaps.

Table 1: Alignment of the NWCG – US Standard to the ABRC

NWCG Standard	National Training and Competency Framework
Firefighter Type 2 (FFT2)	Bushfire Fighter (Level 2 - BF)
Firefighter Type 1 (FFT1)	Advanced Fighter (Level 3 - AFF)
Single Resource Boss Crew (CRWB)	Crew Leader (Level 4 - CL)
Single Resource Boss Heavy Equipment (HEQB)	Crew Leader (Level 4 - CL) with Class 4a
Single Resource Boss Engine (ENGB)	Crew Leader (Level 4 - CL) with Class 2f
Basic Faller (FAL3)	Bushfire Fighter (Level 2 - BF) with Class 2d
Intermediate Faller (FAL2)	Advanced Fighter (Level 3 - AFF) with Class 3a

Source: NSWA Crosswalk to NWCG mapping assessment October 2021

Training delivery and assessment options

RTOs holding the specific units of competency may deliver and assess the training. Applicants who have extensive experience as well as knowledge and skills and provide evidence to undertake roles within the ABRC framework may apply for recognition of prior learning status for competency units. Others with extensive experience who are unable to provide evidence may undertake physical verification of competency. This is an assessment of physical performance of a competency. Applicants attaining all competency units may apply to the ABMA for a Red Card.

The Training and Competency Framework eliminates ambiguity in the training and competency assessment of private sector fire management personnel. It provides a national and standardised approach to training, competency and fitness for work. It also brings clarity to businesses to fulfil obligations under state or territory work health safety legislation relating to training and supervision in workplaces.

The Red Card verifies competencies and gives transparency and governance to prove due diligence is undertaken. Red Card holders are qualified, competent to current requirements, fit for work and can effectively operate on firegrounds.

This initiative improves safety for personnel and teams and shows work health safety compliance for businesses. It provides fire services agencies and their stakeholders with the confidence to work with private sector bushfire agencies within Australia as well as overseas. Through the National Training and Competency Framework and the Red Card, the private sector strengthens Australia's state and territory capacity and capability to improve bushfire resilience.

Endnotes

1. Australian Qualifications Framework, at www.aqf.edu.au.

2. National Training and Competency Framework, at www.ausbma.org.au/about/australian-bushfire-red-card/.

3. Australian Bushfire Red Card, at www.ausbma.org.au/about/australian-bushfire-red-card.

Research prepares organisations for climate-challenged futures

Bethany Patch

Natural Hazards Research Australia

Will your organisation be ready for the effects of natural hazards and climate change as they become more significant in the near future? What can you do today to be ready to face a tomorrow that is fundamentally changed by natural hazards and climate?

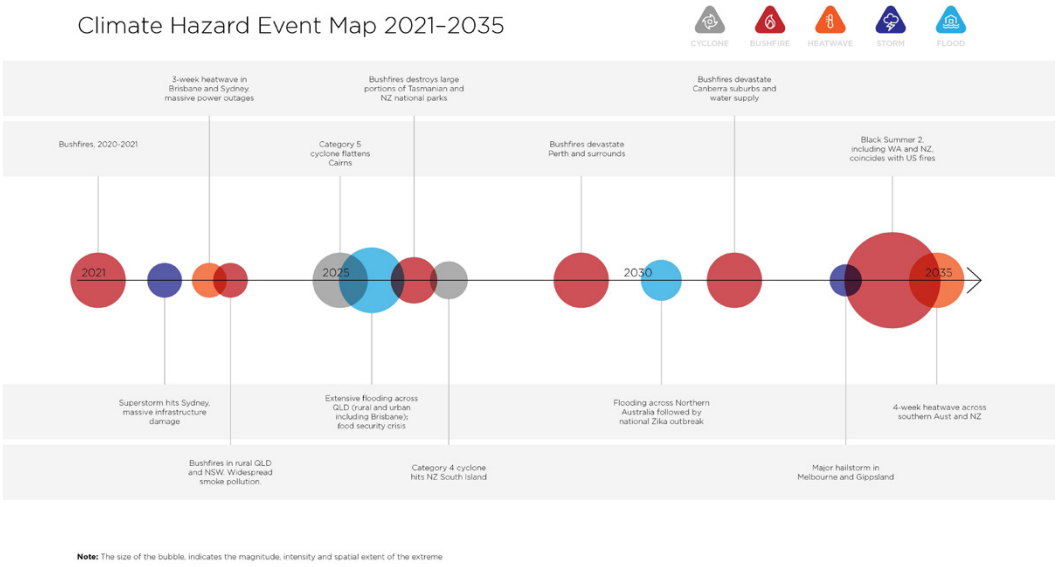
New resources for Transformative Scenarios in a Climate-challenged World provide plausible futures to help the emergency management sector across Australia and New Zealand. The resources are increasing the understanding of what 2035 could look like under compounding pressures of natural hazards and climate change.

The duration, scale and intensity of the 2019–20 bushfires in Australia, the subsequent disruptions of the COVID-19 pandemic and the destructive flooding this year remind us that the management of natural hazards does not always go as expected, and that we cannot rely on the past as a good indicator of the future. The importance of using plausible futures to adapt and mitigate against likely climatic shifts over the next decade was emphasised by the Intergovernmental Panel on Climate Change Sixth Assessment Report[1] on the current knowledge of the physical science of climate change. Importantly, the climate is not the only thing that is changing. Where and how we live will change, the political environment will be different and the social and economic drivers of society will change.

The use of transformative scenarios (sometimes called plausible or alternative futures) is a way for organisations to plan for and adapt now to prepare for futures with different social and political drivers and where climate change will result in frequent, severe and compounding natural hazards.

The use of transformative scenarios is a way for organisations to plan for the future.

Image: Bushfire and Natural Hazards CRC (now Natural Hazards Research Australia)



The Climate Hazard Event Map is one of the resources that can be used to understand the hazard exposures likely to affect an organisation's services within the plausible future scenarios (2021–2035).

Image: Reos Partners, RMIT University and the Bushfire and Natural Hazards CRC (now Natural Hazards Research Australia)

The Transformative Scenarios in a Climate-challenged World resources are based on research lead by Reos Partners in collaboration with RMIT University, through the Bushfire and Natural Hazards CRC 'Preparing emergency services for operations in a climate-challenged world' Tactical Research Fund project. The project was supported by the AFAC Climate Change group. The research team worked with leaders in emergency management to develop 4 distinct and plausible scenarios likely to unfold between now and 2035 in Australia and New Zealand, based on current climate trends. The scenarios are presented as 4 variations on social cohesion (low or high) and governance (reactionary or strategic, long-term or short-term).

Using the resources

Rather than being a predictive tool, these resources were designed as a package of information that organisations exposed to the risks and effects of natural hazards can use and adapt as needed. This includes emergency management agencies, government departments, community organisations, state-level agencies and other organisations exposed to natural hazards. Using these scenarios, organisations can consider the effects of natural hazards and climate change and assess whether current practices and plans will be sufficient in the context of each plausible future.

The resources are explained using a 'board game' analogy, where organisations can use the 'pieces' (resources) to explore how well their current and forward-looking planning prepares them for the future. This allows planners to make informed decisions about how to adapt their services and mitigate against the likely risks to come.

Natural Hazards Research Australia Research Strategy Director, Dr John Bates, explained that these resources include the flexibility to visualise different possible severities of natural hazards so that organisations can develop informed planning solutions.

'One of the challenges in planning for climate change has been understanding how the continental-scale climate predictions will play out at a local level and combining that with the social, political, economic and environmental changes that will develop alongside, or because of, the changes in the climate.

'The plausible futures we have developed combine all those elements to help you visualise what our future world might look like. You can use them to see how well current approaches to disaster risk reduction, disaster resilience, emergency response and disaster recovery will work in these futures and explore how actions you can take now could help us all be better prepared for 2035', Dr Bates said.

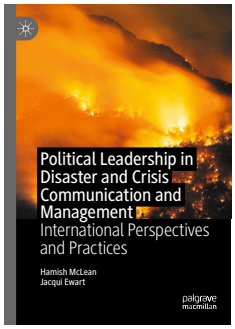
Lead researchers of this project were Geoff Brown and Stephen Atkinson from Reos Partners and Professor Lauren Rickards and Dr Adriana Keating from RMIT University.

The resources are at www.bnhcrc.com.au/climatescenarios. Learn more about this research at www.bnhcrc.com.au/research/understanding-and-mitigating-hazards/8023.

Endnote

1. Intergovernmental Panel on Climate Change 2022, *Sixth Assessment Report, at www.ipcc.ch/assessment-report/ar6/.*

Political leadership: perspectives and practices



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For many years I have presented to emergency managers on the politics of emergencies. When I discussed this topic in past years, politicians were considered by many as irrelevant to their work. Others saw politicians as a distraction, diverting resources and getting in the way of the professionals. However, since Australia's catastrophic bushfires of 2019–20, followed closely by the COVID-19 pandemic, it is now clear to emergency managers that crises and disasters, and the accompanying media conferences, are political events that can make and break governments.

McLean and Ewart's book, *Political Leadership in Disaster and Crisis Communication and Management: International Perspectives and Practices*, is very timely. It is written as a practical resource for politicians and their staff as well as for emergency managers.

The strength of the book is that as well as being practical, it is grounded in the theory and history of political and crisis communication. The authors criticise emergency managers who have no time for the role of politicians, pointing out that '[d]isasters happen when humans and hazards cross paths. Politics is integral to the workings of society at all levels, so we argue that today disasters are political events.' They also observe that the 'presence of political actors who have made no effort to learn disaster management, or build community resilience, should ring alarm bells for emergency managers as a sign that more trouble is on the horizon when calamity strikes.'

The section on unprepared political actors and unprepared communities serves to remind us of the need to invest in mitigation and preparation. The book points out how emergency management often struggles to gain the ear of political actors and the political consequences for governments of being unprepared when disasters occur.

The chapters analyse the different roles played in crisis communication across government. They cover the range of challenges faced by emergency managers, public servants, ministers and their officers. It has a useful section on the challenges emergency managers face when dealing with political demands including organising visits for politicians. It also has a separate chapter on 'Minding the Minders', which covers the issues that arise in the emergency management context from the increasing power of ministers' offices, in particular, media advisors.

The book includes 2 examples to illustrate best and worst performance. The first is US President George W Bush and how his mishandling of Hurricane Katrina destroyed what was left of his political reputation (following on from his mismanagement of the Iraq War). It also illustrates why politicians and their media advisors focus so much on image. Political strategists called the photograph of Bush peering down from an aircraft on the destruction below as 'among the most damaging' of his presidency. The second is the positive example of former Queensland Premier Anna Bligh and the 2010–11 floods.

In the final section of the book, McLean and Ewart outline what they see as best practice. Here they detail their 'tandem information model'. This was inspired by the approach the Queensland Government took during those floods. The roles of the Premier and people managing the disaster were clear. In the model, the necessary elements in messaging are: 'leadership (operational and political), empathy (political) and directions and actions (operational)'. While Bligh focused on empathy and compassion, the Police Commissioner led on operational issues. All the actors kept to their roles.

This book should be read not only by emergency managers but also by political staffers. It would be useful for every minister with emergency responsibilities to go through it too as part of their induction to office. The response to the pandemic has not dated this book. In fact, the opposite is the case, as recent events have confirmed the authors' findings. Good political staffers often have the influence to make a real difference as a bridge between emergency managers and ministers. Every ministerial office should get this book, and at least one ministerial adviser should absorb its contents, so that the mistakes of the past are avoided, and the good lessons are implemented.

Mainstreaming disaster risk reduction, seriously?

Experts and practitioners from multiple sectors respond to the issue of mainstreaming disaster risk reduction

The argument

We do not know how effectively disaster risk reduction (DRR) is considered in decision-making across different policy sectors, and thus whether the goal of 'mainstreaming' DRR is being achieved. Systematic assessment is required to answer this, and to identify areas for improvement.

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Stephen Dovers is a Fellow of the Academy of the Social Sciences in Australia and a Senior Associate with the firm Aither. He has been a Bushfire and Natural Hazards CRC researcher for a number of years.

Bluntly, the job of emergency management and disaster policy is to prepare for, and then cope with, problems caused by vulnerabilities created by other policy sectors. Houses in risky locations, people in vulnerable situations and assets at risk from natural hazards are often in such circumstances because of decisions or non-decisions made in land-use planning, development approval, transport, infrastructure, housing, public health, communications and elsewhere. Those policy sectors may overlook or pay scant attention to DRR when decisions are made. Indeed, it might not be part of their mandate.

Many emergency managers would like more serious attention towards the goal of 'mainstreaming' DRR across relevant policy and management sectors, taking a whole-of-government approach or, as it is called in public policy, horizontal policy integration. This is where a matter cannot be dealt with in one policy sector or portfolio alone and thus needs to be attended to in multiple areas across one level of government.[1]

My focus is on public policy and the tools of governments. While DRR is also very much about non-government actors, the space available here is limited and there is a crucial role for policy and law to set goals, provide resources and mandates, enable actions, empower people and encourage behaviours to enhance DRR.

It is not only emergency managers who believe mainstreaming should occur. Government policy recognises that DRR cannot be left to emergency managers alone. Australia's *National Strategy for Disaster Resilience* (Attorney-General's Department 2011) states:

> *Disaster resilience is the collective responsibility of all sectors of society, including all levels of government, business, the non-government sector and individuals* (p.V)
>
> *Traditional government portfolio areas and service providers, with different and unconnected policy agendas and competing priority interests may be attempting to achieve the outcome of a disaster resilient community individually. This has resulted in gaps and overlaps, which may hamper effective action and coordination…* (p.3).

The National Disaster Risk Reduction Framework (Commonwealth of Australia 2018) states that:

> *…limiting the impact of disasters now and in the future requires a coordinated effort across and within many areas including land use planning, infrastructure, emergency management, social policy, agriculture, education, health, community development, energy and the environment.* (p.4)

We face increasing disasters in a 2–3°C warmer world (AAS 2021, IPCC 2021), so the need to mainstream DRR becomes more urgent. Apart from key policies stating mainstreaming as a goal and committing to achieving it (but rarely saying how), the need for cross-policy sector incorporation of DRR is required to achieve other key social and policy goals:

- **Shared responsibility** is central to Australian disaster policy, extending DRR beyond governments to include individuals, households, communities, businesses and non-government organisations. While the focus here is not on non-government actors, statute law and public policy–the tools of governments–they strongly influence what

these actors can and cannot do or are encouraged or not to do.

- **Resilience** is an ill-defined but core principle in policy and is even in the name of the recently established national and NSW agencies. Resilience demands understanding of and influence on multiple actors and variables interacting in complex ways. The tools at the disposal of governments (law, public policy and administration, mass communication, fiscal power) are crucial to shaping the interplay between natural hazards, communities, individuals and multiple policy and economic sectors so as to encourage resilience.

Thus, the focus is on what governments can do. The goal of mainstreaming DRR across policy sectors and government portfolios is not new (e.g. flood zones, building standards, fire safety regulations, asset protection zones and the like). But is this enough and are there gaps and what reforms are needed? Many emergency managers argue for more, as do others in the community. But we do not really know the answer, in the absence of a systematic review of the adequacy of current incorporation of DRR measures across policy sectors. Could we find out?

Our principal mechanism for learning and improving are formal, post-event inquiries. Analysis of multiple Australian inquiries showed that, while a range of policy sectors are considered, this is patchy and the great bulk of attention and recommendations target emergency services organisations (Cole *et al.* 2018). Considerations such as building regulations and planning get some attention, but usually in a narrow fashion regarding one hazard type and event in one jurisdiction. The Bushfire and Natural Hazards inquiry data base[2] allows interrogation across inquiries, work that is only just beginning. But inquiries are, by definition, single event-focused, not systematic across-hazard types, events, policy sectors or jurisdictions, so only offer partial and dated answers. Broad-scale inquiries such as the 2020 Royal Commission into National Disaster Arrangements[3], while valuable, do not explore the detail of decision-making processes.

Likewise, within state and territory jurisdictions, emergency management agencies do interact with others: SES on floods and planning and RFS on fire and development approvals. Yet this is often single agency-to-agency, focusing on one hazard type and often very location specific. Inspectors-general of emergency management seek to promote DRR across government portfolios but are recent and their impact is as yet unclear.

We need a serious, systematic process

I argue we need a systematic process to identify gaps where DRR is not or is insufficiently incorporated as a core consideration across policy sectors and how it could be done better. This may not always favour DRR considerations, as a feature of the process would be to identify counter-imperatives and values that lessen or override DRR concerns, such as individual freedoms, housing supply and affordability, transport efficiency, environmental values and asset protection costs. But making those value differences explicit and disagreements over them transparent would be valuable—emergency managers might think DRR is the most important concern, while others have their own individual and organisational priorities.

DRR is not alone in requiring whole-of-government processes or horizontal policy integration (e.g. environment, see Ross & Dovers 2008) and there are fully achievable policy and administrative mechanisms through which to pursue such a goal.

The following are some broad options for undertaking a systematic review of barriers to and opportunities for mainstreaming DRR.

What are we targeting? Higher-order policies, enabling statutes, regulatory regimes and administrative procedures that instruct how decision-making is carried out and what information and factors must be considered when making decisions in sectors with implications for DRR (see the starting list from the National Framework quoted above: 'including land use planning, infrastructure, emergency management, social policy, agriculture, education, health, community development, energy and the environment', a list that could be expanded).

What scale and scope? A cross-sectoral and cross-portfolio review could be undertaken at state/territory scale, but a national scope would (i) include federal laws and policies, and (ii) allow cross-jurisdictional learning (an advantage of a federal system). The scope should be all-hazards, for greatest effect and for similar sharing of insights, and to identify generic measures that span DRR rather than multiple, overly specific ones.

Through what process? There are options and all should involve some independence and overview and stakeholder engagement: national-scale collaborative policy review process, inter-governmental taskforce, an AFAC-hosted program, commission of inquiry or applied research project.[4] The common elements would be:

1. survey the emergency management community to identify where it believes barriers and opportunities exist
2. interrogate the information from (1) to refine, scope and target policies, statutes and decision-making regimes in communication with agencies in other sectors
3. scrutinise what is identified in (2) to establish the magnitude of issues, countervailing imperatives and possibilities for reform
4. initiate detailed discussions between emergency management and other agencies to develop proposals for mutually agreed reforms where these are achievable and effective
5. develop best-practice guidelines that could be adapted in different jurisdictions.

1. Vertical policy integration, through levels of government, is also relevant to DRR but is a separate topic.
2. Bushfire and Natural Hazards inquiry, at https://tools.bnhcrc.com.au/ddr/home.
3. Royal Commission into National Disaster Arrangements, at https://naturaldisaster.royalcommission.gov.au/.
4. An overly formal inquiry process is not recommended, for reasons argued in Eburn and Dovers (2015).

Who could run the process? An obvious path is an inter-governmental taskforce (noting that the Council of Australian Governments has been disestablished and no clear location is apparent for DRR in the new National Federal Relations Architecture).[5] Other options are an expert and stakeholder-based review panel, an applied research team, an inspector-general emergency management or similar agency, a parliamentary committee, a public sector commission, the National Recovery and Resilience Agency (assuming state and territory collaboration) or an AFAC-led process. The process would require some longevity, a factor to be considered regarding the organisational home.

What time scale? This is a large body of work, assuming a level of seriousness of intent and level of detail. Depending on the resources provided, a thorough national-scale process would take at least 2 years; a state/territory-level exercise could be quicker. Or, an ongoing review process could be established working through priorities over time. In considering timing, the near certain onset of worse disasters should be kept in-mind, along with the costs of delayed action.

What sorts of reforms might emerge? Sometimes none, where current provisions are deemed sufficient or other values judged more important. Resulting reforms may not seem radical but could make a big difference over time. Options include:

- insertion of an obligation to consider DRR in an agency's statutory objects
- a new step in a regulatory decision-making process
- the addition of consultation with an emergency management agency within a procedure, or
- mandating that particular information be considered in decision-making.

In the words of one department head, 'all this other stuff, put it in my statutory objects and I'll make my people do it – otherwise it's once a month on a Friday afternoon'.

It may be that a mandated, ongoing capacity is needed and models from other areas where horizontal policy integration has been pursued could be examined for their suitability (e.g. workplace safety, gender equity, environment: a range of mechanisms are summarised in Ross & Dovers 2008).

We most often link DRR and land-use planning and building regulations, but a systematic review would cast the net widely (see the menu of sectors from the 2018 National Framework). Such a process could expose issues often overlooked with unexpected synergies and co-benefits emerging. Given no such systematic review has been undertaken, it is likely that:

- policy processes not currently seen as candidates for mainstreaming may emerge, presenting unexpected opportunities
- in areas more often identified (e.g. land-use planning), even where significant improvements may not eventuate the increased mutual understanding of different decision-making imperatives would be beneficial.

5. National Federal Relations Architecture, at: https://www.pmc.gov.au/sites/default/files/federal-relations-architecture-diagram.pdf.

For example, there is scant recognition of 'green infrastructure' such as a forested water catchments where these can be prone to disasters (Steele *et al.* 2017). The issue is not trivial. The value of coastal wetlands for protecting assets and lives globally has been calculated at US$447 billion per year and 4,620 lives per year (Costanza *et al.* 2021). There is an argument for such ecosystem services to be properly accounted for in DRR (Walz *et al.* 2021). There may be opportunities for enhancing DRR when policy sectors such as urban development, coastal and environmental management, transport and infrastructure and other policy sectors are scrutinised for their impacts on such protective assets.

Conclusion: is this all unimaginable?

It depends on social and political priorities, as all the avenues suggested above are politically and administratively available. Many other issues have been pursued across government by a variety of institutional measures and policy processes. In the 1990s, pursuing the goal of economic efficiency and competitiveness, some 2,200 pieces of legislation were scrutinised for 'anti-competitive' elements under the National Competition Policy process, enduring monitoring and regulatory mechanisms were put in place and our society and nation were transformed (e.g. McDonald 2007). If we take DRR seriously enough it could be done. It is a social and political choice.

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Responses

Mark Crosweller AFSM

Founder and Director
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> **The argument put forward by Professor Dovers is compelling. I think it is indeed true that 'the job of emergency management and disaster policy is to prepare for, and then cope with, problems caused by vulnerabilities created by other policy sectors'. I think it is also true that 'many emergency managers would like more serious attention towards the goal of "mainstreaming" disaster risk reduction across relevant policy and management sectors, taking a whole-of -government approach or, as it is called in public policy, horizontal policy integration'.**

Having had the privilege of leading the National Resilience Taskforce for the Australian Government between April 2018 and June 2019, I can attest to such efforts as evidenced by the development of 3 key policy documents:

- *National Risk Reduction Framework*
- *Profiling Australia's Vulnerability: the interconnected causes and cascading effects of systemic disaster risk*
- *Climate and disaster risks: what they are, why they matter and how to consider them in decision-making.*

In essence, the principal aim of all 3 documents was to follow this trajectory.

We know from the scientific literature and from our own lived experiences that climate-influenced natural hazard events in Australia and overseas, on every island and continent, are becoming more frequent and intense (IPCC 2021[1], IPCC 2018[2]). The Australian summer bushfires of 2019–20 left the world in no doubt that things are worsening, and that loss, damage and the ensuing suffering of humans and non-humans are significantly on the rise. We also know that our current capacity and capability to manage these events is constrained in the face of such overwhelming natural forces and that we cannot continue attempting to address these events in historical or conventional ways. The exponential trajectory of climate change cannot be matched by our incremental improvements in response to their effects.[3]

Therefore, we need to substantially increase efforts in addressing the root causes of the systemic vulnerabilities that leave us collectively, but not equally, susceptible to being harmed from climate change influenced natural hazards, and in so doing, increase efforts in disaster risk reduction. However, to do this, we must accept that disasters are not natural, but, rather, result from where, how and why we place ourselves upon the landscape and the extent in which we know about, consider, respect, regard and integrate the forces of nature on our societies both now and well into the future.[4, 5, 6] In short, disasters only arise when such considerations are inadequate. A natural hazard event does not in itself constitute a disaster.

In this context, higher-order policies, enabling statutes, regulatory regimes and administrative procedures all make a significant contribution to the root causes of disasters. Therefore, a cross-sectoral and cross-portfolio review should be undertaken at a national scale cascading down to states and possibly local governments. Arguably, an applied research project would seem to be the most efficient way to achieve this as it could be undertaken independently and contained within an appropriately scoped, funded and time-limited program of work.

The Royal Commission into National Natural Disaster Arrangements (NDRRA) made specific recommendations with regards to national coordination arrangements, and in so doing, referred to the need for long-term policy improvement:

- Recommendation 3.1 Forum for ministers — Australian, state and territory governments should restructure and reinvigorate ministerial forums with a view to enabling timely and informed strategic decision-making in respect of:
  - long-term policy improvement in relation to natural disasters
  - national preparations for, and adaptation to, natural disasters

- response to, and recovery from, natural disasters of national scale or consequence including, where appropriate, through the National Cabinet or equivalent intergovernmental leaders' body.

- Recommendation 3.2 Establishment of an authoritative disaster advisory body — Australian, state and territory governments should establish an authoritative advisory body to consolidate advice on strategic policy and relevant operational considerations for ministers in relation to natural disasters.

The results that would emerge from Professor Dovers' proposal could help establish a sound basis in which to give effect to these recommendations by identifying the key policy drivers and challenges that sit at the root cause of the very disasters that the NDRRA investigated.

The systematic assessment of disaster risk reduction in decision-making across different policy sectors is essential in my view if we are to collectively position ourselves for more frequent and intense climate-influenced natural hazards into the future; a future that without systematic reform will inevitably lead to otherwise avoidable harm and suffering of countless humans and non-humans within the planetary ecosystem we all call 'home'.

1. Intergovernmental Panel on Climate Change (IPCC) 2021, *Summary for Policymakers. In: Masson-Delmotte VP, Zhai A, Pirani SL, Comnnors C, Pean S, Berger N, Caud Y, Chen L, Goldfarb MI, Gomis MI, Huang M, Leitzel, E, Lonnoy JBR, Matthews TK, Maycock T, Waterfield O, Yelekci R, Yu & Zhou B. (eds.) Climate Change 2021: The Physical Science Basis, Contribution of Working Group 1 to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change.*

2. Intergovernmental Panel on Climate Change (IPCC) 2018, *An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty. In: Masson-Delmotte VP, Zhai H-O, Portner D, Roberts J, Skea PR, Shukla A, Pirani W, Moufouma-Okia C, Pean R, Pidcock S, Connors JBR, Matthews Y, Chen X, Zhou MI, Gomis E, Lonnoy T, Maycock M, Tignor M & Waterfield T (eds.). Geneva, Switzerland: World Meteorological Organization.*

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6. Wisner B, Gaillard J & Kelman I 2012, *The Routledge Handbook of Hazards and Disaster Risk Reduction, London, Routledge*

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I strongly agree with Professor Dovers that we do not know how effectively disaster risk reduction (DRR) is considered in decision-making across different policy sectors. DRR should be mainstreamed in social and economic planning across all sectors and jurisdictions and a systematic approach is required to take this work forward.

If it were possible to put on glasses that enabled us to see disaster risk, the risk would not sit neatly within bureaucratic or sectoral silos or jurisdictions but would flow across them in many directions. DRR is as much a finance, health, tourism, aged care and security issue, as it is a disaster management issue. However, disaster risk tends to be viewed by governments narrowly as a disaster management issue and therefore within the bureaucratic remit of disaster management agencies. Although these agencies are the most acutely aware of the consequences of poor disaster risk management, they are not well-positioned bureaucratically to mainstream DRR work across other government agencies.

Dovers touches on this point when he notes that 'emergency managers might think DRR is the most important concern, while others have their own individual and organisational priorities'. When I was the United Nations Secretary General's Special Representative for Disaster Risk Reduction at the United Nations Office for Disaster Risk Reduction, I used to advocate for stronger DRR action by United Nations member states, by pointing out the huge annual cost of disasters—then estimated at $520 billion.[1] There are places where disaster risk is already being incorporated in core economic planning.[2] But this tends to be primarily where disasters are already a major drain on economic development. For decision-makers in many other countries, however, the annual costs of disasters currently seem too small to trigger the transformation in risk management called for in the *Sendai Framework for Disaster Risk Reduction 2015–2030.*

This isn't surprising given that there are many competing challenges within each country and globally that involve costs similar to the annual losses from disasters. For example, the annual cost to the global health sector of smoking is $422 billion[3]; of child abuse and neglect in East Asia and the Pacific is $209 billion[4] of deforestation is $2–5 trillion[5]; of malnutrition is $3.5 trillion[6] and of avoidable blindness is $632 billion.[7] The business case for investment in DRR is very compelling, but it is also compelling for many other investments.

Climate change will rapidly alter this calculation by increasing the frequency and severity of hazards and the scale of the associated disasters. The costs, as Australia's bushfire season of 2019–20 vividly demonstrated, are escalating rapidly. The history of global efforts to reduce disaster risks suggests that major improvements are possible, particularly if they are progressed immediately in the wake of major disasters when governments are under intense

political pressure to act. Without these triggering events, change tends to be—at best—incremental. With more frequent major disasters, political support to reduce disaster risk and build national resilience, including by mainstreaming both climate risk and disaster risk more broadly in economic and social planning and investments, will accelerate.

Indeed, it is already accelerating within the private sector. Sophisticated analysis by the world's largest asset manager, Blackrock, is even now detecting major climate-change impacts on the value of investments, including evidence that the most climate-resilient utilities trade at a premium.[8] The company is advising its investors that this premium will increase over time as climate-change risks and dangers compound. As the financial losses resulting from sudden-onset hazards that climate change is amplifying (such as bushfires, drought, floods, storms and heatwaves) and from progressively intensifying hazards (such as sea level rise, changes in rainfall patterns and rising temperatures) increases, enormous amounts of capital will be directed away from assets exposed to disaster risk and towards more resilient assets and investments.

Although conducting a systemic review of the barriers to mainstreaming DRR would be unlikely to transform disaster risk management in Australia in the short-term, it would still be useful in identifying opportunities to further integrate DRR into decision-making. The review should nevertheless develop recommendations both for pragmatic and transformational changes. In the case of the latter, this should include developing a blueprint for an Australia that has fully integrated and mainstreamed DRR across sectors, bureaucracies and jurisdiction. The blueprint would serve both as a reference point for the incremental improvements that are politically possible today and for the transformational changes that will become more possible after the next major disaster.

1. Natural Disasters Force 26 Million People into Poverty and Cost $520bn in Losses Every Year, New World Bank Analysis Finds, at www.worldbank.org/en/news/press-release/2016/11/14/natural-disasters-force-26-million-people-into-poverty-and-cost-520bn-in-losses-every-year-new-world-bank-analysis-finds.
2. Pacific Community 2016, *Framework for Resilient Development in the Pacific An Integrated Approach to Address Climate Change and Disaster Risk Management (FRDP) 2017 – 2030. At: http://tep-a.org/wp-content/uploads/2017/05/FRDP_2016_finalResilient_Dev_pacific.pdf.*
3. Global economic cost of smoking-attributable diseases, at https://tobaccocontrol.bmj.com/content/27/1/58.
4. The economic impact of child abuse, at www.weforum.org/agenda/2015/06/the-economic-impact-of-child-abuse/.
5. Deforestation Costs to the World…Wow, Big $$$, at www.nrdc.org/experts/jake-schmidt/deforestation-costs-worldwow-big.
6. Cost of Malnutrition, at www.glopan.org/cost-of-malnutrition.
7. The global cost of eliminating avoidable blindness, at, www.ncbi.nlm.nih.gov/pmc/articles/PMC3491279/.
8. Getting physical: assessing climate risks, at www.blackrock.com/us/individual/insights/blackrock-investment-institute/physical-climate-risks.

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Climate change is driving worsening extreme weather events, contributing to insurance affordability and availability issues in parts of Australia. As Professor Dovers identifies, resilience is a core policy principle that is rapidly gaining prominence but is often poorly understood across the community. Importantly, it is not currently considered in building codes, building standards, or within building regulation around Australia.

For the Insurance Council (ICA), resilience across the built environment and at-risk communities is the ability to prepare for and adapt to severe weather events, ultimately improving the societal and economic costs of recovery. Practically, the ICA is seeking to ensure improvements in what we build, where we build it and how it is built, with resilience measures embedded into the National Construction Code. Solving this challenge is not just about what we build next, it's also about how existing homes can be rebuilt, retrofitted or renovated.

Combined, these measures will play a critical role in addressing the challenges Dovers lays out across sectors when he says; '… Houses in risky locations, people in vulnerable situations and assets at risk from natural hazards are often in such circumstances because of decisions or non-decisions made in land-use planning, development approval, transport, infrastructure, housing, public health, communications and elsewhere'.

A recent report from the ICA, *Climate Change Impact Series: Tropical Cyclones and Future Risks*[1], demonstrates the critical role of incorporating resilience measures into building construction. The report found that houses in Australia are not resilient to tropical cyclones, which are expected to become more severe and frequent as the climate changes.

For new builds, the report found that homes should be built to a standard that protects property and minimises the damage, loss and disruption caused by worsening extreme weather events. It identifies examples of pathways that would address key gaps in the current Australian construction code and associated standards, helping to bolster the resilience of new homes. Critically, the report indicated that at least 20% of modern homes affected by a tropical cyclone were found to have some form of water ingress damage regardless of wind speed. Updating the building code to address water ingress in new builds will help to reduce damage.

The ICA report focused on new builds, however, retrofitting older homes is also essential. The 2017 Queensland Household Resilience Program[2] is a prime example. The program evidenced the power of public investment in improving homes to provide greater resilience to extreme weather. One key benefit of this investment has been the quantified downward pressure on insurance premium costs. In total, just over $20 million was contributed by the Queensland and Australian governments to facilitate targeted building work and the retrofitting existing

properties to better withstand the natural peril risks faced in different parts of Queensland. Government contributed 75 per cent of the cost of approved building works up to a maximum grant of $11,250 per house, targeted to homes north of Bundaberg. During its operation, 3,100 grants were provided, with the majority going to roof replacement work (76.5% of grants approved), window protection and door and garage door replacement. Participants in the program subsequently saw an average saving of 7.5 per cent on their insurance premiums, with some savings up to 25 per cent.

As extreme weather events become more frequent and severe, we can adapt, prepare, protect and rebound. This cycle builds resilience, reducing the cost of recovery across the community and the economy. An insurable Australia is a resilient Australia and mainstreaming resilience measures into what we build, where we build and who builds it, is essential to better protect Australians.

1. Insurance Council of Australia 2021, *Climate Change Impact Series: Tropical Cyclones and Future Risks. At: https://insurancecouncil.com.au/wp-content/uploads/2021/12/2021Nov_Tropical-Cyclones-and-Future-Risks_final.pdf.*
2. Household Resilience Program, at www.qld.gov.au/housing/buying-owning-home/financial-help-concessions/household-resilience-program.

Nico Padovan PSM

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Australia is in the early stages of coordinating national effort to understand and address systemic disaster risk, especially at a national level. I note Professor Dovers' principal argument – that we do not know how effectively disaster risk reduction is considered in decision-making across different policy sectors, and thus whether the goal of 'mainstreaming' disaster risk reduction is being achieved – and the case for a systematic assessment.

Mainstreaming disaster risk reduction is a key means to harness the collective effort needed to make the systemic changes required to prevent new and to reduce existing disaster risk and manage residual risk. The present and emerging challenges we face are unlike those of the past. Disaster risk is growing and our systems are increasingly complex, interconnected and interdependent. This requires a fundamentally new and progressive approach to provide the best advice to government and the best service to the public; one of common purpose and integration.

Addressing these systemic challenges requires individuals and organisations to enhance their existing assessment and decision-making approaches and processes across all domains of resilience, at all levels and phases of their decision-making, to:

- understand the current barriers and greatest points of influence
- gauge the importance and ease of access to relevant information to support disaster risk reduction, including for example, climate projections and resilience indices
- consider governance arrangements, particularly within government, that are response and preparedness centric.

I welcome Dovers' goal of mainstreaming disaster risk reduction. This is something being actively worked towards at the National Recovery and Resilience Agency (NRRA). We have made great progress, building on the National Disaster Risk Reduction Framework as the national policy scaffold that guides transformational actions. The framework was released in April 2019 with collective and integrated actions facilitated through a National Action Plan, the second of which is under development and due for release later in 2022.

The Royal Commission into National Natural Disaster Arrangements recognised the need for the Australian Government to step in and take a leadership approach to disaster risk reduction, resilience and recovery efforts. In response, for the first time, the Australian Government has established a national agency to lead disaster risk reduction across all sectors—the NRRA.

Managing systemic disaster risk is key to achieving the NRRA's outcomes and is relevant to all areas including preparedness programs, community engagement and recovery activities. As our Co-ordinator General, the Hon Shane Stone AC QC, noted in his article published in this edition, we have a responsibility to ensure that the major programs that we run, such as the $600m Preparing Australia Program, the Black Summer Bushfire Recovery Grants and the Emergency Response Fund are fundamentally premised in disaster risk reduction and making communities safer against natural hazards. We are marrying this approach with a locally implemented approach to solutions that are best exemplified by our network of recovery support officers based in communities across the country.

Government policy recognises that disaster risk reduction cannot be the responsibility of emergency managers alone. Accordingly, the NRRA is using its convening powers to break down some of the silos, reaching across multiple policy streams and sectors to draw disaster risk reduction into their policies, programs and investments.

The complex, dynamic setting for this policy investment makes cause-and-effect difficult to understand as hazards, vulnerabilities and risks are changing. Many of the drivers of disaster risk are not new and continue to be present, and are only being compounded by a changing climate. A focus on obtaining more data and information on these drivers through a systemic assessment could delay immediate action to manage the effects of disaster, however, it is beneficial for long-term risk reduction. We need to provide robust, trusted, credible and consistent disaster risk information now to those in all policy sectors to implement disaster risk reduction policies, acknowledging that there are and will continue to be gaps. We also know that the strategic learnings from an assessment and evaluation of our policies and their impact on the ground should be included as a continuous process across the cycle of policy design, implementation and assessment. One step towards this will be the mid-term review of the *Sendai*

Framework for Disaster Risk Reduction 2015–2030, which the NRRA is leading and delivering by September 2022. This review will be a preliminary assessment of how far we are in moving toward a more resilient country, against the goals of the Sendai Framework. Further, we are building monitoring, evaluation capabilities and learning from the disaster risk insights generated by Australian Climate Service. Systemic risk reduction efforts will become increasingly informed by this evidence base, including through future iterations of the National Action Plan.

We know that Australia is susceptible to disasters as demonstrated by recent floods, cyclones and bushfires. We can never be disaster-proof, but we can be better prepared. This requires people to think and act differently about the occurrence of these events, including governments, emphasising that disasters are not natural but the consequence of the decisions we make as a society. The NRRA is an advocate for joined-up strategic approaches within the disaster risk reduction space to reduce harm and suffering, prevent the creation of new risk and mitigate existing risk. This will deliver the best advice to government and the best service to the public. We recognise that, in our realm, the science of decision-making and the science of behavioural and systemic change may be more pertinent to reducing systemic disaster risk than previous emphasis centred on managing individual hazards.

Linda Scott

Councillor, City of Sydney

President, Australian Local Government Association

For most of the past 150 years, local governments have been supporting at-risk communities through countless bushfires, floods, drought and cyclones. Because they are the level of government closest to these recurring events, councils have been assigned significant emergency management responsibilities by Australia's state and territory governments.

In Victoria, for example, councils are charged with emergency management responsibilities ranging from prevention through to emergency response and recovery, as well as building the resilience of communities to future emergency response.

In Queensland, councils are delegated with appointing local disaster management groups (chaired by the mayor or another elected member of the council) whose roles include:

- developing, reviewing and assessing effective disaster management practices
- helping local government to prepare a local disaster management plan
- ensuring the community knows how to respond in a disaster
- identifying and coordinating disaster resources
- managing local disaster operations
- ensuring local disaster management and disaster operations integrate with state disaster management.

Local governments are key players in Western Australia's emergency management arrangements, being tasked with establishing, managing and chairing local emergency management committees for their districts. As well as managing recovery efforts, these councils are also responsible for ensuring that local emergency management arrangements are prepared and maintained.

In South Australia, all 68 councils are provided with tailored assistance by the Local Government Association of South Australia based on their self-identified needs. The value of supporting individual councils to develop plans was highlighted during the disastrous bushfires on Kangaroo Island in 2020 when 23 South Australia councils provided 220 employees and 68 units of plant and equipment to help support the Kangaroo Island Council firefighting efforts.

The local government sector's willingness to do whatever is required to improve disaster emergency response and help mitigate the effect of future events is not in doubt–a point I have reiterated at the National Emergency Management Minister's Meeting. But when we don't get the support and resources we need to carry out delegated responsibilities, our ability to protect communities is compromised.

The 2020 report of the Royal Commission into National Natural Disaster Arrangements[1] had plenty to say on this matter. Noting the widespread view that a locally led response is 'one of the strengths of the disaster management system' and a 'foundational principle', the report recommended that state and territory governments should:

- ensure local governments can effectively discharge the responsibilities devolved to them
- review their arrangements for sharing resources between their local governments during natural disasters.

Many state governments, however, are still to officially respond to this recommendation for councils to be given more support and responsibility. This is especially concerning given budgets are under increased pressure from decreased revenue and additional expenditure due to the COVID-19 pandemic.

Regional and rural councils whose communities are frequently affected by disasters than those of urban councils, have been the hardest hit by the pandemic because they have fewer alternative sources of revenue. Budget repair is likely to be prolonged, especially in states where council rate increases are capped. Without extra resources, the ability to support local communities through disaster events such as we've just witnessed in southeast Queensland and NSW, and to prepare for future events, will be compromised.

To guard against this eventuality, the Australian Local Government Association is calling for a once-off injection of $1.3 billion of Financial Assistance Grants from the Australian Government. These grants are incredibly important for councils because they are untied, which means they can be used to address local needs and priorities. Unfortunately, they have declined over the past 3 decades from around 1% of federal taxation revenue to around 0.5%. We are calling on Australia's next federal government to restore these grants at least to 1% of taxation revenue.

We also urgently need more investment in specific mitigation and community resilience measures. Less than 5% of Australia's disaster funding goes to mitigation and resilience-building. This is an astonishingly low figure given the near certainty of more frequent and extreme weather events in the future.

In the lead-up to this year's federal election, the Australian Local Government Association will call for a targeted disaster mitigation program of $200 million per annum for 4 years so that councils can reduce the costs of response and recovery while strengthening community resilience.

To date, Australia's progress on developing a sustainable, coordinated and comprehensive national approach to disaster preparedness and recovery has been slow and fragmented. Communities recognise this. They're also aware of the clear and compelling consequences of climate change and are demanding that governments be more proactive in their responses.

We're ready to do just that, in close partnership with all levels of Australian governments. In working together, we can improve our readiness for future events and that no community is left behind.

1. Royal Commission into National Natural Disaster Arrangements, at https://naturaldisaster.royalcommission.gov.au/.

Robert Webb

AFAC Chief Executive Officer, Melbourne

> We have spoken for some time now about shared responsibility for disaster resilience, a core principle of the *National Strategy for Disaster Resilience*.[1] In the community context, the notion of shared responsibility has seen individuals and groups step up to understand and adapt to the risk of natural hazards in their location and take action to prepare for whatever may come.

Some community members go further, by choosing to join their local rural fire brigade or SES unit to protect their community during times of adversity. AFAC, as the National Council for fire and emergency services, represents some 290,000 members across rural and urban fire agencies, SES and land management. The vast majority, some 250,000 members, are volunteers, stepping up each day to train and prepare and to take on the role of first responders to assist their local community during emergencies and disasters.

That said, we hear a lot about resilience, and as the recent floods in NSW and Queensland exemplify, communities are resilient. But the effects of climate change mean that we are seeing an increasing frequency and severity in natural hazard events leading to disasters, with some communities exposed repeatedly. It is the compounding nature of these events that have the greatest impact on communities.

Our fire and emergency service agencies do their absolute best to manage these emergencies when they occur. The real value comes when we all deal with these risks at the systemic level. Without this alignment, communities will continue to be exposed and vulnerable to disasters.

We need to work together across all levels of government and across sectors to understand the risk landscape and to work collaboratively to reduce it. There are many possibilities cited such as mitigation, building back better, land-use planning, etc. The question is, how can we best collectively build momentum?

At AFAC, we know that we can't solve these problems in silos. AFAC is built on the practice of collaboration and mutual support, bringing expertise from across the emergency management sector to develop best-practice doctrine and then sharing this knowledge widely to strengthen our collective understanding and capability.

It is the case, as Professor Dovers notes, that 'the great bulk of attention and recommendations target emergency service organisations' in disaster inquires and royal commissions. We need to be conscious throughout inquiry processes of what we want to achieve and what we need to learn.

The purpose of an inquiry is not to point the finger at the organisation or person responsible. Used poorly, reviews can lead to knowledge and expertise leaving the sector as we seek to blame someone or something for the disaster that has occurred. Reviews and inquires, used well, help to unravel some of the current complexities in the risk reduction policy space, and provide lessons for a more cohesive approach.

There is a way forward. The *National Disaster Risk Reduction Framework*[2] established the priorities for Australia to reduce disaster risk. Tools, such as the *Systemic Disaster Risk Handbook*[3] from our partners at the Australian Institute for Disaster Resilience, provide guidance on implementing this framework.

The Systemic Disaster Risk Handbook goes beyond hazard-by-hazard approaches to assessing risk. It guides leaders and decision-makers from all sectors to adopt a mindset focused on systemic risks, to know why that is important to disaster risk reduction and resilience and how to apply that thinking to their work. It has been developed to promote and guide consideration of systemic risk and resilience analysis as part of any decision, review, update or development of contemporary practical instruction or risk assessment processes.

Increasing climate and disaster risks are making challenging work for fire and emergency services. Like all sectors, taking a systemic approach to reduce disaster risk will improve the safety of the current workforce and its sustainability into the future. Across all sectors, keeping the needs of communities at the forefront will align our approaches and makes the solution achievable.

1. Australian Government 2011, *National Strategy for Disaster Resilience, at: https://knowledge.aidr.org.au/resources/national-strategy-for-disaster-resilience.*
2. Australian Government 2018, *National Disaster Risk Reduction Framework, at: https://knowledge.aidr.org.au/resources/national-disaster-risk-reduction-framework.*
3. Australian Institute for Disaster Resilience 2021, *Systemic Disaster Risk Handbook, at: https://knowledge.aidr.org.au/resources/handbook-disaster-risk.*

Embracing the challenges of urban resilience

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Australia's growth since European settlement has been heavily oriented to urban areas. It is not surprising then that most of the ongoing material wealth is intertwined with risks faced by urban places and systems.

Urban resilience presents multiple challenges to the disaster risk reduction sector, as well as to the many professionals and other stakeholders who manage and use the built environment. A range of guides, initiatives, charters and strategies aim to improve urban resilience. However, it remains unclear how the enormity of the task can be addressed comprehensively, even while specific actions may be effective in targeted ways. This paper suggests that the field of action and core 'work' of resilience depends on embracing and working on the problematics of achieving city resilience.

Escaping definitional tangles and reducing risk

While accurate definitions of resilience are important, becoming tangled in arcane and sometimes needless complexities can be counterproductive. However, using the well-established, researched and practised field of risk science and risk reduction provides a powerful foundation. Risk assessment is not always precise but it is usually the best way to inform decisions, to determine the characteristics of risks and to establish priorities for action. Resilience thinking adds useful connections and depth, such as acknowledging that we are embedded in complex socio-ecological systems, that 'bounce back' alone is not enough, and that no single end point for achievement exists.

Recognising urban areas as riskscapes

Urban areas are inherently places of risk - riskscapes. These risks are diverse and variable depending on the interactions of built structures and people with a range of natural and other systems. Deeper enquiry often reveals an incomplete understanding about urban risks, for example:

- how proximate to vegetation or coastlines or low-lying areas should structures be
- are the materials used appropriate to withstand storms
- is the structure maintained adequately
- how capable and knowledgeable are the people.

Determining changeable risks in dynamic urban systems

Urban places are dynamic. Their function relies on a changeable and interacting complex of systems including physical structures and spaces, technology, infrastructure, economics, social and ecological elements. The challenge is to determine what risks exist in this context (what needs to be resilient to what) and whether any actions taken will have the desired effects. Further, the size, location, design and interactions of urban places with various hazards is changing rapidly. For example, consider that Australia had limited numbers of high-rise buildings only 30 years ago but now faces new risks associated with high-rise living that are only recently being acknowledged. Every evolving variation of urban places has ongoing and changeable risks. Consider how the COVID-19 pandemic changed views on urban density, emergency communications, supply chains, the need for open space and technologically reliant work, education, health and shopping.

Owning risk and risk transfer

Urban development and change create and modify risks for users and occupiers. Urban development has a tendency towards irreversibility, meaning that once land is cleared, streets are laid out and land is subdivided, many of the core foundations of that settlement remain for long periods of time. As part of this process, risk is passed on from landholders to developers, decision-makers and then to individual householders, users and occupiers. This extends to the emergency planners and responders who manage risks in urban places. Risks need to be

consciously determined, acknowledged and considered at each step to avoid the creation of undesirable and enduring riskscapes.

Acknowledging spatial and temporal scales

Urban places have problems of scale. The challenges of where things should go and 'how much' (density) should be in a particular place (e.g. housing, jobs, schools, open space, shops, health). This is combined with complex connections between activities (via transport systems, infrastructure, services) and with other environmental, social and economic systems that function at diverse scales. Existing urban areas have resulted from change that occurred in increments over time under varying circumstances and diverse competing demands. Also, as places change, this builds upon all that has come before, including poor and good decisions, changing technology, demographics and costs. It is little wonder that urban riskscapes are multiple and are intertwined.

Embracing the logics of decisions and governance

Urban places are the outcome of decisions over time. Some are by formal decision-making by city planners, building practitioners and politicians. However, the vast majority of decisions are made by disparate people, businesses and organisations, mostly about matters that are unrelated to risk management. Improving resilience has become another set of considerations. It is necessary to acknowledge that there are limits to what additional regulation can achieve, even while this is often justified as a way of improving individual and collective outcomes. It is clear that integrated action, the 'joining up' and alignment of objectives across diverse actors and actions, is required to manage risks. Despite these challenges, it is appropriate to involve diverse stakeholders as this has been shown to improve decisions and to facilitate uptake of positive change.

Dealing with new and existing urban risks

A fast-growing large city physically changes by only 1–2% per annum. Small towns are also subject to changes, for example, the ageing or decline in population or increasing population associated with newcomers looking for a certain lifestyle, with flexible work arrangements becoming common or seasonal tourism. While it is important to focus on avoiding unacceptable new risks when change occurs, it is also important to recognise that most risk is embodied in existing, often older, elements of settlements.

Acknowledging internal and external drivers of risk

The drivers of risks are multiple in any circumstance. Taking action to improve resilience requires acknowledgment that many factors are outside the control of the parties involved. It would stand to reason to prioritise action on matters where control of risk drivers is the greatest. However, it is also appropriate to influence others who could help reduce risks. Further, is it possible that decisions within our control are modifying other's risks? For example, consider the affects across jurisdictions and various parties relating to flooding that result from upstream vegetation removal, construction of non-permeable surfaces, modifications of flow paths and changing expectations of water management in catchment areas.

Recognising adaptation, mitigation and transformation assumptions

When we reduce risk and improve resilience, it is challenging but important to acknowledge that the goals are often informed by assumptions or limitations between adaptation, mitigation and transformation. For example, it seems sensible to adapt existing structures in fire-risk areas to improve their resistance to bushfire. However, it would be better to mitigate the risks of bushfire by taking actions to avoid climate change and the effects this has on bushfire (and other) risks. Even better would be to transform the underlying systems we rely on, particularly in urban areas, to redress and improve the environment in ways to achieve multiple sustainability goals, as well as reducing bushfire risks and avoiding costly and ultimately inefficient mal-adaptations.

Dealing with uneven vulnerability, consequences and risks

The consequences of hazardous events are highly uneven across geographical space and urban areas. This is a function of exposure, the characteristics of hazards and the vulnerability of people and the systems they rely on. There is an ongoing need to look beyond physical aspects and to undertake fundamental actions to reduce *human* vulnerabilities. Lower resilience is strongly associated with lower socio-economic status, certain genders, cultural background, education and health.

Anticipating dilemmas of recovery and resilience

Recovery is a key part of the disaster cycle, however, it receives little attention until an event occurs. There are many opportunities to improve resilience during this phase, particularly if strong mechanisms are put in place prior to events. Unfortunately, valorous attempts to rebuild, build back better and use non-systematic thinking that reinforce risks in urban areas are often pursued.

Relying on technology and brittle systems

Urban places rely on an array of technological and infrastructure systems that have brought vast benefits to the quality of life over time. In parallel, considerable advances have been made in technological prediction, warning, communication and other systems. These systems are important, and no doubt will continue to evolve. However, it is important that we anticipate, model and fail-safe systems with redundancies and low-tech fall-backs in urban areas to maintain function.

Determining what risk is acceptable?

No urban environment is without risk. However, we have generally avoided determining the level of risk that is deemed acceptable. Without this, we cannot model and subsequently plan and design urban places that manage risk to improve the resilience of our communities.

Ecological disaster risk reduction and resilience

Dr Mark Maund

University of Newcastle

Introduction

This paper highlights an opportunity to improve our knowledge and understanding of the ecological dimensions of disaster risk reduction and resilience. It is part of a scoping process the Australian Institute for Disaster Resilience (AIDR) is undertaking to refine the focus of a future Handbook on the theme.

Ecological disaster risk reduction and resilience revolves around the idea that preserving and enhancing natural environments can provide ongoing benefits to human populations such as clean air and water, biodiversity, cultural and recreational opportunities and can enhance the disaster resilience of communities as part of a multi-disciplinary approach to disaster risk reduction (see Lowe *et al.* 2022; Martin *et al.* 2021; Rendón, Sandorf & Beaumont 2022). The United Nations (2019) states:

> *The widespread loss of biodiversity and ecosystem health is evidence of a failure to account for and manage the breadth of exposed global assets. That loss also has a major effect on risk reduction and the mitigation of environmental hazards.* (p.145).

The importance of this concept is recognised in international policies such as:

- *United Nations Convention on Biological Diversity* that recognises biological diversity is a global asset of tremendous value for present and future generations
- *Sendai Framework for Disaster Risk Reduction 2015–2030* that identifies the opportunity to build back better, including integrating disaster risk reduction into all stages of development
- *The 2030 Agenda for Sustainable Development*:
  - Goal 14: Conserve and sustainably use the oceans, seas and marine resources for sustainable development.
  - Goal 15: Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reserve land degradation and halt biodiversity loss.

This is particularly relevant with events such as the 2019–20 bushfires in Australia that were described by the Royal Commission into National Natural Disaster Arrangements as an 'ecological disaster' with '…predicted serous, long-term, adverse effects on biodiversity'. The destruction of significant habitat and loss of species during the bushfires resulted in an estimated 3 billion animals killed or displaced and tens of millions of hectares of land affected (Commonwealth of Australia 2020).

Various disciplines are involved with ecological disaster risk reduction and resilience including disaster management professionals, emergency responders, ecologists, planners, scientists and engineers. However, there is currently limited guidance on the many opportunities provided by ecological disaster risk reduction and resilience and we are seeking to fill that gap.

Benefits

While a disaster can impact on ecological systems (see Fujii *et al.* 2021), protecting and enhancing these systems can assist with reduction of risk from high-risk hazards. Multi-disciplinary benefits of a healthy ecological system are being explored as part of an ongoing commitment to improving and sharing knowledge.

The co-benefits of protecting, restoring and managing ecological functions are evident when we walk around areas that integrate ecosystems into communities and protected areas. Ecological disaster risk reduction can protect and enhance native flora and fauna and enhance where people live, work and play while assisting with disaster risk reduction (see Alexander *et al.* 2021, Hagedoorn *et al.* 2021, Kalantari *et al.* 2018, Lallemant *et al.* 2021).

There is a growing trend to incorporate nature-based solutions into environments that seeks to protect and manage ecosystems while improving

Talbaragar river crossing, Merriwa.

Image: Mark Maund

resilience. This trend is assisted by the increasing understanding of the value of ecological systems beyond biodiversity to the broader economy, people's wellbeing, culture and sense of identity (Commonwealth of Australia 2020). Scientific research has a strong focus on ecosystem management, biodiversity and innovation. However, we want to develop and understand the role that ecological disaster risk reduction can play in efforts to support resilient communities.

Current knowledge

Existing documents and guidance relating to the concept focuses on nature-based solutions (IFRC 2022, United States Army Engineer Research and Development Center 2021, World Bank Institute 2019). These documents provide useful background knowledge and ideas. AIDR is consolidating this knowledge with examples of leading contemporary practice and is seeking case studies of best practice in Australia as a basis for knowledge sharing and to draw out the principles of ecological disaster risk reduction and resilience.

How would this look?

A preliminary review of existing guidelines, policies and contemporary research revealed a series of themes. These include balancing the extent to which ecological outcomes are prioritised. Ecosystem interventions are one part of disaster risk reduction and resilience and need to be coupled with other interventions. However, ecological interventions should be integrated with sustainable development at the earliest stages and throughout the development cycle.

Co-benefits were evident in the literature where incorporating ecological outcomes provided benefits beyond disaster risk reduction. These benefits should be considered as part of the 'value' of preserving and enhancing ecological systems, such as:

- greater depth of ecosystems with improved soils, water and multi-layered ecological environments
- preserving habitat
- maintaining ecological processes
- recreation opportunities
- visual and emotional benefits for the community.

It is important to note that best outcomes are achieved by retaining ecosystem functioning rather than trying to re-establish ecosystems.

The role of the community should be promoted as many communities have a strong desire to retain and improve ecological functions. For many people, the definition of 'home' can include 'the landscape and environment, so they have a vested interest in positive outcomes (' Block *et al.* 2019, Reid & Beilin 2015). Additionally, local knowledge can significantly assist with understanding risk from high-risk hazards and how to increase resilience (Kirchhoff *et al.* 2021). The important roles of community in risk reduction is also recognised in the Sendai Framework Guiding Principle of 'Empowerment of local authorities and communities through resources, incentives and decision-making responsibilities as appropriate' (UNDRR 2015).

Other concepts have emerged from the preliminary review:

- Timing – ecological interventions can assist with all phases of the disaster management cycle.
- Goal of biodiversity/ecological outcome – need to identify the goal(s) such as biodiversity protection, improved soil or water quality, flora and fauna long-term management or a combination and these and other goals (see Burrows 2008, Driscoll *et al.* 2010).
- Monitoring – need to identify type and scale of disasters that are sought to be managed. Long-term monitoring prior to a disaster and as part of post-disaster recovery is critical for any ecological intervention (see Chng *et al.* 2022).
- Governance – creating clear governance pathways for pursuing disaster risk reduction projects was identified as a strategy in the National Disaster Risk Reduction Framework (Commonwealth of Australia 2018) and is Priority 2 of the *Sendai Framework for Disaster Risk Reduction 2015-2030* (UNDRR 2015). Governance may include how we oversee emergency management, roles and function of ecological management and integration with engineering controls.

This review is the first step in understanding the concept of ecological disaster risk reduction and opportunities to integrate ecological dimensions into developing resilient communities, land management, building and infrastructure design and land-use planning activities.

AIDR wishes to connect with and learn from subject matter experts, practitioners and stakeholders. We are seeking insights from your experience and understanding of the ecological dimensions of disaster risk reduction and resilience. Interested stakeholders can participate in a brief survey to refine the focus of a future handbook on the theme (see www.aidr.org.au/news/ecological-disaster-risk-reduction-and-resilience-scoping-survey). The survey allows involvement to improve and share knowledge in Ecological Disaster Risk Reduction and Resilience. Additionally, any best practice case studies can be sent to enquiries@aidr.org.au.

About the author

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Mainstreaming disaster risk reduction using the plastic brains of 10-year-olds

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Abstract

A Year 5 student at the time of the floods in the Hunter Valley, NSW, in 2007 would now be 25 years old. When Cyclone Yasi devasted central Queensland in 2011, Year 5 students then are now 21 years old. Year 5 students at the time of the 2013 bushfires in NSW are now 19. This paper proposes that engaging with children about natural hazard risk around them presents opportunities to mainstream disaster risk reduction.

Introduction

Emergency services and other organisations work diligently to refine programs and resources that focus on influencing adult behaviour around appreciating natural hazard risks and providing capabilities to do something about it. As emergency services agencies grapple with implementing recommendations from inquiries following the 2019–20 Australian summer bushfires, you could be forgiven for thinking that disaster risk management and resilience building is by adults for adults alone. This is not so. Children and youth need to be involved in all aspects of learning about and understanding natural hazards and disaster risks. Children and youth are not passive recipients of adult direction when exposed to natural hazards events.

Have you ever paused to think about how different communities would be if more time was spent influencing 10-year-olds about natural hazards and risk and supporting them to live safely in their local environmental context?

The brain of a 10-year-old is highly plastic and can easily develop new neural pathways, unlearn unhelpful pathways and prioritise neural networks that are helpful. By the time the brain fully matures at age 25, we continue to learn throughout life but not in the same way the 'adaptive neural sponge' of a 10-year-old does. Their brains geared for learning and their influence on adults and their choices and behaviours in situations including bushfire preparation is much more than we often credit. The 2020 report, *Children and Young People's Experience of Disaster*[1] says:

> *We all say that children and young people are resilient and our future leaders, but this report demonstrates that they are leaders now, and that they have strong thoughts and feelings about how they can support and guide us through disasters.*

There is a tremendous opportunity to mainstream disaster risk reduction through genuine participation and involvement of children in matters that affect them and classrooms are the ideal place to do that. This article describes just one approach to do this: through teacher and student collaborations with volunteer firefighter 'expert partners'. The principles of this approach are adaptable and transferable to any hazard setting.

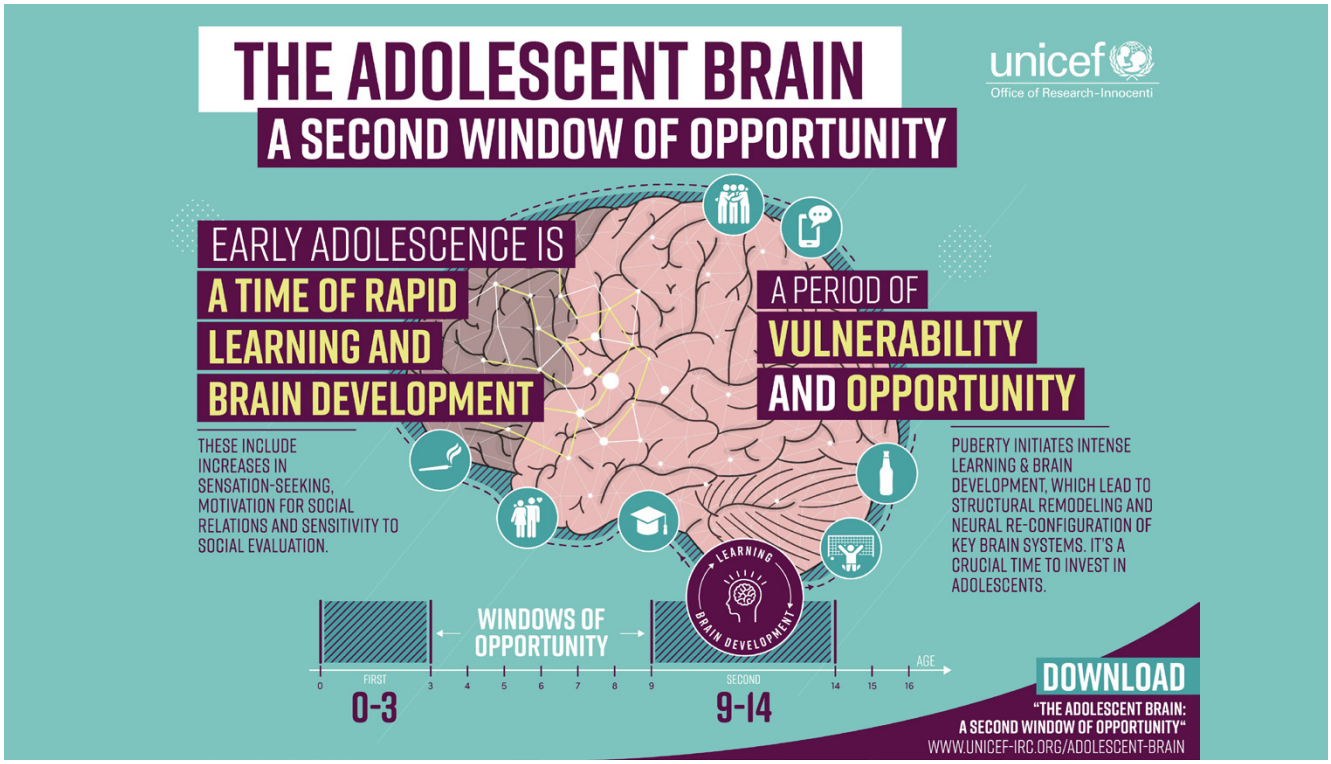
Resilience education

The *Sendai Framework for Disaster Risk Reduction 2015–2030*[2] states that disaster risk reduction is:

> *…the concept and practice of reducing disaster risks through systematic efforts to analyse and manage the causal factors of disasters, including through reduced exposure to hazards, lessened vulnerability of people and property, wise management of land and the environment, and improved preparedness for adverse events.*

The Sendai Framework also states that:

> *…children and youth are agents of change and should be given the space and modalities to contribute to disaster risk reduction, in accordance with legislation, national practice and educational curricula.*[2]



The brain of a 10-year-old is highly plastic and can easily develop new neural pathways, unlearn unhelpful pathways and prioritise neural networks that are helpful.

Image: UNICEF Office of Research-Innicenti, at www.unicef-irc.org/article/1750-the-adolescent-brain-a-second-window-of-opportunity.html.

Disaster resilience education can build student understanding of the hazards and provide knowledge and skills to enable them to contribute to planning, preparation, response and recovery.[3] Emergency management organisations, including the NSW Rural Fire Service (NSW RFS), build programs to foster disaster-resilient populations that are able to recognise current and future risk, reduce and manage those risks and be better able to recover from disasters.[4]

Both the Australian Curriculum and NSW Geography Syllabus K-12 provide the mechanisms for young people to learn about the concepts of disaster risk reduction. Both documents are under review during 2020–21 but currently include hazard and risk components that increase preparedness of learners and can positively affect entire communities. Using critical and creative thinking through geography, students explain and understand the complex world in which they live.

Irrespective of their proximity of their school to a bushfire hazard, around 60,000 NSW students each year across more than 1,500 primary schools study the real-world problem of how bushfire affects people, places and the environment. This presents a unique opportunity for fire experts to work with educators and young students on authentic and local problem-based and inquiry-learning activities.

Natural hazard programs and resources complete with lesson plans and outlines have a long history of being developed by agencies, many without educator input and certainly without input from young people. It is time to leave those programs and resources on the shelf and foster environments of collaborative learning with educational leaders, teachers and their students. This will deliver important expert support and advice as needed in the context of specific local hazards, problems and issues.

Firefighters contributing to student learning

Educating students about hazards and risks can be challenging for teachers, particularly after major events such as the 2019–20 summer bushfires or, more recently, floods in NSW and Queensland. For some children, these events will be traumatic and the expertise of class teachers to support student wellbeing is essential. While some teachers think that educating children about hazards and risk will cause harm, this is unlikely to be the case. Educating children about hazards and disaster risks, and what can be done to manage them, contributes to children's capability to deal with these events in the future.

Contemporary issues about bushfires can be catalysts for valuable teaching and learning in years 5 and 6 (Stage 3) where students focus on real-life and authentic local problems related to bushfire.[5] Examples are the widespread effects of the 2019–20 summer bushfires, the recovery of individuals and communities, environmental damage or the influence of climate change on the frequency and severity of bushfires (and other hazards) across the country.

Firefighters are most effective when they spend more time either in conversation with the school leadership and teachers or in classrooms.

Image: Warrimoo Public School

Teachers can work with expert partners such as volunteer firefighters for the purpose of aiding and enhancing student learning. With a sophisticated understanding of how students in years 5 and 6 learn, firefighter experts can make an important contribution to young people's knowledge and understanding of bushfires that will stand them in good stead as they become adults of the future.

How a school addresses the curriculum and syllabus requirements for the years 5 and 6 bushfire unit of study will vary from place to place. Whether for reasons of school interests or foci, teacher confidence, understanding of natural hazards or the local context, any support to be provided by agencies must respect those reasons or circumstances. Teachers own their classroom. Teachers know their students' needs and talents.

My experience as an 'expert partner' tells me that there are common characteristics of substantial and successful collaborations that deliver enhanced educational and disaster resilience outcomes for students. These include:

- collaborating with school leadership and classroom teachers when the bushfire unit of study is being planned to set the driving inquiry questions and explore classroom and student resources
- delivering an overview or introductory session about natural hazards, risk and bushfire at the start of the unit to set the scene and provide context for deeper learning
- interacting with every student and student groups at a point during the unit when they are working on projects; feedback, support and advice from experts is critical as the local problems are being researched and solutions developed
- joining with peers, families and the school community at the end of the unit when the years 5 and 6 students showcase their projects and their learnings to develop positive connections with schools, families and the community and support students to thrive.

I advocate that all volunteer firefighters go beyond just turning up at a school with a standard hour-long presentation and providing entertainment to students via the fire truck and playing with hoses. The expert partner approach outlined here relies on spending more time either in conversation with the school leadership and teachers or in classrooms. This approach is led by teacher practice and student needs rather than agency programs or documentation. This pathway to more informed, useful and valuable engagement and starts with asking teachers and students: How can I help with learning about natural hazards and risks?

Practice-based evidence

Before retirement in July 2020, I was in the Community Engagement team at NSW Rural Fire Service where I had responsibility for developing the Project Firestorm resource as one aspect of my focus on children and young people. I am a volunteer firefighter at Hazelbrook Brigade in the Blue Mountains of NSW, having been so since 1980. Over 40 years, I have been an accidental 'expert partner' at schools on numerous occasions. I expect many volunteers in agencies and organisations have asked: Did my time spent doing this, with them, make any difference at all?

This has been the catalyst for me as I commence data collection as part of a PhD through Central Queensland University. This research, titled, 'Agency expert partners supporting bushfire

disaster resilience education for Primary School students: A case study in New South Wales, Australia', will investigate and understand further the contribution that volunteers have and their impact on students' understanding and interest in bushfire risk through the Stage 3 bushfire unit of study.

Leading educational practice for Stage 3 sets out a key inquiry question to drive the inquiry-based geography activity. With authentic local problems to consider, students have the incentive to develop workable solutions that can contribute to their own safety and that of their families and local communities. Bringing in volunteer firefighter experts to the classroom with local field experience can enrich student learning with authentic guidance on those real-world problems.

Two case schools were chosen to study that had a history of successful collaborations with the NSW Rural Fire Service about bushfire safety across years K-6, and particularly with Stage 3. In both schools, local volunteer firefighters have been invited into classrooms as authentic expert partners to support teacher-led student learning. They delivered syllabus and disaster resilience education outcomes by sharing personal stories, physical and emotional experiences as well as providing information, facts and data via geographical tools. This guided students to examine problems as well as reflect on and refine solutions.

Two schools were included in the study that had invited local volunteer firefighters into classrooms as authentic expert partners to support teacher-led student learning.

Image: NSW Rural Fire Service

This research will collect data from first-hand sources of teachers, students, NSW RFS experts and parents and carers using semi-structured interviews, classroom observations and focus groups. Research participants are expected to be 8 classroom teachers, 40 Year 5 and Year 6 students, 5 NSW RFS volunteer firefighters and 15 parents and carers.

Gaps in practice evidence

There is limited published research on the application of inquiry-learning approaches such as in Stage 3 Geography in the context of teacher-led, curriculum connected, classroom-based resilience education. The extent to which fire agency experts participate as expert partners in the classroom and influence student learning outcomes is not measured and there is little to no understanding of the enablers and barriers to consistent, sustained and quality support from those experts. This research will address these knowledge gaps and will add to the body of knowledge where disaster resilience education and education practice converge. This work will show how experts support effective education outcomes that increases resilience of students and reduces current and future disaster risk.

Most interest in the new knowledge is expected from emergency services organisation, teachers and students. For emergency services organisation, that knowledge will relate to skills and capability development for expert partners supporting classroom teachers. For teachers, the contribution that experts can offer in the classroom will be clearer and particularly directed to the bushfire mitigation unit in Stage 3 Geography. For students, the value of collaboration with firefighter experts will be explained, as will the process for sharing knowledge. Such guidance and considered advice about bushfire will make a difference to young people in their local setting.

Conclusion

Building confidence about natural hazards and risks in teachers and students is extremely important for all communities. Rather than taking an agency-centric program development approach, I advocate for a collaborative and sharing approach that recognises both the variety of teaching methods and local contexts of natural hazard risk. This study will gather the evidence about the contributions firefighters make when it comes to resilience education and the best practices that are being applied to support teachers and students.

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Using heat refuges in heatwave emergencies

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Abstract

In Australia, heatwaves are more deadly than any other natural hazard and predicted to increase in frequency and intensity as a result of climate change. Heatwaves are directly connected to human health through heat-related illnesses such as heat exhaustion and heat stroke. Vulnerable people, particularly those without effective cooling in their homes, are at high risk of illness or death during heatwaves. Heat refuges—typically air-conditioned or cooled buildings that have been designated as a site to provide respite and safety during extreme heat—are commonly used in the Northern Hemisphere for vulnerable people during heatwaves but are less prevalent in Australia. In Australia, heat refuges tend to be managed by local councils as part of local planned climate adaptation measures. This article discusses the development of a heat refuge strategy in Blacktown City Local Government Area in western Sydney. Blacktown City has higher summer average temperatures than coastal Sydney, caused by its local geography and urban heat island effects that limit the inflow of cooler coastal winds. The draft Blacktown City heat refuge strategy is based on some of the key components of disaster risk reduction including risk assessment, early warning systems, emergency management planning, evacuation centres and community participation.

Introduction

At the global scale, the number of hot days and nights has increased since the 1950s, while cold days and nights have decreased (Seneviratne *et al.* 2012). According to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC), this trend will continue 'until at least the mid-century under all emissions scenarios considered' (IPCC 2021). Many changes in the climate system become larger in direct relation to increasing global warming. They include increases in the frequency and intensity of hot extremes and heatwaves (IPCC 2021).

There is no universal definition of a 'heatwave'. For example, the World Meteorological Organization (2018) defines heatwave as:

> *A period of marked unusual hot weather (maximum, minimum and daily average temperature) over a region persisting at least three consecutive days during the warm period of the year based on local (station-based) climatological conditions, with thermal conditions recorded above given thresholds.*

In contrast, in Australia, a heatwave is defined as 'three or more days in a row when both daytime and night-time temperatures are unusually high in relation to the local long-term climate and the recent past' (Bureau of Meteorology 2021a). In common is that a heatwave is an unusual period of extended hot weather.

Heatwaves in Australia have intensified in the recent past and are projected to increase faster in the future. According to Trancoso and co-authors (2020), 'Heatwaves have increased in intensity, frequency and duration across Australia over the past 67 years, such intensification was particularly higher in recent decades.' Heatwaves may be 85% more frequent in Australia and may last up to one month if global warming increases from 1.5 to 2.0°C (Trancoso *et al.* 2020).

Heatwaves are directly connected to human health through heat-related illnesses (e.g. heat exhaustion,

heat syncope and heat stroke) and death, with people's risk highly dependent on their exposure, location and susceptibility. Physiological factors (e.g. age, gender, pre-existing illness and medication or drug use) and behavioural or contextual factors (e.g. employment, activity, clothing, income and housing type) are determinants for heat-related illness and death (Ebi *et al.* 2021).

Heatwaves are by far the most lethal extreme weather risk in Australia. Since 1890, heatwaves have killed more people in Australia than bushfires, cyclones, earthquakes, floods, and severe storms combined (Deloitte 2017). In Victoria, in early 2009, the heatwave that preceded the Black Saturday bushfires resulted in 374 more deaths than would otherwise be expected (excess deaths), while 173 people perished in the fires themselves (State of Victoria 2009). According to Longden and co-authors (2020):

> *National mortality records in Australia suggest substantial under-reporting of heat-related mortality. Less than 0·1% of 1·7 million deaths between 2006 and 2017 were attributed directly or indirectly to excessive natural heat. However, recent research indicates that official records underestimate the association at least 50-fold.*

Reducing risks to health from current and projected heatwaves depends on physiological acclimatisation and also on planned adaptation by public health officials in concert with partners in other sectors (Ebi *et al.* 2021). This article discusses the development of a heat refuge strategy as part of planned climate adaptation by Blacktown City Council.

Heat refuges

Public heat refuges are provided by governments and other organisations in countries around the world. For example, in the USA, heat refuges are called 'cooling centers' or 'cooling shelters'. They are defined by Widerynski and co-authors (2017) as a:

> *…location, typically an air-conditioned or cooled building that has been designated as a site to provide respite and safety during extreme heat. This may be a government-owned building such as a library or school, an existing community center, religious center, recreation center or a private business such as a coffee shop, shopping mall, or movie theatre.*

Although heat refuges are widely used in Northern Hemisphere countries, they are less prevalent in Australia. This could be because of the relative homogeneous wealth (and therefore perceived universal access to air conditioning and other effective cooling) and consistent hot summer days (compared with more dramatic temperature changes leading to Northern Hemisphere heatwaves). Heat refuges are not included in Australian state and territory heatwave emergency management plans, although the Victorian State Emergency Response Plan Extreme Heat Sub-Plan (Victorian Government 2017) mentions the option for local councils to prepare 'cool public environments'.

In Australia, heat refuges tend to be managed by local councils as part of local planned heatwave adaptation measures. In Victoria, state government heatwave guidelines for local councils (Victorian Department of Human Services 2009) have been developed and include:

- identify and promote safe, public places during heatwaves that are air-conditioned, such as libraries or movie theatres
- establish cooling centres in air-conditioned council buildings or use mobile air conditioning units.

Some local councils provide heat refuges by extending the opening hours of their air-conditioned facilities including libraries and providing free shuttle buses to and from local swimming pools.

However, heat refuges can be viewed as a 'maladaptation'. Maladaptation is the concept of a treatment or adaptation becoming more harmful then helpful (Juhola *et al.* 2016). While air conditioners used in heat refuges may provide immediate health benefits, they also contribute to greenhouse gas emissions if they are using fossil fuels to provide the cooling. However, this perception will become less valid as Australia increases its uptake of renewable energy (Clean Energy Council 2021).

Although not greatly used throughout Australia, there is a strong case for the use of heat refuges during heatwave emergencies particularly in areas that experience marked urban heat island effects (i.e. the large cities) and those that have significant vulnerable populations.

Heatwaves in Blacktown City

Blacktown City is located in north-west Sydney and is home to approximately 403,000 people. It is a city of diverse cultures and represents around 188 birthplaces and 182 different languages (Blacktown City Council 2021).

Western Sydney, including Blacktown City, has higher summer average temperatures than coastal Sydney. This is caused by local geography and urban heat island effects that limit the inflow of cooler coastal winds (NSW Office of Environment and Heritage 2019). The temperature difference between western and coastal Sydney has been increasing over the past several decades and is projected to increase under climate change (NSW Office of Environment and Heritage 2019). Blacktown City is expected to experience an additional 5 to 10 extremely hot days (over 35°C) per year by 2030 (NSW Office of Environment and Heritage 2019).

At the same time, its population is growing rapidly, meaning more people are exposed to heatwave risks. In addition, Blacktown City has a relatively large proportion of vulnerable people compared with other NSW local government areas (Australian Bureau of Statistics 2016). Vulnerable groups include:

- the elderly
- those with underlying chronic health issues
- people with disability
- those with addiction issues
- people experiencing homelessness
- Aboriginal and Torres Strait Islander peoples
- people from culturally and linguistically diverse (CALD) backgrounds.

For these groups, access to effective cooling can be difficult during heatwaves in western Sydney. There is also a high correlation between low socio-economic status and not having air conditioning or other suitable cooling devices (e.g. fans) in homes. Of particular concern are renters and people in social housing (Zografos *et al.* 2016).

The Western Sydney Regional Organisation of Councils (WSROC), of which Blacktown City Council is a member, developed the Western Sydney Turn Down the Heat Strategy in 2018 (WSROC 2018). This was developed to increase awareness and facilitate a coordinated response to the diverse challenges of urban heat in western Sydney.

The Turn Down the Heat Strategy aims to:

- identify and leverage existing best practice to develop a program of effective actions at the household, precinct and regional levels
- acknowledge the limitations of the current policy framework with regard to urban heat to galvanise action across diverse stakeholders
- propose a series of priority actions for development with a broader stakeholder group.

Action 11 in the strategy involves a 'preventative heat response framework that focuses on protecting the vulnerable and connecting communities' of which a network of heat refuges could be a part.

The Western Sydney Turn Down the Heat Strategy (2018) increased awareness and facilitated a coordinated response to urban heat.

Developing the heat refuge strategy

In February 2020, Blacktown City Council declared 'we are in a state of climate emergency requiring immediate action by all levels of government' (Blacktown City Council 2020). Council identified the use of heat refuges as part of its climate change policy. It developed and is implementing its Responding to Climate Change Policy (Blacktown City Council 2018) that includes a suite of planned climate adaptation measures. Commitment 3 in the policy is: 'Assist our community to reduce greenhouse gas emissions and build resilience to climate change'. Action 3d in the accompanying strategy is: 'Develop a strategy for enabling Council-owned public amenities to provide refuges from extreme heat for vulnerable residents'.

In 2019, Blacktown City Council engaged consultants Molino Stewart Pty Ltd to develop a heat refuge strategy for the city. The draft strategy reflects 5 components of disaster risk reduction as advocated by the *Sendai Framework for Disaster Risk Reduction 2015–2030* (United Nations 2015) and Australia's *National Disaster Risk Reduction Framework* (Australian Government 2018). The 5 components are:

- risk assessment
- early warning systems
- emergency management planning
- evacuation centres
- community participation.

Risk assessment

A risk analysis was conducted to identify the parts of Blacktown City with the most vulnerable populations to heatwave and those that may not have access to air conditioning. This analysis identified high-risk parts of Blacktown City to which the establishment of heat refuges should be prioritised.

The NSW Heat Vulnerability Index (HVI) dataset (NSW Department of Planning, Industry and Environment 2016) identified areas to monitor where populations in the Sydney Greater Metropolitan Area are more vulnerable to the adverse effects of urban heat (as at summer 2015–16). The HVI uses indicators for exposure, sensitivity and adaptive capacity to calculate an overall heat vulnerability index.

In the risk assessment, the following demographic attributes were added to the existing HVI social vulnerability indicators relating to population density, the elderly, the very young and persons needing care:

- Socio-economic disadvantage. There is a high correlation between the lack of effective cooling in homes and low socio-economic status.
- People not fluent in English. One of the vulnerable groups is people from CALD communities as they may have low socio-economic status and new arrivals may not have developed social support networks.
- Aboriginal and Torres Islander peoples are potentially vulnerable with some having low socio-economic status.
- Households without a car could face barriers to accessing existing cool places.
- Families with one parent. This may inhibit children accessing cooling as the parent may be working, and also, they may reflect low-socio-economic status.

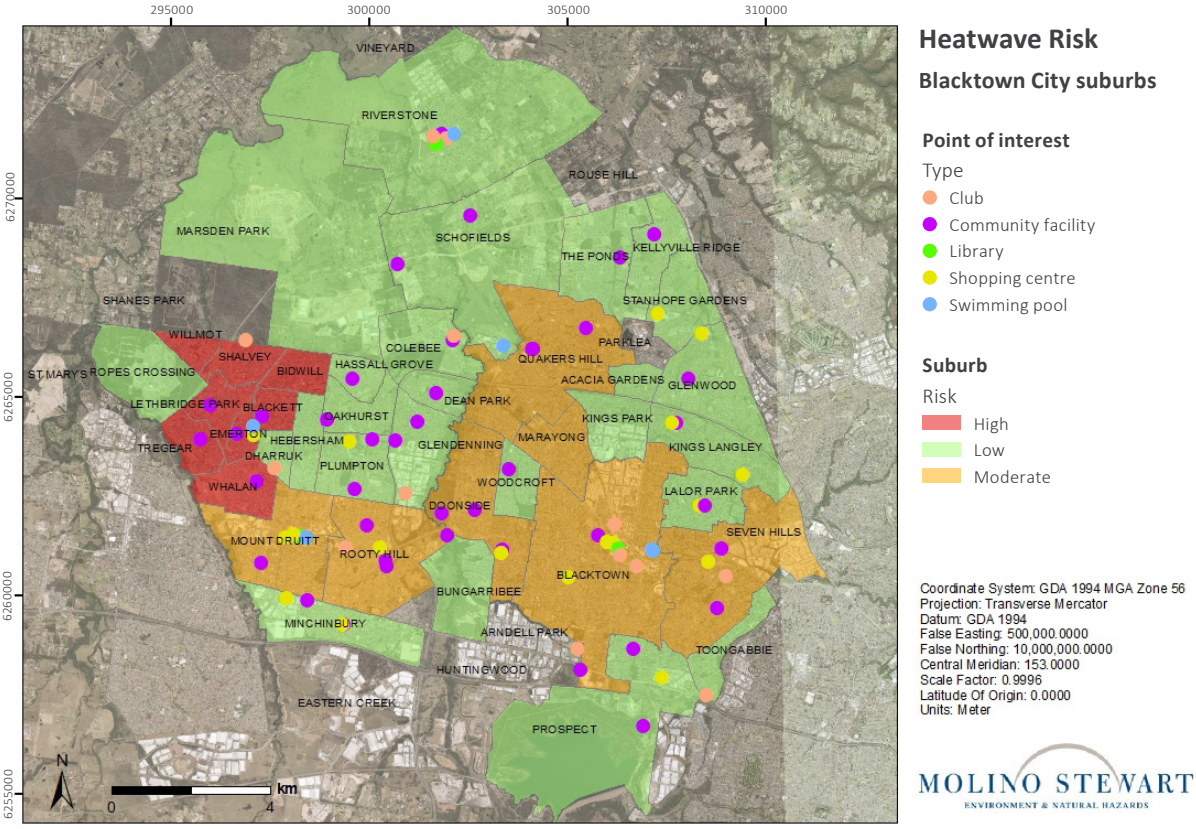

Figure 1: Map of Blacktown City showing the risk of people not being able to access home cooling.

- Single, older people (over 65 years) may be highly vulnerable due to mobility issues and possible lack of social networks.

As a result of the analysis, Figure 1 shows the high-risk areas (vulnerable populations with potential limited access to effective cooling in heatwaves) in Blacktown City. The high-risk areas are located in the western part of Blacktown City and include the suburbs of Lethbridge Park, Whalan, Bidwill, Willmot, Shalvey, Tregear, Emerton and Blackett. The risk trend shown in Figure 1 is further exacerbated by the average gradation of heat from cooler in the east to hotter in the west (Western Sydney University 2020).

Potential heat refuges such as libraries, swimming pools, community facilities, shopping centres and clubs are also shown in Figure 1. The map shows that the main potential heat refuges within the high-risk areas were community facilities such as community halls and hubs.

Early warning systems

Critical to the activation of heat refuges is an early warning system that provides advice regarding impending heatwaves. The Australian Bureau of Meteorology provides heatwave forecasts for a region 3 days prior to the possible heatwave. Heatwaves are classified into 3 types, based on intensity:

- Low-intensity heatwaves are more frequent during summer. Most people can cope during these heatwaves.
- Severe heatwaves are less frequent and are likely to be more challenging for vulnerable people such as the elderly, particularly those with medical conditions.
- Extreme heatwaves are rare. They are a problem for people who do not take precautions to keep cool; even for people who are healthy. People who work or exercise outdoors are at greater risk of being affected.

The Bureau of Meteorology heatwave service provides assessments that identify heatwaves in the preceding days and heatwave forecasts that predict those about to occur. The heatwave assessment consists of 2 maps (see Figure 2) for the 2 previous 3-day periods. Each map shows the location of heatwave conditions and the level of intensity.

For Blacktown City, the forecast of 'severe' and 'extreme' heatwaves will trigger activation of the emergency management arrangements related to the Blacktown City heat refuge strategy. An indication of impending heatwave is provided through 7-day forecasts for western Sydney (Penrith) issued by the Bureau of Meteorology.

Emergency management planning

The NSW Government recognises heatwave as part of its emergency management planning. The State Heatwave Subplan (NSW Government 2018) is a subplan of the NSW State Emergency Management Plan. The State Heatwave Subplan details 'the control and coordination arrangements for aspects of

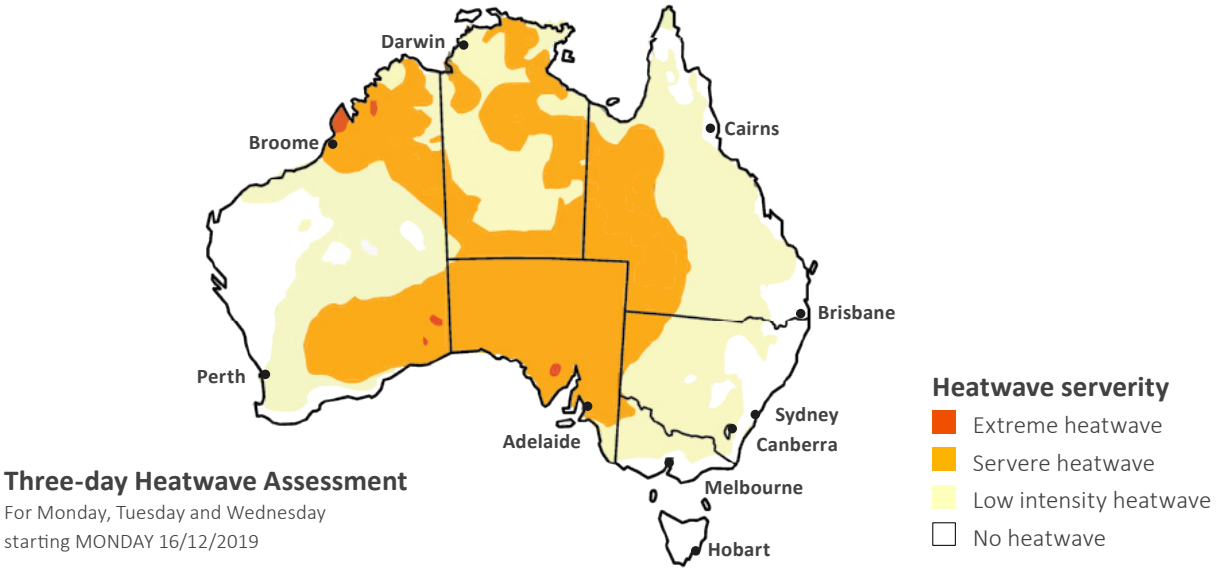

Figure 2: Example of a heatwave-assessment map and text.

Source: Bureau of Meteorology (2021b)

the preparation for, response to and immediate recovery from a heatwave'.

The subplan primarily provides warnings to heatwave-affected communities and educational advice for people to respond to heatwave emergencies. It does not identify nor organise heat refuges as part of the NSW heatwave response and, therefore, the use of heat refuges in heatwave emergencies is primarily managed by local councils.

An emergency management plan was developed as part of the draft Blacktown City heat refuge strategy to cover actions required in the prevention and mitigation, preparedness, response and recovery phases as per the principles of ISO 22320 and the guidance in the Australian Emergency Management Arrangements Handbook (Australian Institute for Disaster Resilience 2019). It is hoped that this emergency management plan is included in the City of Blacktown Local Disaster Plan.

Evacuation centres

Heat refuges are essentially evacuation centres to provide respite for people from the effects of extreme and prolonged heat, particularly in their homes. There are 4 components required in a heat refuge service (Widerynski *et al.* 2017):

- refuges are cool, safe, accessible places
- transport from either home or a designated pick-up location is offered
- volunteers are trained to assist in refuges and can identify heat-related health issues
- promotion and advertising of the heat refuge service is conducted prior to and during heatwaves.

The following guidelines were used to identify potential heat refuges in Blacktown City. Heat refuges (other than swimming pools) must have the following attributes:

- air-conditioning
- capacity – venues must have reasonable capacity (e.g. greater than 20 persons) to be worthwhile opening
- seating – must have seating for each person as many will be older and/or disabled
- accessibility – most refuges should be in or near high-risk or moderate risk areas of Blacktown City (see Figure 1) to enable short transport or even in walking distance
- opening hours – should at least be 9am-5pm
- toilets – should be male, female, non-gender and disabled toilets commensurate with the maximum people capacity
- drinking water – should be available and a refrigerator should be available to keep water cool
- facilities for people with disabilities – should be available including wheelchair access ramps, disabled toilets
- drop-off ease – venues should have drop-off zones close to the venue entrance
- COVID-19 plan – venues should have a plan in place and comply with the current COVID-19 restrictions issued by NSW Health.

If possible, heat refuges should:

- be located in high and moderate risk areas
- have activities available (e.g. watch television)
- be housed in a separate room (e.g. in clubs)
- have food available or close by.

A gap analysis was conducted for each type of potential heat refuge identified. The following venues offered the most promise for heat refuges in Blacktown City:

- libraries (council-managed, have all required facilities, are located near high-risk areas)
- community centres and halls (council-managed, some in high and moderate risk areas)
- clubs (have all facilities, some have transport, are located in high and moderate risk areas).

Heat refuges were only assessed for extended day use. However, during a heatwave there is little respite for Blacktown City residents at night if they do not have air-conditioning or other effective cooling devices (Bureau of Meteorology and CSIRO 2018). Overnight heat refuges face several other issues including security, willingness of volunteers to assist, venue insurance and sleeping arrangements. Currently, the Blacktown City strategy only covers heat refuges for extended day use (e.g. 6am-8pm).

The Cool Centre (heat refuge) trial at Tregear Community Centre.

Image: Kelsey Sanborn

Community participation

As shown by overseas research (e.g. Widerynski *et al.* 2017), the heat refuge service will be limited and possibly not effective if it is totally reliant on local government facilities and resources. Thus, there is a need to involve local community service providers and access the social capital (social networks and trust) they possess.

In the drafting of the Blacktown City heat strategy, 36 community service providers that were related to vulnerable groups or could provide heat refuge and transport services were interviewed. These community service providers included:

- local community clubs
- places of worship
- disability services providers
- multicultural services providers
- WSROC
- Western Sydney Local Health District
- seniors' services organisations
- humanitarian organisations (e.g. Red Cross, Vinnies)
- NSW Police.

The interviews confirmed strong support for the heat refuge concept and several opportunities for heat refuges, transport services and volunteers were identified. The implementation of the Blacktown City heat refuge strategy will rely on the collaboration of the council and the range of community service providers.

Conclusion

The Blacktown City heat refuge strategy is based on the same emergency management principles as other natural hazards such as floods, bushfires and cyclones. The cumulative effects of multiple-hazard events should be acknowledged in local emergency management planning noting that during heatwaves other events could be prevalent such as bushfires and drought. The ongoing consequences of future pandemic restrictions are also recognised in the heat refuge strategy.

The conceptual framework for the strategy is transferable to other local government areas, particularly those with significant proportions of vulnerable people that may not have access to air conditioning and other forms of cooling.

Practical aspects of the strategy were trialled during the 2021–22 summer and the strategy was finalised based on evaluation of these trials. It is envisaged that the strategy will be refined from learnings identified after each heatwave event.

Acknowledgments

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Remotely mapping fires

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Introduction

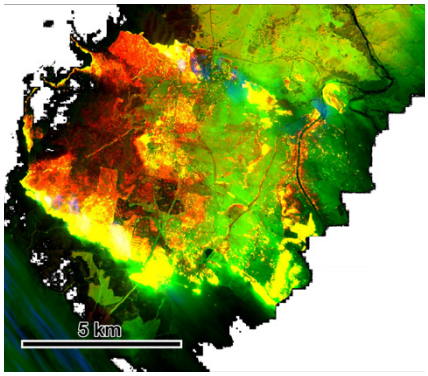
There is a range of remote sensing technology that can be applied to the task of fire mapping. As identified by the Royal Commission into National Natural Disaster Arrangements in Australia in 2020, 'There is widespread support for further investigation, improvement and more cost-effective collection of fuel data using remote sensing and satellite technology' (Commonwealth of Australia 2020, Section 17.10). There is a lot of effort underway to achieve that goal. This paper reviews fire mapping and the potential solutions with the aim to identify ways to improve public safety and fire crew safety. It aims to explain the benefits that may be pursued in the coming years by demonstrating clear examples. It is hoped that improvement can be made before the next serious fire season arrives. Recent events in Canada came only 3 years after their last serious fire season and 4 years since, what was until recently, the worst fire season on record. The catastrophic bushfire events during the eastern Australian bushfire season in 2019–20 are the new record holder by a large margin. The accelerating pace of climate change will affect bushfire frequency and severity and requires that we need to hasten towards better goals.

The task

To define the task, we must start by considering the 2 forms of fire behaviour–steady-state and dynamic. Steady-state fire spread covers the majority of fire events and, because of the training and skills of firefighters, produces a minority of the damage. In risk terms, the likelihood is elevated, but the consequences are minimised, so the residual risk is typically 'High' or 'Very High' during the fire season. Dynamic fire spread has, until recently, been unusual but has caused a large and rapidly increasing proportion of the damage in areas of eastern and south-western Australia. In risk terms, the likelihood is rare (but increasing) and the consequences can be catastrophic. Thus, in the spring of 2019, the risk in many areas of Australia was assessed as 'Extreme', although in other years it is 'High'.

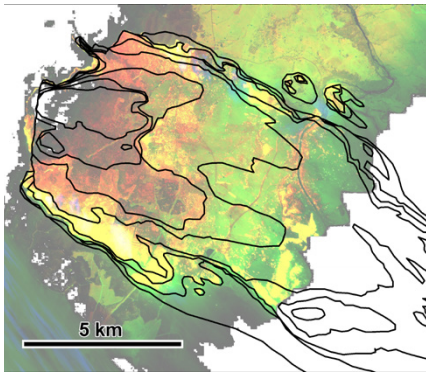
Steady-state fire spread experience is what the majority of careers in bushfire management have been based on. For example, if you know the terrain, the fuel and the weather, then you can know what a fire would be doing. There are some well-known exceptions to this rule, such as during the growth phase of a fire or during wind direction fluctuations, but it is the core of firefighting and prescribed burn planning. It is also the basis of predictive tools such as Phoenix, Aurora and Prometheus. However, as it is critical to understand the difference between the 2 types of fire behaviour (shown in Figure 1) to assess safety or containment options. It is vital that the correct one is selected. This also highlights the requirement for firefighters to have the suitable skill levels to interpret remotely sensed products. This is beneficial for the firefighter as well as the fire services.

The goal of fire mapping is to plot where a fire has reached at a specified time to match against predictions. If predictions are validated, then mapping generated further into the future increases in credibility.



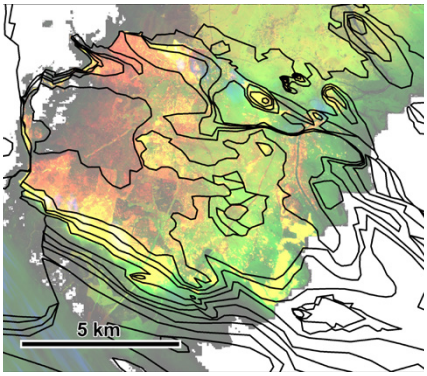
Multispectral linescan from 15:37. Compare the yellow (flaming) geometry to that in Figures 2 and 3.

Image: NSWRFS



Interpretation of the linescan using steady-state spread concepts. Isochrone intervals are variable.

Isochrones: ACT Coroner's Office, by Phil Cheney



Interpretation of the linescan using dynamic-spread concepts. Isochrone intervals are 10 minutes.

Isochrones: ACT ESA, by Rick McRae

Figure 1: Analyses of McIntyres Hut fire on the afternoon of 18 January 2003.

Fire mapping methods

Edge mapping

In its most basic form, edge mapping addresses tactical questions like 'has it crossed the creek yet?' An example is shown in Figure 2. A set of grid references are the next more complex form, and these can be provided on a schedule. The fire perimeter can be plotted to a set level of accuracy and precision and can include spot fires.

Remote sensing

Remote sensing technology is important here. Aircraft can be used. Air observers are trained to plot fire edges and can relay safety messages directly to ground crews nearby. Increasingly, visual and infrared sensors are combined to generate maps. There are 2 modes of this. For the first, a flight path is flown and a map image produced under that path using the appropriate bands and a fire-edge map is made from that image. These images are called 'linescans' (Figure 3) as they are produced by the sensors scanning across the aircraft's line of passage. In Figure 3, the active fire line is shown as yellow stripes.

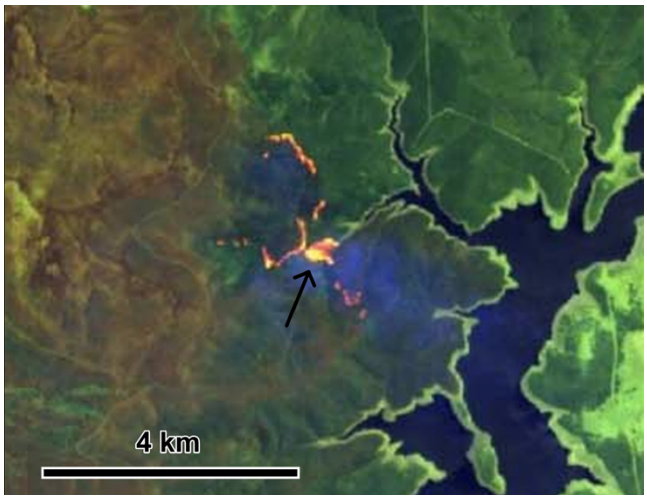


Figure 2: Sentinel 2 image showing that a fire has crossed a watercourse and is joining up with fire on the next ridge. If the latency is low enough (which it was not in this instance), then this is a powerful tool for fire crew safety.

Image: Sentinel Hub

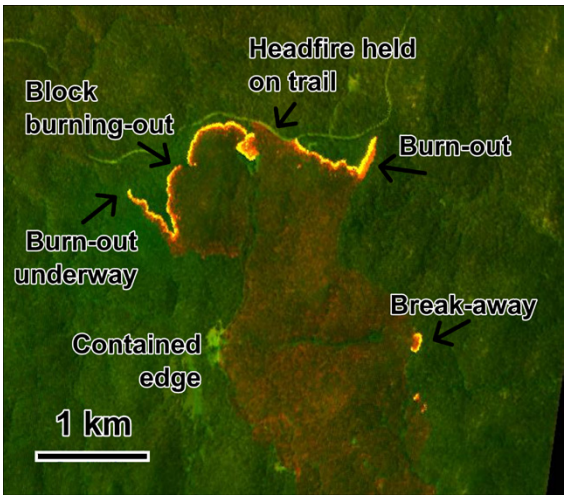


Figure 3: Broken Cart fire, NSW on 17 January 2003.

Image: NSWRFS

A newer mode of mapping uses continuous scanning of the area (through the dynamics of the flight path and sensor targeting) to produce a value-added video feed (e.g. Figure 4) back to the incident management team, while referencing the video to the aircraft's position and orientation to allow identification of significant image elements on the terrain surface.

Both linescanning and video scanning modes allow for repeat mapping. Both are sensitive to aircraft availability and to processing latency (the time between fly-over and data being made available to decision-makers), which is generally quite short. In complex fire situations, the task must reflect the aircraft's flight altitude options and cruise speeds while operating.

Figure 4: A live video feed from FB100 to the control centre showing active fire.

Dynamic fire behaviour reflects localised feedback that can change due to weather, terrain and the fire. These can, and often do, lead to rapid changes in fire behaviour and rapid decay of the safety of anyone nearby. The fire couples with the atmosphere overhead. Predicting this activity requires understanding of the terrain (in detail), fuel, weather, atmospheric profile above the fire and the fire itself.

A common feature of blow-up fire events is deep flaming. If the flaming zone is no longer a fire line but begins to occupy large tracts of the landscape at one time (see Figure 5), then the coupling is very efficient. There are 7 key mechanisms known to produce this.

The goal for using remote sensing is in 3 parts. Firstly, in predictive mode, we need to know if the fire can enter critical parts of the terrain at times of atmospheric instability. This can be similar to a steady-state mapping task. Secondly, if it has been predicted that precursor events might occur at a certain time and place, then the extent of those precursor events needs to be mapped. Basically, it is confirmation that the fire is entering a dangerous location at a critical time. This is not a task to be done from the fire ground. Finally, there can be instances when a prediction is not feasible. For example, some of the largest

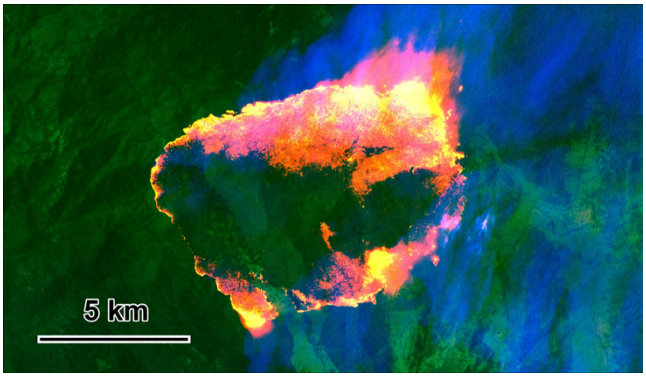


Figure 5: Heat generating areas (yellow and orange) of Orroral Valley fire, ACT, 28 January 2020.

Image: NSWRFS

blow-up fire events have arisen from the use of drip-torches as specified in an Incident Action Plan.

The remote sensing technology might detect the onset of an unpredicted blow-up event. Getting a safety message out as fast as possible is critical. Having an air observer on board, or a skilled intelligence officer in the processing stream is essential, allowing rapid evaluation and confirmation.

It is also possible to use airborne Light Detection and Ranging (LiDAR) technology to map vegetation along the aircraft's flightpath. Data about unburnt vegetation can be used to assess fuel loads or fuel hazard scores ahead of a fire. Data about burnt vegetation (such as tree canopy removal) can be used to validate ideas about fire behaviour and to guide post-fire damage assessment crews. As vegetation recovers from a previous fire, its potential for carrying fire changes in complex ways. LiDAR offers a way to assess this dynamic (Figure 6) especially in remote areas.

> *Remote sensing and other satellite capabilities have proven valuable for states and territories to capture nuanced fuel data and aid in fuel management planning and evaluation* (Commonwealth of Australia 2020, Section 17.85).

> *There is benefit in states and territories developing and utilising remote sensing and other technologies (for example LiDAR) to improve the capture of fuel load data.* (Commonwealth of Australia 2020, Section 17.88)

Airborne Forward-Looking InfraRed (FLIR) pods can scan a fire's smoke plume up to and above the cloudbase and provide information about the fire interacting with the plume (Figure 7). While the air is normally transparent to infrared, smoke-laden air can be heated by fire below (radiative forcing) in a way that increases its instability and increases indraft winds into the fire. This has potential to form a feedback loop.

Linescanners, using a number of infrared bands, have been used to indicate areas where ember storms are underway and also areas where deep flaming is underway. Ember storms are a product of deep flaming and seems to reflect the reduced oxygen

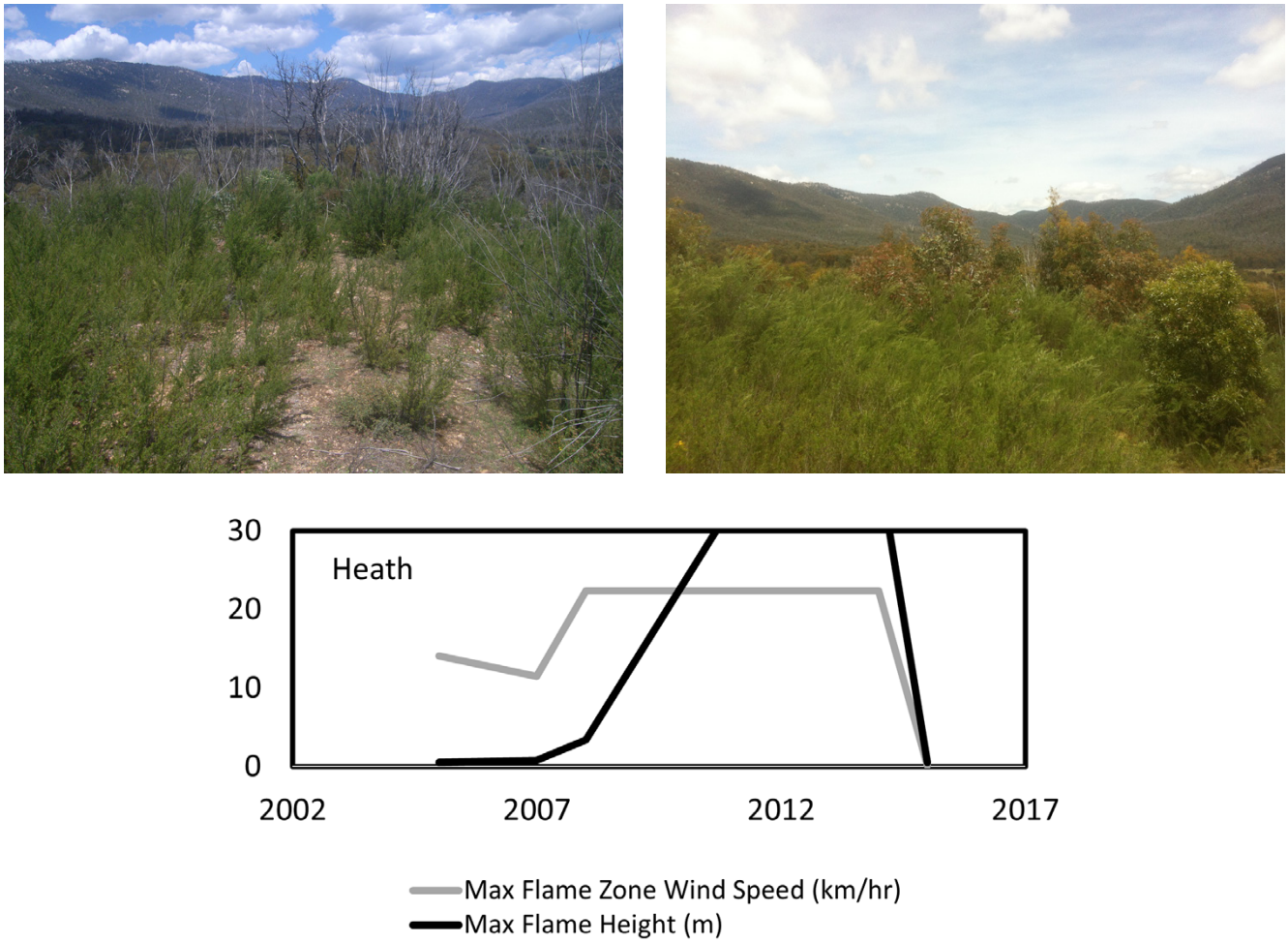


Figure 6: Top left: A stand of tall heath 4 years after a hot fire. Top right: the same stand of heath 5 years later. Graph: changes in fire conditions modelled (using a stylised fire weather scenario) as a result of the regeneration. Airborne LiDAR can be used to identify, track and confirm these changes.

Images and analysis: ACT ESA, Rick McRae.

Figure 7: Infrared FLIR pod image of the Alpine Fire Complex, January 2003. The glow of the lower smoke plume indicates that radiative forcing may be occurring. Infrared is also reflecting off an ice cloud in the upper background.

Image: Australian Government

available on a landscape scale. This alters ember burn-out times and ember production dynamics. Ember storm attacks on urban edges are very different to those due to steady-state fires (encoded in AS3959).

The output

Output products are possible using remote sensing technology:

- A fire-edge map at a specified time. Interpretation needs knowledge of the aircraft's ground speed as the fire may have changed between the start and the end of the mapping run.
- Change in the fire's extent between mapping runs.
- Fire intensity maps, using:
  - Near-infrared bands for a Normalised Difference Vegetation Index or related indices (such as NDBI), or
  - Fire Radiative Power from satellite hotspots.
- Fuel consumption maps using LiDAR to assess changes in surface cover, especially if data for the pre-fire condition are available.
- Fire dynamics.
- Plume dynamics, including violent pyro-convection and ember flows.
- Fuel-state maps, which use satellite data to estimate fuel array and availability.

Aircraft logistics

Fire services agencies have routine access to resources of aircraft, crews and ground support as well as trained air observers to allow for fire extent mapping. Locations with an elevated fire danger rating may have the benefit of a linescanning aircraft being available. There may be resource availability issues based on activities in other locations, recent aircraft and aircrew flight history and air space usage. The more specialised platforms may need access to data links and post-processing capabilities.

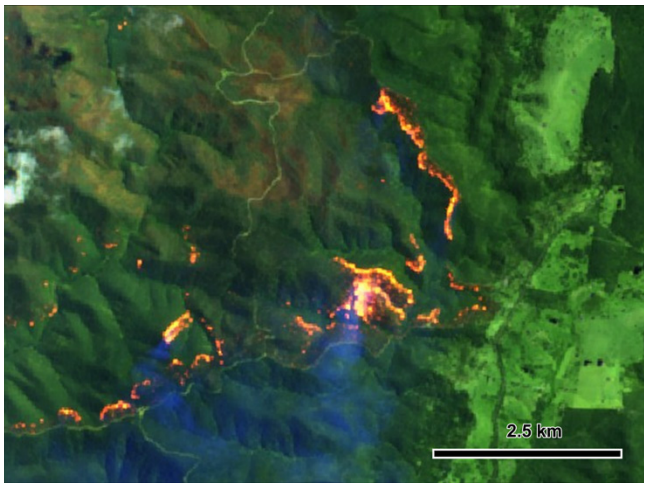


Figure 8: Sentinel-2 image of a backburn near Gelantipy, Victoria, 2 February 2019. Note how well the satellite resolves the fire trails.

Image: NSWRFS

The tasking of aircraft needs careful consideration. 'Bird dogging' aircraft that are used to guide large air tankers (LATs) to their designated drop targets, may be tactically committed to flying too close to the LAT for them to be a useful source of strategic intelligence. The incident management team's intelligence processing capability needs to be able to guide all aircraft allocation and tasking.

Some of the most beneficial remote sensing for scientific purposes has come from aircraft (including drones) with long endurance and the ability to stand-off, well away from the operational airspace over and around the fire. Air space usage clashes with operations and intelligence gathering and should be minimised.

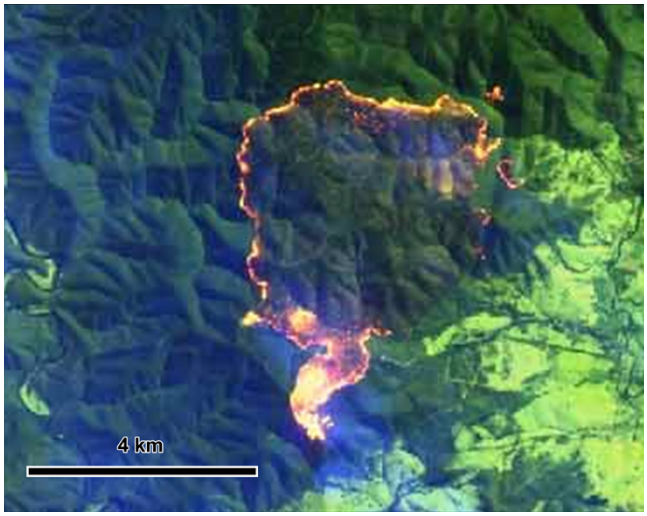
In recent years, it has become possible to fill in gaps in linescanning aircraft availability for fires by using Sentinel-2 satellite imagery (Figure 8).

Issues

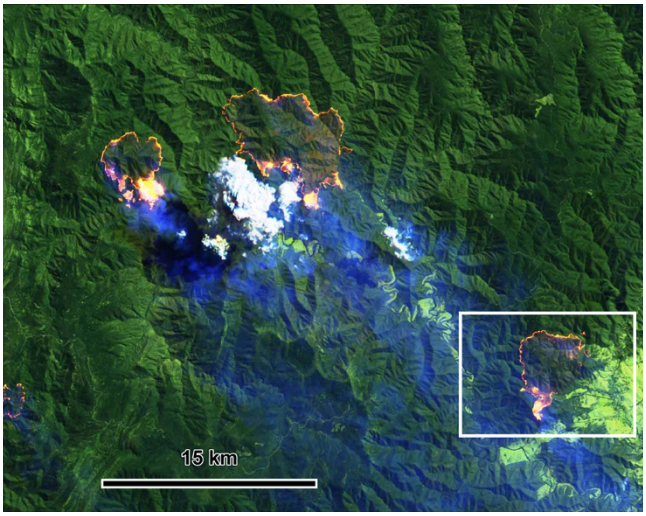
Australian's fire season of 2019–20 produced an unprecedented set of fire conditions with large, running bushfires frequently crossing state borders. As noted by the royal commission, 'There is some variability in capability across jurisdictions' (Royal Commission into National Natural Disaster Arrangements 2020, Section 17.86). This shows that firefighting arrangements in Australia will need to establish a much higher level of cooperation and coordination between state and territory jurisdictions. The increasing sharing of resources will require national standards for capabilities, logistics, training and products.

Remote sensing products are not colour photographs. They are pseudo-colour imagery and colour assignments are the choice of imagery analysts or, in some cases, agreed standards. Analysts and end users operating in time-sensitive environments benefit from standardised depictions. This also applies to symbology, labelling and marginalia (all of the detailed information in the margins of a map, such as scalebar, coordinates and legend). There is a long-standing tension between 'zooming-in' to give the best discrimination of the incident and 'zooming out' to give increased contextual information for the remote sensing product (see Figure 9). This needs to reflect whether the end users are viewing the product in a flexible GIS environment or in isolation (e.g. a single image vs. a printout on paper). This may change between incidents and is most significant if capabilities from external sources are deployed. This is especially so if Australian Defence Force resources are used.

Increased resource sharing, assistance from non-emergency management agencies and the need for standardisation, suggests greater oversight role by the Australian Government. This is



a) A fire with a spot fire adjacent near farms and upwind of a powerline easement.



b) The same event (lower right corner) in a larger context, showing a greater level of threat to fire crew safety.

Figure 9: Fire activity near Dargo, Victoria, 4 March 2019.
Images: Sentinel 2.

already in place for space-based remote sensing but is limited for airborne capabilities. Fire events like eastern Australia's 2019–20 summer bushfires are going to cross state borders. Coordinated intelligence systems can only assist.

Satellites

For many years, fire analysts have been watching the evolution of satellites that may be useful for fire monitoring. For any satellite, there is a trade-off between the resolution and the repeat time. Satellites can provide images that are roughly detailed enough to be useful every 10 minutes. Some stunningly useful images can be produced but the wait takes days until the next update. Every generation of satellite and sensor (e.g. LANDSAT, AVHRR, MODIS, MTSAT, VIIRS, HIMAWARI and SENTINEL) moves closer to delivering quality and useful images for remote mapping of fires.

Fire hotspots are generated by programs that scan satellite imagery for spectral signatures likely to have come from fires. The backbone of this work for the last 2 decades has been the MODIS sensor on the Terra and Aqua satellites. The 2 together work better than one alone. They are now remarkably nearly 20 years into what were planned to be 6-year missions. Currently, Terra is losing orbital position and is suffering data availability issues. The VIIRS sensor is its replacement and is in satellites called NPP and NOAA20. Together they work better than MODIS. On average a large fire generates 11 times more VIIRS hotspots than MODIS, largely because VIIRS has a better ground resolution. MODIS has a climatology spanning 2 decades, while we will have to wait some years for a VIIRS climatology to build up. For near real-time fire work, VIIRS is a promising approach.

Figure 10 is an example of hotspots for a major fire run during the summer bushfires of 2019–20.

The fire shown in Figure 10 contained 242 hotspots. The hotspot Fire Radiative Power values were aggregated (summed) along that transect into 0.01° segments. The Fire Radiative Power trace along the transect is shown in Figure 11.

Figure 11 shows the hotspots dataset from the 2 VIIRS sensors and provides a snapshot of the fire's behaviour at the time of overflight (halfway between midnight and sunrise). Analysis shows a likely resolution of a major spotfire about 3 km ahead of the main run. This indicates that there was a major fire run that included dense fire spotting that quickly merged, forming a head fire that took a long time to burn-out (estimated to be about 2 hours). The Y-axis, in Megawatts[1], is a reminder of the extraordinary power of large fire runs. Datasets can be downloaded by a GIS operator in the incident management teams and processed quickly to aid production of the next shift's Incident Action Plan.

The path ahead

What we know about fireground application of remote sensing technology and its future potential indicates elements of the path forward. Any technology needs to be carefully placed in the data-information-intelligence hierarchy if its full value is to be realised. It can become quite demanding during active fire runs

1. The hotspots are tagged by NASA with a Fire Radiative Power value, in MW, which is the instantaneous emissions detected for each pixel – roughly 450m on a side. If the average values are divided by 20, they are roughly emissions per hectare.

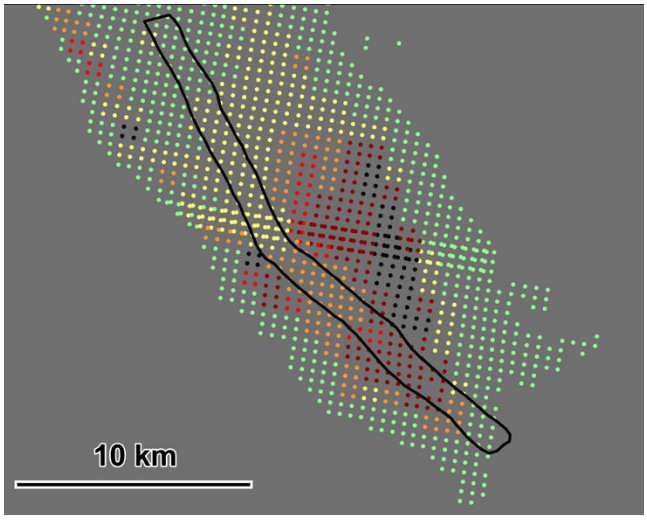


Figure 10: Blow-up fire event hotspot transect, 30 December 2019 with a north-westerly wind. The colour legend is: Green = 0 to 20 MW (Mega Watts), Yellow = 25 to 50 MW, Orange = 50 to 75 MW, red = 75 to 100 MW, Dark red = over 100 MW.

Data source: NASA Fire Information for Resource Management System

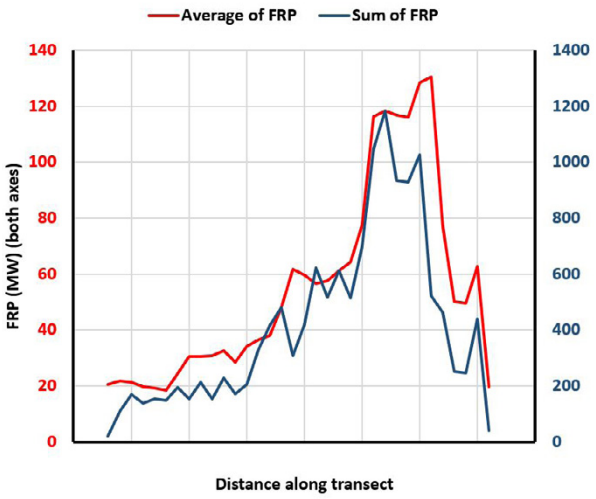


Figure 11: Blow-up fire event transect results.

Analysis: Rick McRae

to handle a 'flood of data' in the correct timeframe to support mission-critical decision-making.

Useful technologies are constantly changing and offering new options and yet fire operations require training and familiarity with established, mature technologies. No single technology can provide both. Foundation systems must work alongside systems under development, with the balance reflecting operational needs. It is important for a diversity of technologies to be applied to complex fires. The required balance needs to consider both platform availability and processing-interpretation capabilities.

Mature technology needs uptake by all users, including to fire sector leader levels. The increasingly dangerous bushfire environment requires technology to identify and highlight critical evolution of fires. New staff skills need to be introduced and disseminated. The modern fire operating environment relies on interstate and overseas support and poses challenges for firefighter baseline skill sets. Achieving a useful level of commonality will require effective coordination.

It is vital that remote sensing data are used to support scientific exploration of the bushfire environment. New learnings must be incorporated at an ever-increasing pace to keep communities and fire services personnel safe in dangerous fire events.

Acknowledgments

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About the author

Adjunct Professor Rick McRae retired from a career in bushfires and emergency management spanning 3 decades. He is a visiting fellow at the University of NSW in Canberra. He specialised in fire behaviour and served on major fires in the ACT, Tasmania and Canada. He has served on national committees on bushfire matters and has run a national emergency management workshop during the introduction phase of the Himawari-8 satellite and maintains online material showing uses of the data.

Abstract

Knowledge from past disasters can inform and support recovery, yet these insights are not always readily accessible to recovery practitioners. To bridge this gap, effective collaboration is needed to produce practical, evidence-based resources. This was the focus of the Recovery Capitals (ReCap) project, a collaboration between researchers and practitioners across Australia and Aotearoa New Zealand. This paper presents a critical case study of the participatory processes involved in developing a recovery capitals framework and associated resources. The framework is based on an existing Community Capitals Framework that emphasises the social, natural, political, built, human, financial and cultural strengths and resources within communities. The Recovery Capitals Framework arose through applying the Community Capitals Framework to disaster recovery, with conceptual adaptations to reflect shared values, diverse perspectives and collective knowledge of recovery. The lessons learnt from this international and researcher-practitioner collaboration are analysed, and the application of principles of equity, inclusion and community-led recovery is evaluated. Shortcomings and innovations are examined in how resources were tailored to the cultural contexts of each country, and reflections are presented from the perspectives Indigenous and non-Indigenous contributors. These lessons can inform future collaborations that support inclusive, holistic and evidence-informed recovery efforts.

Recovery Capitals: a collaborative approach to post-disaster guidance

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Introduction

Experiences following a disaster can affect long-term recovery just as much as the disaster itself. Efforts to support disaster recovery play a critical role in shaping these experiences (Bryant *et al.* 2020, Lock *et al.* 2012). Research from past events provides insights into risk and protective factors during recovery. Good decision-making and recovery actions can be enhanced through awareness of these lessons among recovery practitioners (a term used to broadly encompass anyone with a role in recovery such as policy makers, on-the-ground staff and volunteers and those whose core work is unrelated to disasters). This is particularly important given the surge workforce required after events, which means that many people involved in providing support may have little prior recovery experience (Brady 2018). However, knowledge from disaster research does not magically flow into practice (Owen, Krusel & Bethune 2020). Effort and innovation are required to share knowledge and to support the training of practitioners as efficiently as possible post-disaster and, ideally, prior to events.

Collaboration between researchers and practitioners is increasingly promoted within the emergency management sector to enable 'evidence-informed practice' (Owen, Krusel & Bethune 2020). Yet the value of researcher-practitioner collaboration also exists in opportunities for the conduct and outputs of research to be *practice-informed*. Practitioners offer highly valuable insights and contributions to the design and dissemination of knowledge-translation materials. Comprehensive researcher-practitioner engagement throughout a project gives access to a broader set of practitioner knowledge. For disaster recovery research, this includes practitioner understanding of processes and principles of community recovery, what works and where challenges lie. However, there is a gap in the literature analysing such processes of researcher-practitioner collaboration and examining impacts on project outcomes.

This paper presents a critical case study of the collaborative processes within the Recovery Capitals (ReCap) project. The aim of ReCap was to support the planning of recovery activities after disasters by providing evidence-based

guidance. ReCap was underpinned by the ethos of participation and collaboration, with insights flowing among researchers and recovery practitioners. ReCap also involved collaboration between Australia and Aotearoa New Zealand; 2 countries with much in common as well as important differences. We analysed how these processes shaped the project outputs and evaluated the application of best-practice principles of participatory health research and disaster recovery work. We also examine how differences in perspectives and contexts were navigated, with a focus on Indigenous peoples of each country. In sharing these insights, this paper informs and encourages future collaborative initiatives particularly among Indigenous and non-Indigenous people within and across countries.

Methods

Theoretical framework

Given the dynamic, interlinked nature of disaster impacts and recovery outcomes, it was important to use a framework that recognises this complexity. From the outset of the project, an existing 'community capitals' approach was identified as a guiding framework. The notion of 'capitals' originates in economics (Storberg 2002) but has been broadened to encompass other dimensions of life and has been applied in fields including community development (Emery & Flora 2006, Pigg *et al.* 2013), disaster resilience (Mayunga 2007, Miles 2015) and, in more recent years, disaster recovery (García Cartagena 2019, Himes-Cornell *et al.* 2018, Plodinec 2021, Ripley *et al.* 2020). Of the numerous variations on capitals frameworks, the Community Capitals Framework outlined by Emery and Flora (2006) was the starting point in this project. This consists of 7 'capitals': social, natural human, political, financial, built and cultural. In this framework, capitals are defined as 'any type of resource capable of producing additional resources' (Flora, Flora & Fey 2004, p.165). While the term 'capitals' is often defined narrowly, especially in economics, this broader view was deemed useful in a disaster recovery context. An adapted version of this theoretical framework was developed as one of the outputs of the ReCap collaboration.

Study design

A participatory-health-research approach was adopted to produce knowledge and action through close collaboration between the researchers and recovery practitioners (ICPHR 2013a). Participatory health research focuses on the co-creation of knowledge and values different forms of knowledge from contributors. It includes a shared commitment to bring benefits for communities (ICPHR 2013a; Onwuegbuzie, Burke Johnson & Collins 2009). The intent of ReCap was to produce a set of resources to support recovery practitioners in their work. Rather than being a linear progression from resource conceptualisation to production then dissemination, the ReCap process was iterative and each of its phases overlapped and informed others with continual collaboration throughout. A case study was applied to analyse and evaluate the approaches used in the project, enabling evaluation of the extent to which it reflected the principles of equity, inclusion and community-led recovery.

Participants

The ReCap project evolved from an earlier project that was relinquished by the original academic leads due to role changes. End users[1] who opted-in to the original project maintained their involvement in this project, including Australian Red Cross as the lead end user. Participation was extended to additional academic and practitioner partners if their expertise addressed a knowledge gap that was identified and/or if there were synergies between their operations and the project. This was an iterative process over the course of the project and membership grew and shifted as people changed roles and their involvement was handed over to new representatives within their organisations. At the time of publication of the ReCap resources, there were approximately 18 academic contributors and 33 practitioner contributors representing government (local, state and national), emergency management agencies, not-for-profit organisations and practitioner training organisations across Australia and Aotearoa New Zealand.

Data collection and analysis

In participatory health research, data collection and analysis involves gathering evidence and knowledge to inform discussion and the co-generation of action and outputs.

> *The process is characterized by a dialogue among participants with different perspectives on the subject under study. The dialogue does not necessarily result in a consensual view, but may reveal and promote several different views resulting in different ways of addressing the health issue at hand.* (ICPHR 2013a, p.20)

To support this process, bimonthly meetings and annual workshops for ReCap contributors were conducted to discuss the project aims, the conceptual framework, sources of evidence and other forms of knowledge, project outputs and knowledge translation at different project stages. These meetings allowed relationships to be built, new insights to be gained and different perspectives to shape the developing resources.

Between these bimonthly meetings, the research team collaborated to gather the evidence and other forms of knowledge and advance the project. This team consisted of 2 researchers from Australia and 3 from Aotearoa New Zealand.

Identified needs for resources

In discussions to plan the content and design of the ReCap resources, practitioners identified 3 main needs.

First was for resources that provided evidence-based guidance on how to apply recovery principles and frameworks in practice. Providing a 'bridge' between principles, evidence and practice would be useful for those new to recovery support roles and those with limited knowledge of relevant research to guide their actions. For experienced practitioners, easy access to relevant evidence would assist them in advocating for certain actions or preparing grant applications.

1. The term 'end user' refers to people and organisations that will use outcomes of the project.

Second, resources needed to be accessible and engaging. Practitioners identified this as an important aspect especially given the fast-paced and high-pressure contexts in which recovery practitioners operate.

The final need related to advancing the conceptual framing of recovery efforts within the sector and reflecting this within the resources. Since the early-2000s, the 4 recovery environments of social, built, economic and natural have underpinned key strategies and policies across Australia and Aotearoa New Zealand (e.g. Australian Institute of Disaster Resilience 2018, National Emergency Management Agency 2020). While practitioners acknowledged the value of this framing for organising resources and delineating responsibilities, there are limitations. For example, the notion of 'environments' was perceived as a passive framing, lacking emphasis on the strengths that exist within communities and how they can be developed. Some participants felt there was insufficient attention and nuance in the framework regarding the different elements within 'social environment'. This aligns with the recent inclusion of some form of 'cultural' environment in some versions of the environments framework (e.g. Bushfire Recovery Victoria 2020, Ripley *et al.* 2020). Practitioners also expressed concern that, despite efforts to promote holistic and coordinated approaches to the environments (e.g. Australian Institute of Disaster Resilience 2018, p.54), in practice, the environments framework often perpetuates siloed approaches that are at odds with the holistic and integrated ways that people and communities enact and experience recovery. Based on these reflections, evidence-based and engaging resources that reflected more nuanced, strength-based and holistic conceptualisations of recovery were the goal.

Recovery Capitals Framework

An initial intention was to directly apply the Community Capitals Framework as the basis for the ReCap resources, and indeed that framework provided opportunities to address several of the issues identified by practitioners. For example, in response to concerns about the limitations of a single social environment, the Community Capitals Framework recognises political, cultural and human as well as social capitals (Figure 1). Further, in contrast to the notion of different domains or environments of recovery, the concept of capitals emphasises the strengths, assets or resources within communities, framing these as dynamic. The Community Capitals Framework underscores how capitals fluctuate over time and influence each other (Emery & Flora 2006, Pigg *et al.* 2013). Practitioners found this to be valuable in encouraging active efforts to recognise and foster recovery capacity.

Yet the Community Capitals Framework alone did not address all the conceptual matters of concern. Discussions generated rich insights into how the Community Capitals Framework could be adapted to enable a better response to needs in ways that aligned with the ReCap collective knowledge of recovery and shared principles and values, including equity and community-led recovery. The resulting Recovery Capitals Framework (RCF) includes definitions of each capital (see Appendix A) that were developed through synthesis of literature (Emery, Fey & Flora

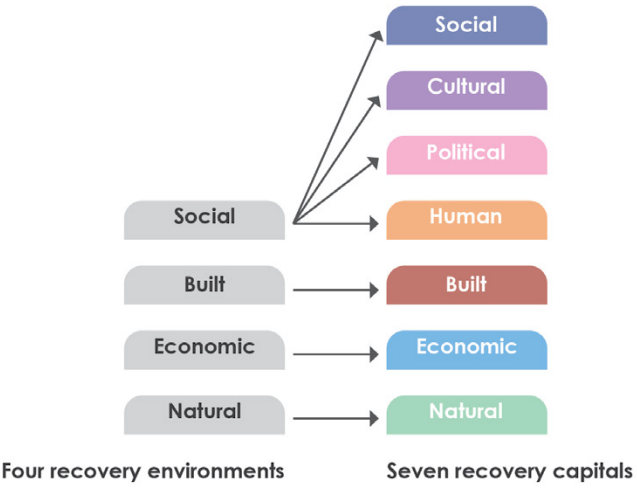

Figure 1: The 4 recovery environments framework mapped onto the 7 capitals in the Community Capitals Framework and Recovery Capitals Framework.

2006; García Cartagena 2019; Himes-Cornell *et al.* 2018; Jacobs 2011; Mayunga 2007; Plodinec 2021; Stofferahn 2012) and practice experience. In this way, the process of collaboration enabled a wide range of knowledge, experience and values to be integrated into project outputs. The *Guide to Disaster Recovery Capitals* (ReCap Guide) (Quinn *et al.* 2021) summarised the adaptations featured in the RCF, which will be discussed further in the following sections.

Multiple levels and contexts

The RCF encompasses the notion of capitals at all levels (e.g. people, households and communities), in contrast to the Community Capitals Framework (Emery & Flora 2006), which focuses on capitals as community-level constructs. The RCF draws from a socio-ecological model (Bronfenbrenner 1998) to explore the multiple dimensions and levels of recovery in terms of time, people and place, and the interactions between these. The RCF highlights diversity among people, communities and disaster contexts.

Community-led and equitable approaches

Another key adaptation relates to the notion of capitals. Equitable, sustainable and community-led approaches to recovery are important principles and there was concern that the Community Capitals Framework may be applied in ways that are inconsistent with these principles. The concept of capitals has been critiqued for how it potentially represents an economic framing (e.g. commodification) of social life (Storberg 2002). Some practitioners were concerned that the notion of capitals could be used as a tool for top-down, externally driven decision-making based on objective assessments of community assets and needs, leaving little room for people and communities to shape their recovery based on what is important to them. Further, a capitals lens is often applied with the unexamined assumption that capital accumulation is inherently worthwhile (García

Cartagena 2019, p.46). ReCap contributors recognised that, in some cases, a person's or a community's efforts to accumulate capital at a given point in time may be detrimental to some people or purposes across place and time.

ReCap therefore explicitly treated capitals as useful and worthy of attention because of the purposes they can serve, rather than as ends in themselves. These purposes may be whatever is important to a person or community, aligning with community-led recovery principles. In this way, rather than being a tool for external assessments of assets and needs, a capitals approach can assist each person or community to assess what strengths and resources they already have and identify priorities for enhancing their capitals to support their recovery based on what is important to them.

Considering disaster recovery in a general sense, ReCap contributors identified that the desired purpose of capitals is to support the wellbeing of affected communities. Therefore, within the RCF, capitals are defined as the resources that can be maintained, increased and drawn upon to support wellbeing. Accordingly, within the ReCap Guide, there is evidence to illustrate how a capital could influence wellbeing directly or indirectly by interacting with other capitals. Issues in the distribution of capitals within and between communities in the RCF and ReCap Guide situate differences in social power alongside discussion of strengths, vulnerability and structural inequities. The input of Indigenous contributors and others with experience in fields relating to social justice was instrumental in navigating these complex matters.

In recognition of the importance of community-led and context-appropriate approaches, we did not make universal recommendations or prescriptions for recovery efforts. Instead, the ReCap Guide summarises evidence from past disasters, accompanied by considerations to prompt recovery workers to reflect on the implications for their efforts and contexts.

Inter-relatedness

Some capitals literature explores the inter-connectedness of different capitals (e.g. Emery & Flora 2006, Pigg *et al.* 2013) while other studies treat capitals as mostly independent (e.g. Mayunga 2007). Considering practitioner concerns about siloed approaches to recovery, an holistic approach to the capitals was especially important in the RCF. Inter-connectedness formed the basis of the structure and design of the ReCap Guide and decisions about what evidence to include. For each capital, there is a section on how it can influence other capitals and/or wellbeing.

Highlighting the connections between capitals still required separating them in the first instance. This proved problematic when attempting to map evidence against the framework, as few things sit neatly within one of the 7 capitals. The process of collectively defining the 7 capitals revealed competing perspectives on the capitals categories. Collaboration enabled a refined definition of each capital to be developed as well as a nuanced understanding of capitals overall. In particular, the contributions of Indigenous people provided a more holistic worldview. Although ReCap ultimately retained the 7 capitals as categories for their usefulness in structuring the resources, it is recognised that a more deeply holistic perspective is likely to better align with how people and communities experience recovery.

Developing, piloting and refining the resources

Based on the RCF and the needs expressed by practitioners, a set of user-friendly resources was produced, piloted and refined.[2] These include:

- the ReCap Guide (in hard copy, PDF and as interactive webpages) – Australia and Aotearoa New Zealand editions
- a series of recovery stories told by people with personal and professional experience of disasters
- a set of activities and presentation slides to assist the application of the content from the ReCap Guide in practice, pre- and post-disaster
- the Indigenous Peoples and Recovery Capitals (Australia) resource.

This project took an all-hazards approach and was supported by contributors from Australia and Aotearoa New Zealand with experience of different hazards that affect urban, rural and remote areas. It was not within the scope of this project to review of all the literature relating to the 7 recovery capitals, so research the team had been involved in or was familiar was principally used. This represented the core contemporary recovery research in Australia and Aotearoa New Zealand, and a selection of key evidence from the USA, Japan, Sri Lanka, Canada and elsewhere was also included. This evidence was used to identify links between the capitals and influences on wellbeing before findings were grouped into themes and distilled into messages (with sources cited). Gaps in evidence were addressed by inviting new collaborators with relevant expertise or conducting targeted literature searches.

As the summaries of evidence were developed for the resources, practitioner input was incorporated regarding the formats, language and focus that would be most useful and appropriate for the intended audiences. Visual elements emerged as an important aspect and we engaged 3 artists, 2 graphic designers, 2 video producers and web developers to deliver the resources in engaging formats. The diverse perspectives of ReCap contributors confirmed that simple images could convey different things to different people and not always in helpful ways. The visual elements were refined to align with the RCF values of equity and diversity.

Practitioner involvement maximised the piloting, uptake and dissemination opportunities. Close collaboration enabled the early release of the pilot ReCap Guide based on practitioner advice that this would be helpful in efforts to respond to disasters during 2020, including the COVID-19 pandemic. This enhanced the all-hazards approach of the guide and allowed for adjustments to ensure the relevance of messages.

2. The ReCap resources are available at https://recoverycapitals.org.au/.

Many potential uses of the ReCap Guide and other resources were discussed. The original intent was for the resources to be useful in recovery, but many practitioners observed that they could also be highly valuable in preparedness and pre-event recovery planning. Thus, supplementary resources such as the 'Applying ReCap' activities were produced to help people use the resources in a range of ways.

Discussion

The participatory-health-research approach adopted for this project enabled different forms of expertise and knowledge to be drawn on that greatly enhanced the outputs from the project. Contemporary knowledge-translation literature advocates for close involvement of practitioners throughout research projects, to maximise uptake of research outputs (Baumbusch *et al.* 2008; Owen, Krusel & Bethune 2020). In the ReCap project, involvement of practitioners in every step of the project helped foster an awareness of the resources and a sense of shared ownership. This was instrumental in gaining support from partner organisations to provide in-kind support to the piloting process, securing additional funding and ensuring sustainability of the resources beyond the funded period with the resources hosted on partner websites.

There is emerging literature in the disasters sector exploring the value of participatory processes in conceptual development (e.g. Sharifi *et al.* 2017). The ReCap case study builds on these developments by demonstrating that involving practitioners early in a knowledge-translation project creates opportunities for conceptual co-design. This resulted in the RCF, an unanticipated output of the ReCap project that makes a contribution to the sector as well as enhances the resources produced from the project.

To evaluate the extent to which this participatory approach enabled the RCF principles of equity, inclusion and community-led recovery to be applied, we asked: 'who was included as a ReCap contributor and which groups were left out of the process?' We also analysed the challenges, learning and innovations that emerged from the process of adapting the ReCap Guide to the sociocultural contexts of Australia and Aotearoa New Zealand, with particular attention to the role of Indigenous contributors in each country.

Issues of inclusion

Issues of equity and diversity were discussed throughout the project, with contributors recognising that some groups are often overlooked in recovery decision-making and research including refugees and migrants, Indigenous peoples, people with disabilities, people experiencing homelessness and children and young people. Some exceptions include research with people from migrant and refugee backgrounds following the Christchurch earthquakes (Marlowe 2015) and Indigenous perspectives on disaster recovery from Australia and Aotearoa New Zealand (Kenney & Phibbs 2014; Williamson, Markham & Weir 2020). Marck and colleagues (2021) examined the impact of the Australian bushfires and pandemic on people with multiple sclerosis and Gibbs and colleagues (2013) explored children's experiences of recovery using case studies from both countries. The experience of ReCap contributors in supporting diverse communities was helpful in reflecting the principles of equity and diversity.

Nonetheless, creating resources that are appropriate to all people and communities was limited by the fact that the makeup of the ReCap contributor group did not reflect the diversity and intersectionality in the peoples of Australia and Aotearoa New Zealand. This is consistent with the issues of representation in the emergency management sector in both countries (Young *et al.* 2021). By inviting contributors through existing professional networks on an informal and ad hoc basis, the ReCap participatory process departed from the participatory-health-research principle of actively encouraging and enabling people from a wide range of backgrounds and identities to take part (ICPHR 2013b). Participatory health research offers an opportunity for diverse and potentially marginalised perspectives to be recognised and included in knowledge and action (Wallerstein 2006). However, if those perspectives are missing, misunderstood or misrepresented there is potential for harm and, what Bordieu (1996) described as symbolic violence.

When the ReCap Guide was piloted in Australia, feedback was sought from organisations representing or working with under-represented groups such as people with disability and this led to important adaptations. We intend to pursue opportunities to transform the resources into a wider range of accessible formats, and earlier involvement of people with disability may have enabled this to occur within the original project timeframe.

While the principles of community-led recovery (Dibley *et al.* 2019) were embedded in the ReCap Guide, the collaborative process of developing the guide was not in itself community-led. Although some researchers and practitioners had experienced disasters, all were contributing in a professional capacity and we did not attempt to engage community members as contributors. This decision was made on the basis that the resources were designed for recovery workers rather than community members. It is acknowledged in hindsight that it would have been worthwhile to engage community members as integral ReCap contributors for several reasons. First, the National Principles for Disaster Recovery (Community and Disability Minister's Advisory Council and Government 2009) highlights the importance of community-led approaches that elevate community member voice and agency in matters concerning their recovery. This is relevant to the ReCap project because it aimed to influence community experiences by guiding the approaches of recovery workers. Second, comments were made on the potential usefulness of the resources to community members as well as recovery workers. Indeed, the lines between these identities are increasingly blurred, for example, through the increasingly prominent role of community recovery committees and employing local people in recovery roles. As the language and design of the resources was intended to be accessible and engaging to recovery workers, it should also be useful to community members. Third, engagement with community

members would increase opportunities for involvement of groups that are under-represented in the recovery workforce.

Sociocultural adaptations

In part, the approaches taken to tailoring the resources to Australian and Aotearoa New Zealand reflect the social, cultural and political circumstances in each country. They also arose from the identities and positionalities of researchers (Carter *et al.* 2014) and the interactions between the researchers. Researchers in Australia and one of the Aotearoa New Zealand researchers were white and the 2 researchers who led the adaptation of the ReCap Guide for the Aotearoa New Zealand context identify as Māori.

Perspectives from Aotearoa New Zealand

The Aotearoa New Zealand team had a strong commitment to Māori flourishment and worldviews, which underpinned the inception of the Aotearoa New Zealand version of the ReCap Guide. As the project progressed, the different ways of engaging with and representing Indigenous peoples in Australia and Aotearoa New Zealand seemed starkly incompatible. In Aotearoa New Zealand, Māori are valued as tangata whenua (Indigenous peoples of Aotearoa New Zealand, recognising deep connection to the land) and there is a growing commitment to te reo Māori (language) revitalisation. While relationships between Māori and non-Māori in Aotearoa New Zealand remain problematic (Eklington *et al.* 2020), a treaty has facilitated collaboration, which is not the case in other countries such as Australia. At times, the Māori researchers felt challenged and uncomfortable with the approaches taken in the development of the ReCap resource. However, shared values and principles of respectful dialogue, contemplation and engagement alongside regular meetings enabled relationships to flourish and there was a genuine willingness to partner in ways that supported the uniqueness of the nations. This enabled the team to discuss these disjunctions and find ways to navigate the situation. This led to changes in the approach to the Australian resources, yet the need to tailor a version of the ReCap Guide for Aotearoa New Zealand remained. This acknowledged the cultural specificities relating to Indigenous peoples of each country such as using different language for how people care for and relate to the land (e.g. use of 'Country' and 'kaitiakitanga').

In te ao Māori (worldview) and beyond, extrapolating complex and interconnected elements of the world and applying it specifically to the recovery phase of a disaster can be artificial and, as such, difficult to represent. Each of the capitals required different conceptualisations and understandings from a Māori perspective. For example, 'natural' capital needed to represent the deep relationship that Māori have with the land, which means that natural hazard impacts can be deeply wounding and distressing. As the caretakers of Aotearoa New Zealand (kaitiakitanga), a disaster influences experiences of wellbeing. Similarly, with 'cultural' capital, Māori have inherent values of caring for people and showing hospitality (manaakitanga). They are not individualistic in their ways of being as demonstrated time and again when Māori communities open their doors and support all people during times of distress. Another important element was the role of social-power relations during recovery processes. With a history of colonial abuse, 'political' capital needed to represent the importance of Māori authority (rangatiratanga) and that any partnership should be a genuine collaboration whereby Māori have agency to care for themselves. The Māori researchers are committed to advocating against inequity (e.g. financial, social, built) and this aligns with research (King *et al.* 2018; Lambert 2015; Phibbs, Kenney & Solomon 2015) showing the value of Māori ways of being in response and recovery, particularly following the 2010–11 Canterbury earthquakes and 2016 Kaikōrua earthquake. This body of research included the importance of Māori history, knowledge of the land and whānau (community-based social practices).

As the collaboration and consultation processes with Aotearoa New Zealand practitioners evolved, there was a need to reflect biculturalism with supporting visuals. Thus, original artwork that supported Māori knowledges and inclusive recovery practices was developed. To do this, artwork by a Māori artist steeped in Māori history and customs (pūrākau, tikanga) was incorporated. The artist demonstrated insight and knowledge in translating western ideas into Māori images. For example, political is represented as a debate (whaikōrero) (Figure 2) and financial as the concept of trade (Figure 3).

A further aspect to being culturally accountable, was to have the Aotearoa New Zealand guide translated into te reo Māori to support language revitalisation and treaty relationships. The translation is about the concepts and not literal meanings.

Figure 2: Central 'political' image by Ariki Arts depicts the origins of whaikōrero (speech making or debate), which is one of the core political structures in te ao Māori.

Source: Guide to Disaster Recovery Capitals, Aotearoa New Zealand edition (Campbell & Blake 2021, p.25)

Figure 3: Central 'financial' image by Ariki Arts depicts resources traded between land and sea and the older means of exchange before the introduction of currency.

Source: Guide to Disaster Recovery Capitals, Aotearoa New Zealand edition (Campbell & Blake 2021, p.18)

Perspectives from Australia

Throughout the project, concerns from practitioners (Indigenous and non-Indigenous) were expressed about the lack of awareness within the recovery workforce of considerations in working with Aboriginal and Torres Strait Islander peoples affected by disasters. As non-Indigenous scholars, the efforts of the Australian researchers to address this were influenced by colleagues in Aotearoa New Zealand and Aboriginal colleagues in Australia.

Consistent with participatory-health-research literature, the collaborative process brought different perspectives forward, forcing assumptions to be challenged and generating new ways of seeing and acting (ICPHR 2013a). The Australian researchers deeply valued the opportunity to learn and grow through discussions with the Aotearoa New Zealand researchers and Māori emergency managers and leaders throughout this project. This was a source of inspiration which supported them to harness their concern with the lack of inclusion and attention to Aboriginal and Torres Strait Islander peoples into tangible–albeit preliminary–action within the ReCap project.

Contextual factors meant that the Australian approach could not mirror the Aotearoa New Zealand version. For example, given that about 260 Indigenous languages exist across Australia (Wurm 2019), pursuing translations was not feasible. Further, there has been very limited attention to the experiences and roles of Indigenous communities in disaster recovery in Australia, despite growing recognition of traditional land management practices, including in post-disaster policies and inquiries (Williamson, Markham & Weir 2020) and research. This was a challenge as to how to reflect diversity and equity through an evidence-based set of resources when the existing literature itself systematically neglected certain perspectives and experiences. One agreed approach was to focus on these perspectives (including Indigenous peoples, refugees and migrants) in producing ReCap 'recovery stories', which were not directly based in published evidence.

During 2020, there were opportunities for new collaborations with Indigenous people to advance a more substantive approach. The 2019–20 summer bushfires prompted policy responses such as the inclusion of Aboriginal Culture and Healing as one of the Bushfire Recovery Victoria 5 'lines of recovery'[3], along with commentary and research on the unique impacts on Aboriginal and Torres Strait Islander peoples and the historical neglect of these issues (e.g. Williamson, Weir & Cavanagh 2020; Williamson, Markham & Weir 2020). These insights were incorporated into the pilot Australian ReCap Guide[4], in direct collaboration with the academic leading that research and advocacy. This developed into ongoing collaborative efforts to address these research gaps, as another example of relationships initiated or deepened through ReCap.

There was a need for further adaptations to the ReCap Guide and the need for a specific resource focusing on Indigenous peoples. The Indigenous Peoples and Recovery Capitals resource (Quinn, Williamson & Gibbs 2021), developed with input from Indigenous people and organisations, identified strengths that can be drawn on in recovery. This was framed within holistic notions of the 7 recovery capitals.

Artwork was an important aspect in this resource and in the adaptations to the ReCap Guide. Mirroring advice from Aotearoa New Zealand researchers, feedback was that the visual design of the pilot guide did not convey relevance for Indigenous audiences. A Yaegl artist developed icons and artwork (Figure 4) to give an Indigenous interpretation of the recovery capitals and a holistic understanding of interrelatedness. The flowing water illustrates the capitals as connected and also as part of the river and part of each other.

Although it was complex to navigate, the integration of artwork from 2 artists (one Indigenous and one non-Indigenous) within a single resource, insights from ReCap contributors and artists enabled what the ReCap contributors feel to be an appropriate and cohesive result. Importantly, practitioners affirmed that within the Australian emergency management context, such an approach would be an effective way of conveying the relevance of the guide to all users.

Future directions for collaboration

The ReCap resources were launched and disseminated progressively throughout 2021, with a high level of uptake by partner organisations reflecting the participatory approach (ICPHR 2013a). This also signifies the next phase of opportunities to collaborate with new people and organisations in applying the resources in practice, as well as possibilities for further resource development. Building on the benefits of researcher-practitioner and international collaboration, the inclusion of community members in future work is required. Additional resources should be co-developed with the many groups of people who experience marginalisation before, during and after disasters.

3. The Bushfire Recovery Victoria 5 'lines of recovery' are 'People and wellbeing', 'Aboriginal culture and healing', 'Environment and biodiversity', 'Business and economy' and 'Buildings and infrastructure'.

4. Pilot Australian ReCap Guide, at www.phoenixaustralia.org/disaster-hub/wp-content/uploads/2021/01/ReCap_pilot_guide.pdf.

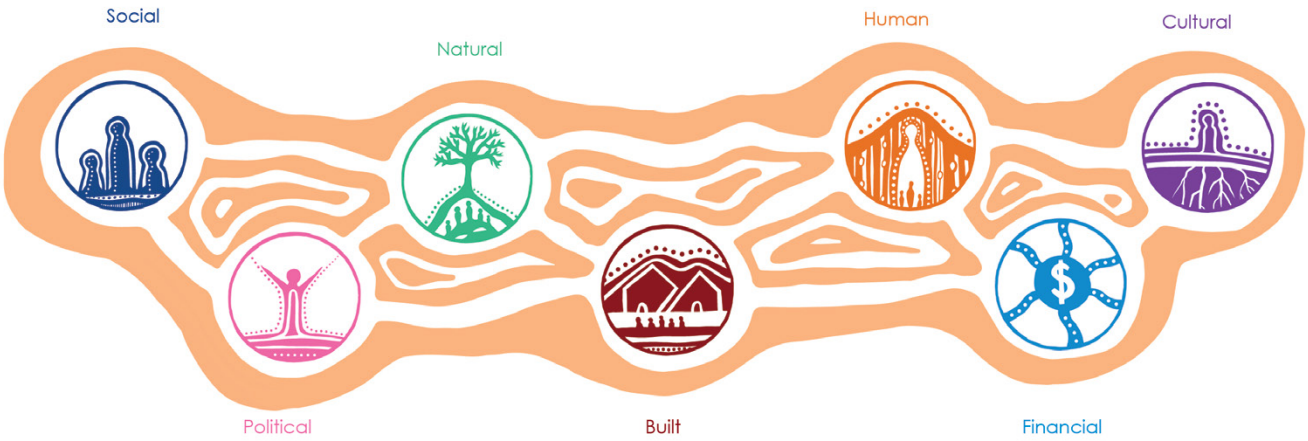

Figure 4: Artwork by Frances Belle Parker illustrating the interrelatedness of the 7 recovery capitals.
Source: Guide to Disaster Recovery Capitals, Australian edition (Quinn *et al.* 2021, p.7)

Ongoing empirical research into their recovery experiences should be conducted in appropriate ways to address gaps in knowledge and practice. This may include the creation of new formats of the ReCap Guide, such as an oral version to improve accessibility for people who are vision impaired.

In Australia, preliminary efforts within this project to improve the relevance of resources highlighted the dearth of evidence and resources that exist and the need for support for emergency management organisations to provide services that are culturally safe and appropriate. In Aotearoa New Zealand, the drive for ongoing and authentic treaty relationships is necessary for collaborative and inclusive recovery practices. Māori researchers and practitioners continue to work towards this.

Conclusion

This project represents an approach to enhancing the knowledge and capabilities of people with existing or emerging recovery support roles, pre- and post-disaster. It centred on collaboration between researchers and practitioners in Australia and Aotearoa New Zealand and between Indigenous and non-Indigenous contributors. By embedding authentic collaboration throughout the process, the ReCap project benefited from diverse practitioner and researcher insights about resource needs, content and design. This produced a high degree of practitioner engagement in the pilot and uptake of the resources. An unanticipated outcome of the early establishment of collaboration was the conceptual co-design process, resulting in the RCF. By evaluating the ReCap participatory processes against the RCF principles of equity, inclusion and community-led recovery, this case study identified shortcomings and improvements that can be brought forward to inform future collaborative processes.

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Appendix: ReCap definitions of recovery capitals

Social capital	Social capital refers to the connections, reciprocity and trust among people, groups and organisations. There are 3 main types of social capital: • Bonding social capital refers to strong, close ties between family, kin and friends, who are usually similar in terms of background and shared identity. • Bridging social capital refers to relationships and associations between a broader range of people, institutions and acquaintances. These looser ties (referred to as 'weak' or 'thin' ties) cut across race, gender and class. • Linking social capital connects people with those in power (authority figures, decision-makers, institutions, agencies) and brings capacity to leverage resources, ideas and information. Social capital is not only the existence of ties but also their mobilisation to facilitate access to resources. This can occur through collective action and there is overlap with political capital, although political capital also encompasses a broader dimension of influence over decision-making. **Individual and community levels:** Social capital is a resource that accrues specifically to individuals as a result of their networks or as a group-level asset (e.g. levels of trust and social cohesion) that provides benefits to a community's members irrespective of their own social ties. Some authors emphasise one or another of these constructions of social capital while others suggest synthesising the 2 whereby social capital comprises both group-level assets (e.g. community norms) and individual-level assets (e.g. membership of networks). The latter approach was taken in the ReCap project.
Human capital	Human capital refers to the skills and abilities of people and within organisations, as well access to outside resources and knowledge to increase understanding and to identify promising practices. It includes education, health (including mental health), physical ability, cultural competencies, disaster-related knowledge from experience and leadership skills and experience.
Political capital	Political capital refers to the power to influence decision-making in relation to resource access and distribution and the ability to engage external entities to achieve local goals. It includes agency, voice, justice, equity, inclusion, legislation, regulation, organisational frameworks, governance, leadership and policy. Political capital operates within groups as well as externally and exists both formally and informally. It also includes effective leadership (e.g. principles of inclusive and participatory decision-making and focusing on assets) and opportunities for people to express their viewpoints and to participate in collective actions that improve wellbeing.
Cultural capital	Cultural capital refers to the way people understand and know the world, and how they act within it. It includes ethnicity, stories, traditions, spirituality, habits, heritage, language, symbols, mannerisms, preferences, attitudes, orientations, identities, norms, values, cultural artefacts and sites and the process and end products of cultural and artistic pursuits. Cultural capital influences what voices are heard and listened to, which voices have influence in what areas and how creativity, innovation and influence emerge and are nurtured. It includes local understandings, subcultures and attitudes relating to disasters, which are shaped by collective experiences of disasters. It also includes gender roles in disaster contexts, and connection to place, land, Country and te taiao.
Natural capital	Natural capital refers to natural resources, beauty and the overall health of ecosystems. It includes air, land, soil, water, minerals, energy, weather, geographic location, flora, fauna and biodiversity. It is related to concepts of Country and te taiao. Ecosystems provide benefits to human health and wellbeing and support economies, as well as supporting nature. Natural capital includes assets of a particular geography regardless of whether they are native, 'untouched', introduced or artificially altered.
Built capital	Built capital refers to the design, building and maintenance of physical infrastructure in a community (or accessible to people living in the community) including its function and aesthetic value. It includes critical facilities and services, housing, public buildings, vehicles, roads, equipment, information technology, communications, water and energy infrastructure. Physical infrastructure is shaped by regulatory mechanisms and the ways in which they are implemented and responded to.
Financial capital	Financial capital refers to the availability of and access to financial and economic resources that influence the ability to prepare for and recover from events and that support the development of other forms of capital. This includes savings, income, assets, investments, credit, insurance, government support, emergency grants, donations, loans, consumption and distribution of goods and services, poverty, socioeconomic status, employment and economic activity. Financial and economic capital may be considered in relation to the resources available to individual people, households and communities with interactions across these levels. Community financial and economic capital includes resources available to invest in capacity building, to underwrite businesses development, to support civic and social entrepreneurship and to accumulate wealth for future community development.

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Get lost! Safeguarding lost tourists in wilderness environments

Peer Reviewed

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Abstract

People lost in the wilderness may be geographically disorientated, incapacitated or unable to return to places of safety. Tourists enter wilderness environments in pursuit of pleasure and leisure but sometimes things go wrong, and they become lost. Tourists have some unique needs dependent on their attitudes, behaviours, motivations and general lack of familiarity with the environment. These unique needs have been recognised in tourism disaster management literature but have not been addressed in search and rescue or lost-person literature. This paper reviews existing literature from the fields of tourism, search and rescue, preventative search and rescue, lost person behaviour, tourism disaster management and community engagement to propose a way forward for tourist safety research. One pathway is to deconstruct the event of a person lost in the wilderness into a series of linked phases. Deconstruction can inform theorists, practitioners and stakeholders about better ways to prevent and manage such events. This could benefit all stakeholders and provide empirical research grounded in established tourism, tourism disaster management and search and rescue theories.

Introduction

Tourists venture into wilderness areas in pursuit of leisure and adventure (Boller *et al.* 2010, Kortenkamp *et al.* 2017). They can be uniquely vulnerable due to their lack of familiarity with the environment, their touristic behaviours, their attitudes and barriers to effective communication (Faulkner 2013, Gurtner 2014, Jeuring & Becken 2013). People becoming lost (hereafter called 'lost tourist events') can threaten and damage perceptions of safety of the destination and its appeal (Jeuring & Becken 2013). Understanding people who become lost can provide clues to their whereabouts and possible behaviours (Syrotuck & Syrotuck 2000, Koester 2008, AMSA 2021). There have been many attempts to categorise lost people based on demographics, psychographics and behavioural patterns (AMSA 2021; Koester 2008; Twardy, Koester & Gatt 2006). However, there has been little work to identify and address the unique needs of lost tourists.

This article establishes what is and is not known about lost wilderness tourists through a review of relevant multi-disciplinary literature. The paper overviews key terms and establishes a definition for lost wilderness tourist. It discusses tourist-focused search and rescue (SAR) and preventative search and rescue (PSAR) and shows how tourism disaster management tools might be useful to understand and prevent lost wilderness tourist events. It establishes that lost tourist events are likely to be phase-based and might be best understood by examining stakeholder interactions before, during and after lost experiences. The paper synthesises the literature and suggests future research.

Method

Literature searches were conducted of major academic databases via the James Cook University library search engine using key words such as 'lost person', 'search and rescue', 'tourism', 'disaster', 'crisis', 'community' and 'disaster management framework'. Initial searches yielded around 300 relevant scholarly articles. These articles were imported into an Endnote database and screened for relevance. Results were grouped and the findings summarised.

Lost wilderness tourists

The Oxford Dictionary defines 'lost' as: 'unable to find one's way, unable to be found and unable to understand or to cope with a situation'. Lost person events may be triggered by geographic disorientation, inability to reorientate, inability to return to places of safety, misadventure, misunderstandings, psychological issues, injury, incapacitation or death (Boore & Bock 2013, Heggie & Heggie 2012, Hill 1998, Hung & Townes 2007, Pearce *et al.* 2019, Scott & Scott 2008).

Understanding lost wilderness tourists begins with defining the terms 'wilderness', 'tourist', 'lost' and 'lost wilderness tourist'. Boller and co-authors (2010) define 'wilderness' as natural environments that have not been significantly modified by human activity. In Australia, this includes rainforests, mountains, outback deserts, inland waterways and other remote settings (AMSA 2021, Whitehead 2015). Tourism literature provides a range of definitions for 'tourist'. The United Nations describes tourists as temporary visitors staying at least 24 hours for the purpose of leisure (Leiper 1979, p.393). Leiper (1979) advises that a tourist is a 'man away from his usual habitat'. Cohen (1974, p.533) defines a tourist as '…a voluntary, temporary traveller, travelling in the expectation of pleasure'. McCabe (2005, p.87) describes a tourist as '… a person who travels outside of his normal environment for a period of more than 24 hours'. Yu and co-authors (2012) suggest that tourists might simply be people who identify as such.

Thus, lost wilderness tourists might be defined as:

> *…people who make discretionary trips away from normal places of residence for longer than 24 hours, who engage in touristic behaviours in wilderness environments and are identified, by themselves or others, as a tourist who is geographically disorientated and/or unable to return to places of safety.*

Search and rescue theory

Searches are triggered when police receive notification of a lost person (Boore & Bock 2013, Harrington *et al.* 2018, Heggie & Amundson 2009, Phillips *et al.* 2014, Silk *et al.* 2018). When lost person events occur in wilderness areas then wilderness search and rescue (WiSAR) responses are launched (Doherty *et al.* 2014, Lin & Goodrich 2010). Searches aim to locate and recover lost people quickly and efficiently with minimum cost and minimum risk exposure (Doherty *et al.* 2014, Lin & Goodrich 2010). These typically involve predetermined actions organised in accordance with the knowledge, skills and abilities of search commanders and in accordance with search theory best practices (AMSA 2021, Lin & Goodrich 2010).

Academic interest in search theory dates back to the early 1900s as can be seen in *The Circular Track of Lost Persons* (Anonymous 1912). Since this early work, there has been an ongoing effort to develop and improve the accuracy of search theory as can be seen through the work of Koester (2008), Lin and Goodrich (2010), Sava and co-authors (2016) and Twardy, Koester and Gall (2006). Most extant WiSAR research literature focuses on searching for, locating, rescuing and recovering lost people (Abi-Zeid & Frost 2005, Al-Kaff *et al.* 2019, Kenneth 2012, Koester 2008, Sava *et al.* 2016, Syrotuck & Syrotuck 2000, Twardy, Koester & Gall 2006). This has arguably led to an action-focused and searcher-centric understanding of WiSAR events. Search literature is mostly quantitative in nature and focused on where lost people might be found and typically concentrates on geo-fencing (Doherty *et al.* 2014), probability modelling (Lin & Goodrich 2010), lost person behaviour modelling (Twardy, Koester & Gall 2006) or a combination of these methods (Sava *et al.* 2016). There is however, a small and growing body of work that examines how to prevent or minimise the consequences of lost person events.

Preventative search and rescue

Preventative search and rescue aims to reduce the frequency and effects of lost person events (Pearce *et al.* 2019, Spano *et al.* 2019). PSAR is an emergent field and an identified growth area for WiSAR. Boore and Bock (2013) sought to identify where and when people are likely to get lost. Pearce and co-authors (2019) sought to understand behaviour patterns that might lead to lost person events and Kortenkamp and co-authors (2017) identified areas for lost person prevention. Boore and Bock (2013) and Pearce and colleagues (2019) also identified that education can help prevent lost person events. Some of these findings have been employed to drive functional PSAR initiatives in places such as the California Yosemite National Park program, PSAR: Keeping You Safe in Yosemite.[1] Effective PSAR initiatives will also benefit wilderness tourism operators in Australia and New Zealand.

Lost tourists, tourism disaster and event phases

Tourism disaster literature recognises the value of holistic, phase-based approaches to event management. Faulkner (2001) produced a framework that breaks tourism disaster events into 6 phases with identifiable boundaries, distinct event response procedures and strategies. These phases are pre-event, prodromal, emergency, intermediate, long-term (recovery) and resolution. Faulkner's framework has been cited over 15,000 times in academic literature. It has also been tested in various disaster and crisis situations (Faulkner & Vikulov 2001, Gurtner 2014, Miller & Ritchie 2003) and has been shown to be generally robust. This phase-based approach is similar to the widely adopted Queensland Disaster Management Prevention, Preparedness, Response and Recovery (PPRR) model (Queensland Government 2018). It is the proposition of this article that an holistic, phase-based approach to understanding lost tourist events may be useful to SAR and PSAR academics, practitioners and stakeholders.

1. PSAR: Keeping You Safe in Yosemite 2021, at: https://yosemite.org/psar-keeping-you-safe-in-yosemite.

Lost person behaviour and event phases

Lost person behaviour models are concerned with the behavioural and psychological actions of people who are lost (Heggie & Amundson 2009, Hill 1998, Koester 2008, Lin & Goodrich 2010, Sava *et al.* 2016). Understanding lost person behaviour allows searchers to categorise lost people, predict likely locations of lost people, develop profiles of the lost people and anticipate possible behaviours and actions (AMSA 2021, Koester 2008, Twardy, Koester & Gall 2006). Theorists have developed lost person models that include up to 41 different groups but none of these models classify tourists as a unique subset of lost people.

The unique needs of tourists are well documented in tourism and tourism disaster management literature (Faulkner 2013, Gurtner 2014, Jeuring & Becken 2013). Jeuring and Becken (2013) call for more work to explain wilderness tourist behaviour. This indicates a need for tourist centric PSAR research that extends beyond searching and rescuing. Extending lost tourist knowledge beyond searching and rescuing might reduce the frequency and severity of lost person events. This reduction could be achieved by learning about risky tourist behaviours, developing tailored responses and creating post-event feedback loops.

Teams conducting search and rescue operations near Tully, Far North Queensland.

Source: Steven Schwartz

Community engagement

Community engagement is frequently discussed in both tourism disaster management and risk reduction. Community engagement can also be useful when addressing the needs of tourists (Bulley 2013; Kolopack, Parsons & Lavery 2015; Titz, Cannon & Krüger 2018) but communities can also have negative effects (Brint 2001, Titz, Cannon & Krüger 2018). Effective intervention requires community identification and appropriate intervention strategies. This can be achieved by uncovering structural complexities and hidden features and developing appropriate community-based intervention strategies (Barrett 2015). This approach has been effective in social policy (Barrett 2015, Titz, Cannon & Krüger 2018) and consumer behaviour theory development (Schouten & McAlexander 1995) and has potential in PSAR theory development.

Identifying different communities and groups that may be involved in lost tourist experiences through each phase may give SAR and PSAR practitioners more effective intervention and response tools. Search and rescue literature shows that communities seek to connect with lost parties during the action phase of search events (Koester 2008, Sava *et al.* 2016, Twardy, Koester & Gall 2006, Whitehead 2015). The literature also shows attempts to connect with people to prevent them from becoming lost (Boore & Bock 2013, Pearce *et al.* 2019, Spano *et al.* 2019). Counterproductively, Kortenkamp and co-authors (2017) identified negative community-based peer pressure can lead to poor decision making in some lost person behaviour.

Discussion

It may be possible to extend SAR and PSAR theory through multi-disciplinary literature and through empirical research. New insights might be achieved by taking an holistic, phase-based approach to lost wilderness tourist event management. This approach has been shown to have value in tourism crisis management and in emergency management planning.

A review of literature identified that SAR and PSAR theory:

- is dominated by work that focuses on how to best conduct search and rescue or recovery operations
- is underdeveloped
- could be extended by developing pre- and post-event knowledge.

Tourism literature shows that tourists have unique needs that can lead to WiSAR events, that tourists are not considered unique by lost person behaviour theorists and that more wilderness tourist risk research is needed. Community literature shows that various stakeholders have different roles during tourism disasters phases and that it might be expected that tourists and communities have different needs and roles throughout lost wilderness tourist events

Examining interactions throughout each phase might identify the types of communities that wilderness tourists interact with and the influences these communities might have. A phase-based approach allows researchers to explore tourist interactions with communities and could lead to phase-appropriate interventions. Having a better understanding of the interactions between lost tourists, searchers and communities before, during and after lost wilderness tourist events might help identify better preventative interventions, better response procedures and effective feedback learning loops. PSAR practitioners could maximise the benefits of these interactions and minimise any negative effects. This offers the potential for PSAR initiatives that reduce or minimise the effects of WiSAR events and their associated costs and traumas.

Conclusions

Based on a literature review, this study proposes linking SAR research with tourism disaster research and adopting an holistic, phase-based approach to PSAR research that extends from pre-event to recovery and considers stakeholder interactions. This approach provides novel insights into the prevention and management of lost wilderness tourist events. It might also help develop a better understanding of the interactions between lost people, searchers and the extended stakeholder community. Linking SAR theory to tourism disaster theory could ground lost tourist experiences within the tourism disaster literature. This benefits tourists, search teams, wilderness area managers, tourism providers, educators, theorists and stakeholder communities. Benefits come from increased understanding of lost wilderness tourists, research-based policies and practices, reduced trauma, improved consumer confidence in wilderness tourism and improved demand for related goods and services.

Empirical research could develop a framework that is similar to Faulkner's (2001) disaster management framework or Queensland's PPRR model. This framework could drive tourist-specific PSAR interventions and SAR responses. This article focused on the needs of lost tourists because tourists are socially and economically important and because their unique needs have been overlooked in existing literature. There are other unique groups and, once a model is developed for tourists, it may be possible to develop the model to improve PSAR interventions and effectiveness for other groups of lost people such as children and the elderly. Future research could investigate the interaction between various lost person groups and community stakeholders through each phase from pre-event to resolution. This could lead to new insights that could be implemented before people become lost. There will always be a place for skilled search coordinators and trained searchers in the search process but, ultimately, prevention is always the best option.

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About the author

Steven Schwartz is a researcher with the Centre of Disaster Studies at James Cook University. He has been involved in numerous search and rescue operations in Far North Queensland, Australia.

Abstract

The bushfires of the 2019–20 summer were followed by a global pandemic. Both events highlighted the importance of skills of emergency managers and their importance in the response to and recovery from these and other emergency events. In Australia, the Royal Commission into National Natural Disaster Arrangements was conducted with the bushfires as a background event and, at the same time, the initial response to the COVID-19 pandemic outbreak. Findings of the royal commission addressed a range of areas including the capability building of emergency managers. These are underpinned in part by the education, training and experience of emergency managers who will implement the royal commission's findings in the years to come. Education, training and experience are aspects of the human capacities of the emergency management leader and each emergency manager is different. Capability is based on recruitment, education, training, development and experience built up over time. This paper arises from a larger study of the human capacities of emergency managers and examines the supporting education and training opportunities available within the Australian education and training system and how they are affected by the concept of experience. This paper contributes to the understanding of the suite of human capacities required by emergency managers in Australia. The paper draws on research that examines human-capacity lessons from previous events that can develop emergency managers. This paper builds on a previous paper that examined certification for emergency management leaders.

Professionalism: education and training for emergency management leaders

Peer Reviewed

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Introduction

In Australia, most communities have been affected by an emergency or hazardous incident at some point in their history. Emergency events range from individual accidents to the effects of bushfires, floods or the currently occurring pandemic. The people who manage these events (emergency managers) require knowledge, skills and abilities (human capacities). These human capacities allow the emergency manager to lead the prevention of, preparation for, response to and recovery from emergency events. This study examined aspects of the emergency manager and exposes education, training and experience as a concept in human-capacity building. Aspects of education, training and experience are explored within the broader consideration of emergency management 'professionalism'.

The literature examined during this study was broader than 'emergency management literature' in recognition of the applicability of human resource development. The literature review focused on Australian training and education and the systems used in delivery. This is compared with concepts of experience that people gain outside of the formal frameworks.

Dippy (2020, p.56) noted that the terms 'incident management' and 'emergency management' are often used interchangeably in Australia, but that 'emergency management' was defined to include all aspects of the prevention of, preparation for, response to and recovery from an emergency. This use of emergency is broader than the use of incident that focuses on the response and recovery aspects of the emergency. For the purposes of this paper, the term 'emergency manager' is used in recognition of the broad role of the emergency manager in prevention, preparedness, response and recovery phases.

The concept of professionalism is complex. Dippy (2020, pp.57–58) provides a full description of the pathways to professionalism. For the purposes of this article, professionalism is associated with the completion of formal qualifications (Dippy 2020, p.57). In particular, this paper focuses on the completion of vocational emergency management qualifications within Australia as one aspect of professionalism.

Definitions

The Macquarie Dictionary describes 'education' as a systematic acquisition of knowledge whereas 'training' is a process of learning the skills that are needed for a particular job.

Australian Qualification Framework

In Australia, education and training are delivered within the Australian Qualification Framework and its delivery sectors. The Australian education and training system is underpinned by the Australian Education Framework that:

- accommodates diversity in education and training
- supports consistent outcomes
- provides pathways for students
- supports lifelong learning
- enhances student mobility between workplaces and industries
- enables alignment with international systems (Australian Qualifications Framework Council 2013, p.8).

The framework provides for 10 levels of education and training starting at a Senior Secondary Certificate level (often the final year of school for many students) and builds through another 10 levels of further education and training. Each level equates with a standardised type of qualification with Level 1 of training equalling a Certificate 1, a Level 7 equalling a Bachelor degree and a Level 10 equalling a Doctoral degree (Australian Qualifications Framework Council 2013, pp.14–18). While the framework is based on a taxonomy of levels (see Figure 1), the levels do not need to be completed in an order and many people will work towards different levels of qualification depending on their needs and abilities. While the levels of education are set by this framework (Australian Qualifications Framework Council 2013, pp.12–17), it also applies to the content that is delivered in ensuring the standards are applied and training accredited to each of those levels.

The delivery of the 10 levels of education is achieved by accredited organisations delivering training and education within approved levels and qualifications. Schools teach the Senior Secondary Certificate level and are now also issuing, often in partnership with other education providers, some Certificate 1 and 2 qualifications. The vocational education and training sector includes providers such as South Australian Technical and Further Education colleges and jurisdictional equivalents (e.g. Canberra Institute of Technology), registered training organisations that provide level 1–8 qualifications and universities and tertiary organisations providing level 5–10 qualifications (Australian Qualifications Framework Council 2013, p.21). Overlap of vocational and tertiary education facilitates movement between sectors and provides a wider range of education and styles for students.

Vocational sector

Within this framework of training in Australia sits the vocational training and education sector and its component parts. The primary part applicable to emergency managers is described

Figure 1: Australian Qualifications Framework.

Source: Australian Qualifications Framework Council (2013), pp.19

within the Public Safety Training Package, which includes qualification levels from Level 2 (Certificate 2) to Level 8 (Vocational Graduate Certificate) in industry-wide areas and sector-specialty areas including fire, police, state emergency service, biosecurity and oil spill (Commonwealth of Australia 2018, pp.32–36). This package addresses the skill needs of 506,000 volunteers and career personnel across Australia (Commonwealth of Australia 2018, p.100). A training package is defined as a set of individual competency standards including their assessment guidelines. Packages of competencies that make an accredited qualification are documented and presented in such a way as to ensure consistency, reliability, flexibility in training and assessment leading to verifiable outcomes (Commonwealth of Australia 2018, pp.96–97). The Public Safety Training Package recognises that the knowledge, skills and attributes required of people who operate in emergency management are broad and not able to be documented in one package of learning. To this end the Public Safety Training Package includes parts of other training packages from areas such as agriculture, business services, community services, property services, forestry, health, information and communications, local government, water, public sector management, sport and fitness, tourism, training and education, maritime and transport and logistics (Commonwealth of Australia 2018, pp.73–79).

Tertiary sector

The tertiary education sector includes Australian qualification level 5 (Diploma) to 10 (Doctoral) and is regulated by the Tertiary Education and Quality Standards Agency (TEQSA) (Tertiary Education Quality and Standards Agency 2017a). The TEQSA maintains a register of self-accrediting and non-self-accrediting providers. All Australian universities are self-accrediting and 113 other providers are accredited by the TEQSA (Tertiary Education Quality and Standards Agency 2017b). Each of the self-accrediting providers determines, accredits and delivers qualifications as per the Australian Qualifications Framework. Non-self-accrediting providers must have their courses accredited by TEQSA (Tertiary Education Quality and Standards Agency 2017c). This process of accreditation allows a range of qualifications to be issued within the tertiary system. Each will have a different focus with some contained in a central register and others available on university websites.

The application of the levels of training are described within the Australian Qualifications Framework. This framework describes how the knowledge and skills are applied at each level and this leads to industry alignment of tasks to levels within an organisation (Australian Qualifications Framework Council 2013, pp.14–17). In summary, the qualification levels are applied with Certificate 2 and 3 (levels 2 and 3) often required for team members, Certificate 4 (level 4) for team leaders and the Bachelor degree (Level 7) and above qualifications being applied to levels of management.

Experience

Qualifications and the 2 educational sectors that deliver them are well described, regulated and split into delivery sectors with defined roles and levels of training mapped to levels of qualification. However, experience is not well described in the literature or emergency management systems.

The Macquarie Dictionary describes ‘experience’ as:

- knowledge or practical wisdom gained from what one has observed, encountered or undergone
- the process of personally observing, encountering or undergoing something
- encountering or undergoing something.

These descriptions draw out aspects of knowledge, skills and having previously undertaken a task. However, unlike qualifications, the concept of experience does not address the scope of the knowledge, the amount or level of skills displayed or the appropriateness or outcomes of the past completion of the task. This definition of experience is vastly different from a qualification that describes skills demonstrated and the scope of how those skills have been applied.

Experience is difficult to describe and quantify with descriptors based on duration of activity or number of repetitions. Descriptors of experience do not address level, standards or duration of skill demonstrated. The repetition count method of simply counting the number of repetitions, could identify multiple repetitions but at a very low skill level and without any complicating factors. The duration of activity description leads to a colloquial statement of ‘50 years of experience or 1 year of experience repeated 50 times’.

While qualifications are used as a discriminator in employment decisions, experience is often considered as a beneficial and valuable recruiting tool (Cully 2005, p.7, O'Donnell & Dunlap 2014, p.611, Ridoutt *et al.* 2005, p.7). Experience is shown to improve the skills of a qualified person (Haas, Orav & Goldman 1995, p.1090; Ridoutt & Hummel 2005, p.63) and improves knowledge of the person (Nass 1994, p.47). It improves the general economy (Jenkins 2017, p.445) and is deemed to be critical in teaching roles (Smith 2013, p.30).

The concept of experience can be broken into 2 parts. These are:

- skills developed while obtaining qualifications, constrained by the education and training environment
- skills obtained outside of the training environment that are not so constrained.

There may be confusion with these sets of skills as it is often considered that there is a link between the concepts of qualifications and skills. As such, it may be inferred that qualifications are a proxy for skills. This link of qualifications and skills is not as clear as may be first thought. It has been shown not to be the case in a study of literacy skills (Massing & Schneider 2017, p.22). However, training and support has been directly linked to effective emergency management self-efficacy (Kim *et al.* 2012, p.1156).

Role of education, training and experience in professionalism

This paper does not explore the language that underpins the use of the term 'professionalism' in detail, nor does it explicate the use of the occupational terms of 'vocation' and 'profession' when applied to emergency management. Professionalism is used as a label to describe the outcome of the process of professionalisation (Birkett & Evans 2005, p.101). The use of occupational descriptors of vocation and profession is not static in the literature nor in the occupations that form the emergency management field. The term 'blue-collar professionalism' (McCann *et al.* 2013, p.754) is a variation previously used for ambulance officers in the United Kingdom who abided by the ethos of public service and had some autonomy but whose work was not entirely consistent with a profession in that they did not enjoy levels of autonomy of practice available to a recognised profession (McCann *et al.* 2013, p.760). While blue-collar professionalism was previously used for ambulance officers, the occupation has since been recognised as a profession in Australia (Australian Health Practitioner Regulation Agency 2018). De-professionalisation occurs from declining community prestige (Freidson 1984, p.4) or loss of control over the body of knowledge (Gorman & Sandefur 2011, p.281) The literature shows inconsistencies in the use of words describing the occupational status of people within the emergency management sector. What is consistent when reviewing the use of these words is the foundation of each with an amount of education, training and/or experience. Thus, the term 'professionalisation' describes the deliberate journey aimed at changing the occupational recognition from vocation to profession, acknowledging the functions, skills and attributes that apply to a profession. The terms 'professional' and 'professionalism' describe a level of service delivery applied by a person regardless of the label applied to their respective occupation.

Emergency management training and education in Australia

Australian vocational emergency management qualifications are predominately delivered against the Public Safety Training Package (not explored in this paper). This package contains 31 qualifications from Certificate 2 (Level 2) to a Graduate Diploma (Level 8) in topics including aquatic rescue, firefighting, emergency management, community safety and crisis leadership (Department of Education Skills and Employment 2020). Potential students of these qualifications include fire and emergency services agencies as well as other response agencies such as health, biosecurity, police and organisations that undertake recovery operations. Across the range of qualifications delivered under this package of training over the period 2017–19 a total of 9,236 qualifications were issued in Australia. Table 1 provides a breakdown of Public Safety Qualification levels by year.

1. It is noted that figures contained within tables 1 and 2 are sourced from publicly available data. It is acknowledged that industry-produced data are being compiled in 2022 that shows this public data may under report the statistics that are publicly available. This new data, once verified, may affect the outcomes described in this paper.

Table 1: Public Safety Qualification completions for 2017, 2018 and 2019.

Qualification	2017	2018	2019 (Preliminary)	Total
Certificate 1	0	0	0	**0**
Certificate 2	1,489	2,387	2,791	**6,676**
Certificate 3	350	356	651	**1,372**
Certificate 4	159	78	202	**451**
Diploma	102	107	136	**352**
Advanced Diploma	91	145	149	**385**
Total vocational qualifications	**2,191**	**3,073**	**3,929**	**9,236**

Source: VOCSTATS, extracted on 24/12/2020

Table 1 lists the totals of qualifications and relate to many agency-specific or hazard-type qualifications such as firefighting and state emergency services operations. The Certificate 2 and 3 qualifications are in areas applicable to the training of new members who undertake team member type roles. The Certificate 4 is applicable to people with leadership roles and align with the Australian Qualifications Framework.

There are 2 qualifications specific to emergency management that are issued under the training package. They are the Diploma (Level 5) – Diploma of Public Safety (Emergency Management) and the Advanced Diploma (Level 6) – Advanced Diploma of Public Safety (Emergency Management). These qualifications were reviewed and updated in December 2020 (Department of Education Skills and Employment 2020). For 2017–19, the total of dedicated emergency management qualifications issued in Australia was 562. Table 2 provides a breakdown of qualification levels by year for emergency management qualifications only).

Table 2: Dedicated emergency management qualification completions.

Qualification	2017	2018	2019 (Preliminary)	Total
Diploma	76	77	78	**233**
Advanced Diploma	88	121	123	**329**
Total vocational qualifications	**164**	**198**	**201**	**562**

Source: VOCSTATS, extracted on 24/12/2020

Based on the Australian Qualifications Framework application of qualifications, these broader emergency management qualifications are suited to people moving from agency-based leadership (Level 4 qualifications) to agency-management roles.[1]

Manock (2001, pp.4–6) described the development of tertiary emergency management in Australia since it commenced in 1993 with an Associate Diploma (approximately equal to the Australian Qualifications Framework Level 6) in one Australian state to a range of qualifications at the Degree (Level 7) to Masters (Level 9) being delivered by multiple tertiary institutions.

In particular, Manock (2001) noted that the development of tertiary education was required as 'the provision of workplace related training courses, seminars and conferences is only a part of the educational support required by emergency management organisations and personnel' (p.5). Manock (2001) concluded that further work was needed to develop better alliances between education providers and industry to 'enable tertiary educational institutions to provide programs that would benefit the emergency management community, improving their professionalism, capabilities and service to the community' (p.6).

The Generic Emergency and Disaster Management Standards (GEDMS) were developed in 2017 after an extensive review of emergency management tertiary education being delivered in Australian and New Zealand (FitzGerald *et al.* 2017). The GEDMS were developed in recognition for a need for an 'evidence based curriculum designed to inform tertiary emergency and disaster management programs' (FitzGerald *et al.* 2017, p.4). It was noted that without standards many providers of tertiary education were focusing on the context brought to the programs by those who developed the material (FitzGerald *et al.* 2017, p.4). The GEDMS outlines that tertiary training should address domains of knowledge, skills and application to support the development of tertiary education programs for emergency managers for Degree (Level 7) qualifications and above.

Vocational and tertiary education is not static in the content delivered. Already in 2022, there are 2 projects underway in Australia to amend the Public Safety Training Package. The first project is developing improved recovery training for recovery practitioners including specific units of competency and full qualifications. The second project is providing further units of competency for the Diploma and Advanced Diploma of Public Safety (Emergency Management) and a further specific emergency management qualification at the Certificate 4 level (Australian Industry Standards 2022).

Discussion

The 2018 Public Safety Training Package was delivered to 560,000 volunteers and sector staff (Commonwealth of Australia 2018, p.100). However, the training records show that only 9,600 (see Table 1) people obtained qualifications over a 3-year period (about 2%). Taking that further, only 562 (or about 0.1%) of those people undertook dedicated emergency management training over the same period (see Table 2). There are no data showing the completion of tertiary training but it is contended that this would be a lower number of completions than for vocational training.

These reported training numbers do not include any training delivered to the sector that involves individual units of competency or parts of qualifications from the Public Safety Training Package. Part qualifications may or may not be delivered through other accredited and non-accredited training from other training packages or specific industry training regimes. A full training audit of every member in the public safety sector would be required to determine the total training delivered and the source of their training standards, which is beyond the scope of this review. Individual agency application of part qualifications to suit business need is also not within the scope of this paper. However, this aspect should be considered for further research to support the ongoing review process of vocational and tertiary qualifications.

The numbers of qualifications delivered does not describe the state of the emergency management workforce, as the numbers given are for new qualifications issued. These numbers do not address the total number of people who have been issued with these qualifications over time. The rate of take-up of vocational training in Australia, as shown by publicly available data, does not appear to support the aim of professionalisation within the emergency management sector and will not support an increase in certification. Increasing the completion of education and training qualifications is one aspect that would allow emergency managers to support professionalisation of their industry. While vocational and tertiary education, training and experience cater for different roles within emergency management, they can be sought by a range of individual emergency managers.

Conclusion

Emergency management in Australia is moving down the path of professionalisation. What the outcome will be is not yet agreed and should be considered both in further research and industry engagement. Professionalisation is supported by qualifications, training, education and experience. While vocational and tertiary qualifications have been developed and are constantly being reviewed and refined, unfortunately, broad agreement and adoption of qualifications, training, education and experience has not occurred. This paper supports emergency management professionalisation but further research is required. In particular, noting that industry data and publicly available data may not be consistent, future research should seek to address data standards in the recording of emergency management education packages. If improvements are to be made in emergency management qualifications, it is incumbent on emergency managers to consider their ongoing training, education and experience as part of professionalisation.

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Abstract

Catastrophes present leaders with complex and significant challenges that they have not previously experienced nor have had time to deeply analyse. Leaders must collaborate and demonstrate agility. To develop such leadership skills, it is useful to reflect on the experiences of people who have faced catastrophe before. This paper examines the leadership of Major General Alan Stretton AO, CBE in the aftermath of Cyclone Tracy in 1974. Alan Stretton's personal accounts and archival interviews with other leaders were reviewed as source material. These showed that he demonstrated decisiveness and courage and 'over-responded' if necessary. He worked collaboratively with community leaders and acted in a confident, empathetic and reassuring manner. He led with agility and with a focus on an overarching plan. He prioritised communication with the community and negotiated political challenges. Lessons from this experience can help to guide leaders who may be called on to lead during times of future disaster events.

Leading through crisis: the leadership experience of Major General Alan Stretton

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Introduction

Disasters pose unique challenges to leaders. t'Hart (2014, p.172) describes the decision-making pressures:

> *Leaders need to take highly consequential decisions in a context in which they can't get the experts to study it for a few months. They have to act much faster than governments normally act. And often that acting involves doing quite unpleasant things, or disappointing a lot of people, or making tough decisions about the allocation of scarce resources.*

To identify these pressures, a review of literature in respect of emergency management was conducted to examine the experiences of Major General Alan Stretton in directing the initial response to Cyclone Tracy landfall in Darwin in 1974. This case study outlines decision-making in extremis.

Literature review

Comfort and Kapucu (2006) argue that successful management of catastrophe requires an ability to rapidly assess and adapt and to use open-minded decision-making, rather than relying on bureaucratic systems and procedures. Good management must allow for innovation, collaboration, trusting relationships and the suspension of rules, where necessary (Kapucu & Van Wart 2006). In Australia, and across the globe, few emergency managers will have had experience of facing a truly catastrophic disaster. Yet, emergency managers rely on their previous experience and training and may fail to adapt their methods of managing (Comfort & Kapucu 2006).

Gissing (2016) indicates that ways of responding to emergencies that routinely work for business-as-usual events will be quickly overwhelmed and rendered ineffective during catastrophic events. Community members often take on roles as first-responders and, commonly, groups like service

provider personnel, media and volunteers will converge into the affected area. Often the success of the response is reliant on the capacities already present in communities (Tierney 1993).

No single organisation is capable of responding to all aspects of a catastrophe. Boin & Bynander (2015) state that there is a need to integrate and coordinate operations of large numbers of disparate organisations. A collaborative model of interacting organisations may be able to adapt more appropriately to threats than individual organisations acting alone (Comfort & Kapucu 2006, Waugh & Streib 2006). Integration also needs to happen quickly, as contemporaneous and conflicting demands for services add further pressures (Comfort & Kapucu 2006).

However, efficient cooperation between organisations cannot always be guaranteed. In 1919, during the Spanish Flu pandemic, the Australian experience was that jurisdictions cooperated on border security and quarantine, but, following disputes, cooperation was abandoned with each state imposing its own policies (Curson & McCracken 2006).

It is argued that plans should allow for decentralised decision-making (Kapucu & Van Wart 2006, Boin & McConnell 2007) that allows for flexible, improvised and networked responses that the centralisation of decision-making inhibits (Boin & t'Hart 2010, Tierney 1993). Decentralised models recognise emergent group behaviours and local response capacity. Thus, preparedness is built on existing social structures and support networks (Dynes 1990, Howitt & Leonard 2006). According to these authors, excessive reliance on rigid, centralised and top-down decision-making in times of disaster response is liable to be fraught as centralised decision-makers are unlikely to hold sufficient knowledge that is available at the local level. This is especially so in the early phases when information maybe scare or unreliable (Kapucu & Van Wart 2006, Boin & t'Hart 2010). Leaders may be unavailable or uncontactable (Comfort & Kapucu 2006) and decision-makers may become overwhelmed by competing priorities and the complexity of the event.

There is tremendous challenge in building leadership skills and experience in the context of catastrophic events. Therefore, reflection on how previous leaders have coped when faced with complex and overwhelming circumstances is helpful (Ellis & MacCarter 2016, Stack 2017). Such reflection can assist emergency managers to move beyond their previous experiences and habits (Stack 2017). This is a critical component of lessons management. With this in mind, we re-examine the challenges, leadership and organising methods adopted in the immediate response to Cyclone Tracy in 1974. This paper includes discussion of leadership and strategic elements that were demonstrated.

Methods

This research used autobiographical accounts from Major General Alan Stretton to construct the events he was involved in following the landfall of Cyclone Tracy; primarily his book, The Furious Days (Stretton 1976). Other descriptions of the event were sourced from published literature and archival material to cross reference facts and add to the case study. Oral history transcripts from the Northern Territory Library and Archives were accessed about other individuals involved in the immediate relief efforts.

Cyclone Tracy, 1974

Cyclone Tracy, arguably one of Australia's most severe and challenging natural hazard events, destroyed the Northern Territory capital of Darwin on Christmas day in 1974. The cyclone was first observed on 20 December 1974 and, at times, seemed unlikely to reach Darwin. However, on Christmas eve, the cyclone shifted course directly for Darwin and struck just after midnight on Christmas day (Vardanega 1984). Sixty-five people were killed and 140 were admitted to hospital with injuries (Stretton 1975b).

Darwin is a remote city located at the top of the Northern Territory. In 1974, the Northern Territory was administered by a commonwealth department and was under direct legislative control of the Australian Government (McNamara 2012). There was no territory-level bureaucracy that could have assumed control as though the disaster had occurred in a different jurisdiction (Britton & Wettenhal 1990) and disaster management arrangements were being developed (Vardanega 1984). Darwin's population was approximately 45,000 people and few had previously experienced a cyclone.

At that time, Alan Stretton was the head of a newly formed National Disaster Organisation (the equivalent of today's Emergency Management Australia). He had wide military experience having served in World War II, Korea, Malaysia and Vietnam. He was described by a Darwin local as being an imposing figure, being physically tall and having an 'air' about him (Wilson 1979).

The National Disaster Organisation was formed in August 1974 with only a small staff of 15 (Stretton 1975a) and had little experience dealing with large-scale disasters (Britton & Wettenhall 1990) and was still exploring its mandate (Emergency Management Australia 2005). Cyclone Tracy was the organisation's 'baptism of fire' (Jones 2019). The organisation's role was to coordinate national efforts with other state-based and voluntary agencies during major natural disasters or other civil emergencies (Jones 2019). The National Emergency Operations Centre was opened and exercised for the first time in October 1974 (Jones 2010).

Initial decision-making

Warnings of Cyclone Tracy issued on 24 December by the Bureau of Meteorology warned that the cyclone was imminent and advised residents about preparedness measures to be taken. Given it was Christmas eve, many families were attending religious ceremonies or family events. At this time, the National Disaster Organisation was also providing support to the NSW Government that was fighting large-scale bushfires occurring in western parts of NSW (Thorogood 1990, Stretton 1975b).

Cyclone Tracy struck Darwin in the early hours of Christmas day with wind gusts estimated at 250 km/hour. In the hours following, communication between Darwin and the outside

world was intermittent. Initial reports were that 90% of the city and suburbs had been destroyed.

Alan Stretton was advised of the disaster at 6:20 am at his home in Canberra (Stretton 1975b). The National Disaster Organisation duty officer phoned him to relay a message from the Bureau of Meteorology Perth office that Darwin had been hit. No further details were known at the time. As detailed by Stretton (1975b), his immediate thoughts were about what might have taken place during the evening and what still might be unfolding. His questions included: were there casualties? If so, how many? What was the damage? Could local emergency services cope? Was the airfield serviceable? What was he supposed to do?

His initial decision was to seek further information about reports from Darwin. He called the police station in Darwin and was connected even though most communications were hampered. He gained a small amount of information about damage to the police station and hospital before his phone call dropped out. Stretton and his staff continued to try to contact Darwin but it was not until midday that direct communications were successful (Stretton 1975b, Vardanega 1984). Even then, situational awareness was poor and some information was conflicting, for example, some reports described immense impacts while, initially, media reports indicated no causalities.

Despite this uncertainty, Stretton immediately initiated actions to commence a large-scale relief effort. He activated the National Emergency Operations Centre, ordered aircraft to be ready and requested medical supplies, stretchers, cooking equipment and food. Later in the day, he made arrangements for the Australian Navy fleet to assist and head to Darwin. He communicated with internal and external groups, including staff from his team and sections within the Department of Defence to pass on information and also seek information.

Stretton acted decisively and in a proactive fashion in an environment of huge uncertainty. He did not hesitate. He showed a willingness to over-respond, in recognition that a proactive response was vital to achieving on-the-ground initiative and effect in Darwin. Stretton reflected on this decision-making, saying:

> *Certainly, the failure of communications from a number of different agencies confirmed that the damage was widespread and extensive, but wouldn't it have been prudent to wait until communications had been re-established and a proper damage assessment had been received? If the early reports were exaggerated, as often they are in the early stages of a disaster, I had over-reacted and had spoilt Christmas Day for hundreds of people who had been called back from leave. But if my assessment was right and Cyclone Tracy had caused a major disaster, I had probably saved the best part of a day in valuable time and more importantly, saved valuable lives.* (Stretton 1976, p.27)

He also had to brief politicians. This was initially problematic and wasted precious time as the then Prime Minister was on leave and Stretton did not have the private contact details of the Deputy Prime Minister. Stretton could only communicate with his own minister, the Minister for Defence, through a private secretary. Initially he had no ministerial backing for the decisions he was making, although this was granted several hours later. It was decided that Stretton would travel to Darwin to gain a better appreciation of the scale of the disaster. It is only on the flight to Darwin that Stretton learnt of the government's plans to place him in charge. It was not the responsibility that he had originally foreseen, especially as he did not have a lot of prior knowledge of Darwin. He recognised that he had no legislated mandate to take control.

Arrival in Darwin

Stretton arrived in darkness and rain at 10:20 pm. He travelled into Darwin to find the Police Commissioner and the Secretary of the Northern Territory. On his trip through what was described as the 'unrecognisable city' (Thorogood 1990), he again asked himself: where were all the people? Where to start? How to get water and food distributed to so many? How many casualties were there?

He considered whether the best way to deal with the situation would be to call in the Australian Army but then rejected this idea. He knew that every additional person brought into Darwin would be another mouth to feed and it would take several days until the armed forces could be mobilised and arrive on-mass.

Stretton arrived at the police station to find parts of it already turned into a temporary mortuary and many shocked and crying people gathering. Many of the officers on duty had been badly affected by the cyclone. From his discussions with the Police Commissioner and the Secretary of the Department of the Northern Territory, Stretton pieced together that most people were probably homeless, some had moved to schools seeking shelter, the hospital was full, all essential services and utilities were down and a meeting of local officials had occurred. There had been some progress throughout the day in locating bodies and attending to injured people, but much work was still to be done (McLaren 1979).

There is some debate as to who made the decision to evacuate but there was an agreement that a major evacuation was required (Thorogood 1990, Cunningham 2014, McHenry 1979), although its extent would need to be evaluated in daylight after further reconnaissance. The evacuation decision received criticism in later years (Britton & Wettenhall 1990) but senior officials defended the decision (McLaren 1979, McHenry 1979).

Stretton's main concern was the shock felt within the community. He decided that Darwin would need to be restored by the local community using local capabilities (Thorogood 1990). After the initial meeting at the police station, he reflected:

> *I thought if I allowed the people of Darwin to remain in the rubble for several days that serious morale problems would develop. The whole city had to be given the challenge. I decided, therefore that if the 45,000 people of Darwin were to be saved, they would have to do it*

themselves. This would give them a challenge worth fighting for. If troops were called in, I felt the population would remain where it was, despondent, with little hope for the future, and that this would lead to a drop in morale with resultant health and administrative problems that could lead to further loss of life. My decision was that the Armed Forces would be confined to a supporting role by helping with the fly-in and provision of essential stores and a few key personnel, but that responsibility for the organisation and handling of the enormous local problems would rest with the people of Darwin, under my leadership. (Stretton 1975b, p.49)

Stretton establishes control and rallies the community

At 9:00am the next morning, a day after landfall, Stretton attended his first coordinating conference. His first task was to gain the acceptance and confidence of local officials. This was aided by strong support given by local senior Australian Government bureaucrats who chaired this initial meeting (Thorogood 1990). Stretton also repeated that his position was that of 'supreme commander' reporting directly to the Prime Minister. He later claimed that some people only followed his instructions because they thought such powers were legitimate (Truth Staff Reporter 1975).

Stretton presented himself not as a Major General in military uniform but an experienced leader, dressed in casual clothing, looking similar to many others on the committee. He announced that he did not intend to take over from local authorities and would stay only until satisfied that a local coordination structure was functioning (Thorogood 1990). At this first meeting, a coordinating structure of different committees was expanded using a strengths-based approach. For example, Stretton understood that people most likely in need of evacuation were at local schools and that schools had become important coordination points. Based on this, the Education Department was appointed to lead the evacuation committee.

The management style used was collaborative, not one of command-and-control. Decision-making was described as a 'consensus of opinion' (McLaren 1979). Stretton was said to have been clear and concise and knew what he wanted (Wilson 1979). The Australian Broadcasting Commission manager described that Stretton acted with great respect and was never shy to ask questions (Sanders 1979). Coordinating conferences were depicted as:

> *The meetings never went long enough for there to be minutes. They were very good meetings; they were functional meetings; people came in – few could sit because there wasn't room – we simply quickly took reports* (Thorogood 1990, p.16).

Initial actions commenced for the evacuation. Priorities were established and sick and injured people and pregnant women were evacuated first. Receiving centres were established in other capital cities in Australia. Decisions were also required regarding the donation of goods and how to respond to international offers for assistance.

The local radio broadcast capability had been damaged and Stretton put a high priority on re-establishing communications. He stated:

> *If morale was to be restored, it was imperative that the population be kept informed as to the measures being taken* (Stretton 1976, p.56).

Media conferences were held twice a day. Stretton (Stretton 1976, p.91) reflected on his initial advice to media when establishing the rules of engagement:

> *For my part I would give them an undertaking that I would keep them informed of events as they happened; I would not conceal anything from them and I would always be available to give them an honest answer to any rumour they might pick up.*

With the consent of the relevant Australian Government ministers, normal regulations and purchasing procedures were suspended, to streamline the buying and delivery of resources (Stretton 1975b).

The politics

All disasters have a political interface and Stretton had to manage this as well as the relief operations. This was particularly important given that his role had no legal standing. He was very much reliant on the backing of the then acting Prime Minister. On occasions, Stretton unknowingly came between political opponents, for example, the Minister for Defence and the acting Prime Minister.

Political interference annoyed him. He described an angry exchange with a visiting Queensland Senator whom Stretton threatened to remove from Darwin. Various cabinet ministers were travelling to Darwin and Stretton hoped they would not issue conflicting directions to that of their departments. He stated:

> *They had no idea of the local situation and being ministers, some of them acted characteristically by starting to give instructions that ran contrary to what I was trying to achieve.* (Stretton 1976, p.102)

Stretton raised the issue of political interference with the then Prime Minister Gough Whitlam when he visited Darwin to view the damage:

> *I informed him that I was concerned because I found it necessary to countermand the orders of some of his Ministers. His reply was sympathetic. With a knowing smile, he said 'Don't worry Alan, you have my support – I have to work with them all the time'.* (Stretton 1976, p.125)

However, Stretton did, opportunistically, take advantage of the presence of cabinet ministers by deliberately pressing them for Australian Government commitment regarding the reluctance of families to leave Darwin unless their return airfares were government-funded as well.

Stretton placed significant focus on keeping influential politicians in the loop. At the local level, Stretton worked with local political leaders to ensure they presented a consistent message to the community. He developed an excellent relationship with the acting Prime Minister and was said to report to him several times a day (Thorogood 1990). The irony was that cabinet ministers, if providing directions, were acting within their legal authority whereas Stretton did not have that authority. The political difficulties could be blamed somewhat on the political leadership for not establishing arrangements with relevant ministers and managing their movements (Robertson 1999).

Politics also existed between Stretton and the armed forces (Robertson 1999). The Royal Australian Air Force (RAAF) Base Commander refused Stretton's orders stating that he would only 'seek to cooperate'. On one occasion, the Commander refused to deploy RAAF personnel to erect tents, stating that his staff were required to establish the functioning of the airfield and that local community members could set-up tents. However, it was later reported that local military personnel were disappointed that their services were not given a greater role (Hitchins 1979, Robertson 1999).

A test of personal resilience

Stretton's leadership was not without test to his own personal resilience. There were very long days with little rest, little food and a lot of stress. His staff officer described the circumstances:

> *We were tired, very, very tired, because we had been on the go since – in Alan Stretton's case – the wee hours of Christmas day; less so for me. But we'd had a very long flight, a lot of stress, going into the unknown* (Thorogood 1990, p.12).

Stretton received an injury to his buttocks on the first night when he sat on shards of glass and the car he travelled in got a puncture after running over glass. The same night, he slept for only a few hours on the uncomfortable floor of a damaged RAAF building (Thorogood 1990). At one point, Stretton broke his glasses.

The stress levels were such that Stretton shed tears during several media interviews (Cunningham 2014, Robertson 1999) and was referred to as the 'weeping dictator' (Truth Staff Reporter 1975). These displays of emotion received criticism from the media, the military and local officials (Truth Staff Reporter 1975). At the time of his departure, the RAAF Commander described Stretton as being under great emotional stress. He considered Stretton was a man of compassion and the circumstances of Darwin and its population distressed him (Hitchins 1979). Stretton claimed that he needed to show compassion (Robertson 1999).

Stretton admitted that he had personal doubts but that he needed to display confidence to maintain morale. He feared that government politicians in Canberra would see him as weak and remove him. His staff officer noted that Stretton was harassed by senior officers and public servants who may have been jealous of the successful profile Stretton was developing (Thorogood 1990).

Stretton admitted to and regretted one significant action. He attempted to advocate on behalf of a man who was convicted of an offence shortly after the cyclone. The media reported that Stretton stormed the courthouse as the supreme commander of Darwin. The incident resulted in resentment and criticism (Robertson 1999). Stretton had to explain his actions to the Prime Minister and the media reported he was in tears as he apologised (Truth Staff Reporter 1975).

Discussion

By the time Stretton left Darwin on 31 December, the restoration of Darwin was well underway with many essential services operating once again. Some 35,000 people had been evacuated, local coordinating structures were functioning and the Australian Navy had begun to arrive. These achievements had been made without further loss of life (Stretton 1975b).

Stretton was applauded for his leadership and, in 1975, was awarded Australian of the Year in recognition of his role in Darwin. He would be described as a national hero.

Local officials in Darwin had accepted the role that he played alongside community members in resurrecting Darwin (McLaren 1979) and they thought he had performed successfully (Hitchins 1979, Robertson 1999, Truth Staff Reporter 1975). Despite his lack of legislative authority, only 2 of Stretton's orders were countermanded (Truth Staff Reporter 1975), which might attest to the trust he established with local officials who could have challenged his legal standing if they had needed.

There were other criticisms of his leadership style. Some thought Stretton was arrogant and did not fully appreciate the role of local authorities or the civilian way of doing things (Wilson 1979, McLaren 1979, McHenry 1979, Vardanega 1984). Some were frustrated that Stretton did not recognise the achievements of local officials made before his arrival (McHenry 1979).

It is questionable whether the National Disasters Organisation should have been operating at a heightened state of readiness prior to the cyclone, reflecting a possible lack of foresight. The organisation had not liaised with Darwin authorities to avoid giving the impression of a lack of confidence in their capabilities (Vardanega 1984). Stretton had checked the duty officer arrangements over the Christmas period before leaving Canberra in the belief he would enjoy a few day's rest (Stretton 1978). The National Emergency Operations Centre was not manned until receiving word of the cyclone's destruction and struggled to achieve adequate resourcing in the first days of the response (Jones 2010). Such a procedure may have been influenced by previous disasters that did not require a national-level response (Dwyer 2006). Cyclone Tracy was like nothing the new agency

had ever seen before. Vardanega, the Deputy Head of the National Disasters Organisation, later wrote:

> *Certainly at the NDO we did no more and no less than seemed proper at that early stage of our existence* (Vardanega 1984).

In fact, the Australian Government appeared unprepared, with key ministers uncontactable. Stretton (1976, p.26) stated:

> *Valuable time had been wasted in trying to contact the acting Prime Minister and other ministers, and again I wondered what would happen in the event of an outbreak of war. Surely a better system of contacting ministers in a crisis needs to be instituted.*

Perhaps medical teams, ration packs and aircraft could have been pre-positioned inland at the township of Katherine to rapidly assist. In the early phases of the response, when information was scarce, the pre-positioning of reconnaissance assets could have been very helpful. Perhaps the National Disasters Organisation was waiting on a request from Northern Territory authorities. It was still early days for the Natural Disasters Organisation (Emergency Management Australia 2005).

However, with the organisation's role as coordinator of national support, more could have been done before the cyclone. In the aftermath of the 2019–20 bushfires in Australia, a key theme from the Royal Commission into National Natural Disaster Arrangements was the need for the Australian Government to coordinate arrangements to facilitate proactive support to states and territories including the pre-deployment of resources where they may be required.

The decision to place Stretton in control of the Darwin response operation without legal authority demonstrated the need for crisis arrangements to be flexible and underscored the importance of relationships and goodwill in achieving objectives under immense uncertainty.

There were mixed views about bringing in an outsider to lead at the local level. An advantage was that Stretton had not been personally affected by the disaster and could focus his attention on the response for the community. However, some people believed that local authorities had the capacity to lead and Stretton's role should have been an advisory one only (Wilson 1979, Vardanega 1984).

Leadership reflections

Stretton displayed leadership attributes that were effective:

- He was decisive in an environment of huge uncertainty.
- He showed courage to over-respond, where necessary, to achieve an on-the-ground effect. If he had waited for more information and make critical decisions later, the initiative may have been lost; he would not have made it to Darwin until Boxing Day and there may have been further suffering. Overall, he was willing to take risks – not involving consequences to the community, but to himself.
- He was empathetic and reassuring; a quality other crisis leaders view as essential (Cantwell 2015).
- He acted with agility. He did not have a set step-by-step plan established in advance but reassessed the situation and acted accordingly.
- He acted in a strategic manner, focusing on the bigger picture and on achieving an holistic plan.
- He was politically aware, although he unknowingly stepped into political wars. He acted in a way that realised the political component of the disaster. He maintained the trust of key elected officials and of the community, which assisted him to win support and backing for decisions such as the evacuation of Darwin.
- He was described as having immense skill with the media and worked to ensure transparency of information regarding the relief operation.

Importantly, Stretton was able to quickly assess the strengths within the local community and the importance of working with and motivating the community in an empathetic fashion. Instead of assuming all accountability and bringing in resources on-mass, he used existing local capacities (e.g. the committee structure) as he understood that recovery is best led locally with some outside coordination assistance (Stretton 1975a). Stretton was able to quickly collaborate with organisations, some of which had not previously been involved in emergency situations. This could have been challenging given his lack of local knowledge and established relationships.

One can draw parallels with many contemporary disaster events where leaders are faced with complex and uncertain environments with associated time pressures and stresses. Collaborative leadership is critical as many and diverse organisations emerge to contribute, and a national response is required necessitating interoperability and decentralisation. Flexibility and improvisation are required as extreme events do not run in accordance to plans. Political and community expectations are higher, and disasters are more complex with associated cascading consequences and global media attention. The ability of a leader to build and maintain public trust and confidence, as Stretton did, remains paramount.

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Disaster preparedness communication and perception of foreign residents in Kansai, Japan: a socio-cultural study

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Abstract

There is a misconception that Japan is a monocultural and homogeneous country. The variety of social classes and the increasing rate of foreigners, repatriates and students living in Japan defies this assumption. However, disaster preparedness and communication strategies tend to simplify the problem of multicultural communication in disaster as a purely linguistic issue. This research examines the assumption by Japanese policymakers and media that all residents in the Japanese archipelago are equally equipped with the cultural background and basic knowledge of the 'average Japanese'. The research questions were: 'how do foreign residents living in Japan perceive disaster preparedness and communication strategies?' and 'what are the factors affecting their perceptions?'. Research findings suggest that the challenges faced by foreign residents go well beyond linguistic barriers and include cultural and social aspects that occur in their daily lives. This paper contributes to a better understanding of the perceived risks for foreign residents in Japan and suggests improvements in preparedness and communication strategies to minimise the vulnerabilities of communities in Japan.

Introduction

Risk perception in preparedness

The fact that foreigners are disproportionately affected in disasters, in combination with an expected increase in Japan's foreign resident population, requires an urgent assessment of their vulnerability (Nagy 2009). To minimise vulnerabilities for foreign residents, conventional disaster preparedness strategies rely on the institutional environment, infrastructure safety and available information. However, little attention has been given to the role that perception of risk plays in minimising vulnerabilities, despite the literature suggesting an important link between risk perception and disaster preparedness (Oliver-Smith 1999, Boret 2020). This research aims to fill this gap by investigating the disaster risk perceptions of foreign residents.

The relevance of this study is that risk awareness during a crisis can increase resilience and reduces reliance on external help. A case study is used to illustrate this. During the flooding in Kyushu, Japan in 2020, the deployment of relief personnel, normally in charge of coordinating and providing relief operations was reduced, delayed or did not occur at all due to the COVID-19 pandemic. As a result, individuals and households had to rely on their own knowledge and local resources (Kamino 2020).

Factors affecting risk perception

Research on communication during disaster events for foreign residents often focuses on linguistic barriers and pays less attention to other social and cultural aspects such as disaster risk perceptions of foreign populations (Uekusa

2019). This study investigated the social and cultural factors affecting disaster risk perceptions of foreign nationals and how these factors could be included in future communication strategies.

To understand individual perceptions of disaster risks, different cultural backgrounds and other social factors must be acknowledged. Social factors, such as age, gender and social class, are important aspects of social vulnerability (Jayarathne & Babu 2017; Hamidazada, Cruz & Yokomatsu 2019). However, these aspects have only been considered as vulnerabilities after a disaster, not as factors that can influence the perception of risks before a disaster. An example is the post-disaster study by Davidson and co-authors (2013) that investigated the effects of social and economic factors on disaster vulnerabilities among Latino and African communities in the US. The study showed that the socio-economic conditions of immigrant communities made them more vulnerable and more exposed to negative mental health outcomes compared to local residents.

To acknowledge the importance of different cultural backgrounds, this study introduces the element of individualistic-communitarian societies to investigate if the society structure of the country of origin affects disaster risk perceptions of foreign nationals (Trompenaars & Hampden-Turner 1998, Zialcita 1999).

The paper addresses 2 research questions:

- RQ1: What are the disaster risk perceptions of foreign residents in Japan?
- RQ2: What are the factors affecting these perceptions?

The study found that constraint recognition and awareness influence risk perception and that gender, as well as the society structure of the home country, strongly influence disaster risk and communication perceptions.

Research design

Data were collected through a survey based on the Situational Theory of Problem Solving (STOPS) model (Kim & Grunig 2011). The STOPS model was developed in public communication sciences and is centred on individual perceptions to predict motivation to act and behaviour change (Kim & Krishna 2014, Chen *et al.* 2017). The model has been used to assess gender-based disaster risk perceptions of Japanese citizens (Petraroli 2020) and is applied here to analyse the perception of disaster risk of foreign residents.

Location and participants

This research was conducted between September 2020 and February 2021 in the cities of Osaka and Kyoto in Japan. Kyoto and Osaka were chosen for the high numbers and diversity of the foreign communities. In 2020, 2.8% of the total population of Osaka Prefecture was foreign residents (253,303), making it the third-highest prefecture for foreign populations in Japan. The foreign community is mostly from countries in South East Asia, especially South and North Korea (jointly counting 38% of the foreign community), China (26%) and Vietnam (14%). The foreign population in Kyoto Prefecture in 2020 was 2.4% of the total population (62,510), with higher components of Europeans (4.4%) and Americans (3.2%) (Immigration Services Agency of Japan 2020). Osaka and Kyoto offer varied support systems for non-Japanese residents. For example, the International House Foundations[1] offer services including disaster drills and preparedness activities specifically tailored for foreign nationals.

Surveys were distributed online to foreign students at Kyoto University (selected through quota sampling) and members of

1. International House Foundations (Osaka) at www.ih-osaka.or.jp/english/ (Kyoto) at www.kcif.or.jp/en.

Disaster prevention event for foreign residents conducted at Kokoka Kyoto International Community House, Kyoto City in 2021.

Image: Irene Petraroli

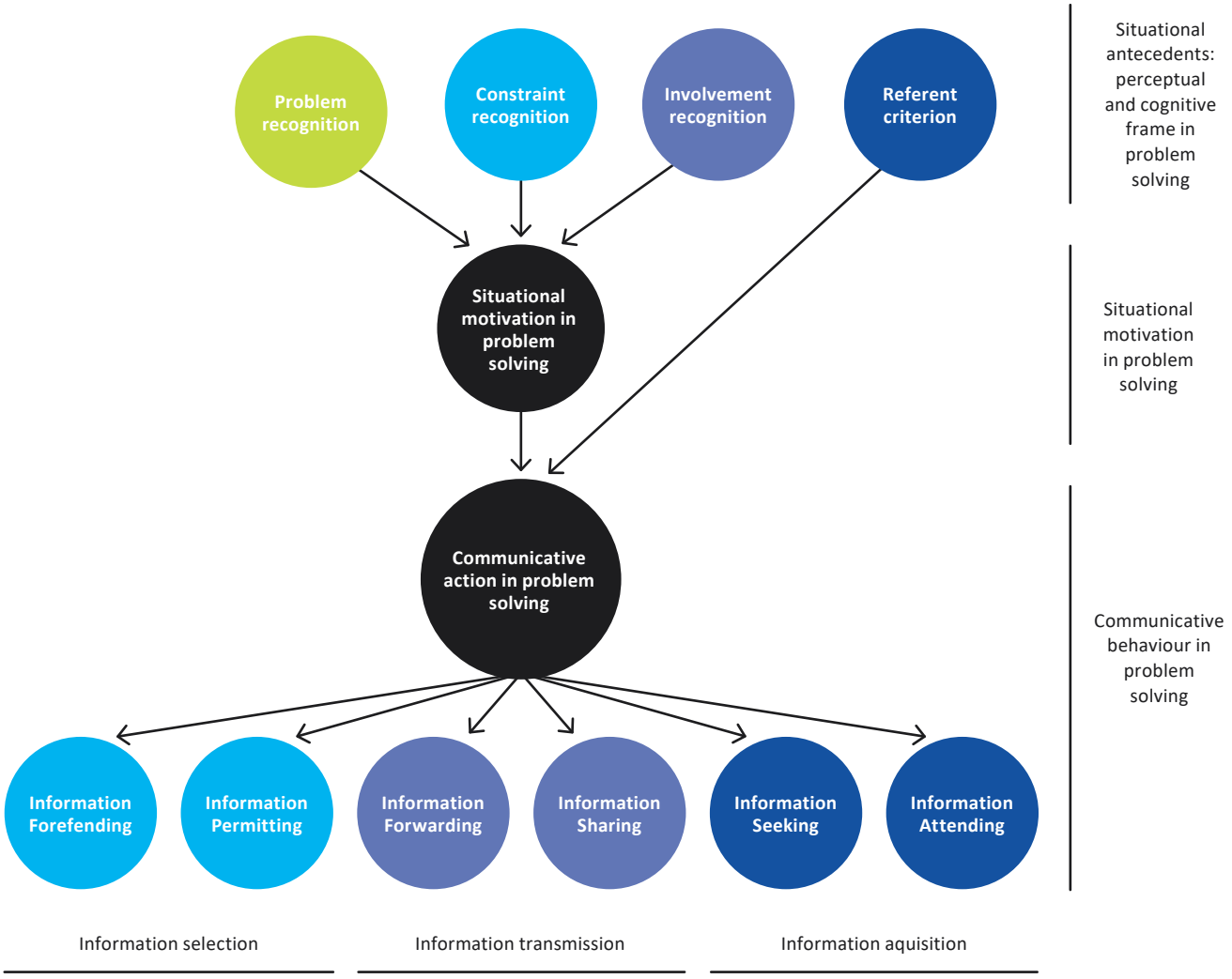

Figure 1: STOPS model.

Source: Kim and Grunig (2011)

a local not-for-profit organisation supporting foreign resident women. The survey was provided in English, Chinese and Japanese to foreign nationals living in Japan for more than one year. The majority of respondents were university students (52%), followed by employed (25%) and self-employed (13%) workers. They also differed for gender and age: 53% of the respondents were women (n=56) and 47% were men (n=48), aged 14 to 59.

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Situational Theory of Problem Solving model

The methodological framework derives from the public communication STOPS model (Figure 1). The model, developed by Kim and Grunig (2011), was used to assess 'the extent to which a person is willing to learn and think more about a given problem', classified as 'situational motivation' (Kim *et al.* 2012, p.151). This model was chosen because it allows investigation of how foreign residents *perceive* disaster risk and preparedness (Kim & Krishna 2014, Chen *et al.* 2017). The model suggests that situational motivation can be predicted by 3 perceptive factors (Kim & Grunig 2011):

1. **Problem recognition:** One's perception that something is missing and that there is no immediately applicable solution to it.
2. **Constraint recognition:** One's perception that there are obstacles in a situation that limit their ability to do anything about the situation.
3. **Involvement recognition:** One's perception of the extent to which people connect themselves with a situation.

Each factor corresponded to 2 statements in the survey and was measured on a 5-point Likert scale (1 = strongly disagree to 5 = strongly agree).

Analysis

The data were analysed using descriptive statistical analysis. Confirmatory factor analysis was used to test the adequacy of the model. To test the effects of problem recognition, involvement recognition and constraint recognition on situational motivation, multiple regression and structural equation modelling were conducted. A series of univariate analyses of variance was used to test the effects of the external factors of gender, age, language knowledge and the society system of the country of origin on situational motivation, problem recognition, involvement recognition and constraint recognition. The identification of the 'communitarian' or 'individualistic' nature of the country of origin, was based on the Trompenaars cultural dimensions (Trompenaars & Hampden-Turner 1998), the Hofstede Insights software for cultural comparison, as well as media accounts, and literature from social and communication science (Hofstede Insights no date, Zialcita 1999, Myles 2018, Dansong 2020). The main characteristics of the individualistic and communitarian societies are shown in Table 1.

Table 1: Individualistic and communitarian society characters.

	INDIVIDUALISTIC SOCIETY	COMMUNITARIAN SOCIETY
Focus	Individual achievement over community.	Community's goals prioritised over individual achievements.
Values	Focuses on individual autonomy and individual decision-making.	Focuses on community values and more people involved in decision-making.
State role	Lower state intervention.	Higher state intervention.

Results and discussion

The data showed that situational motivation was determined by the constraint recognition and problem identification of the respondents. Situational motivation was also influenced by gender and society model of the country of origin.

General perception of risk

RQ1: What are the disaster risk perceptions of foreign residents in Japan?

Table 2 shows a general high interest in the topic of individual disaster risk perception as illustrated by the high values of situational motivation (Q7-Q8). Respondents were aware of the topic of individual vulnerabilities for foreigner residents (Q1-Q2) and identified with the issue of multiple disaster risks both personally (Q3) and for those around them (Q4). Although respondents considered themselves capable of minimising risk through individual actions (Q5), they considered the lack of communication with authorities as an obstacle to their ability to improve their risk preparedness (Q6).

A slight difference in the responses based on gender was recorded. Female respondents had a higher mean response in problem recognition (Q1-Q2), individual recognition (Q3-Q4) and situational motivation (Q7-Q8). Male respondents had slightly higher scores of constraint recognition (Q5-Q6). This could mean that men have lower perceptions of obstacles towards individual disaster preparedness.[2]

Confirmatory factor analysis was conducted to test the situational theory of problem-solving model. The Chi-square test shown in Table 3 established the adequacy of the model. The Comparative Fit Index (CFI=0.931) and Root Mean Square Error of Approximation (RMSEA=0.090) showed that the empirical model was adequate. Overall, the analysis showed that all the variables were statistically correlated with situational motivation and that problem recognition and involvement recognition were also statistically correlated (see Table 4).

Having established the relationship between variables and situational motivation, multiple regression analysis and standard equation modelling were used to determine how much variance of situational motivation can be explained by the model and which factors best predict this variance.

The adjusted R2 value shown in Table 5 estimates that 92% of the variance in situational motivation can be explained by the model and the joint capacity of variables predict the variation of situational motivation as significant (Table 6). Through a multiple regression and the standard equation modelling analysis, it was possible to establish that, holding other variables constant, constraint recognition (Q5-Q6) and problem recognition (Q1) were good predictors of situational motivation (Table 7). Problem recognition accounted for 23% and constraint recognition for 60% of the variance in situational motivation (Figure 2). This means that higher risk perception and lower perceived obstacles increased the desire to think and learn more about individual disaster risk. The analysis showed that, in opposition to the original STOPS model, involvement recognition (Q3-Q4) did not predict situational motivation (Figure 2).

2. Note that the constraint recognition statements were positive ('If I contact the local authorities about my individual disaster risk, they will consider my input'), hence higher values correspond to lower constraints.

Table 2: Descriptive statistics divided by Male (M) and Female (F) respondents.

	Q1		Q2		Q3		Q4		Q5		Q6		Q7		Q8	
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F
Valid	48	56	48	56	48	56	48	56	48	56	48	56	48	56	48	56
Missing	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mean	4.02	4.18	3.69	4.02	1.62	1.93	1.29	1.46	3.81	3.71	2.92	2.80	3.48	4.07	3.62	3.96
Std. Deviation	1.16	1.22	1.05	1.24	1.31	1.30	1.29	1.43	1.12	1.12	1.05	1.20	0.99	1.02	1.04	1.28
Minimum	1	1	1	1	1	1	1	1	1	1	1	1	2	1	2	1
Maximum	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5

Table 3: Chi-square test results.

Model	X^2	df	*p*
Baseline model	198.126	28	
Factor model	25.753	14	0.028

Table 4: Confirmatory factor analysis covariances.

							95% Confidence Interval		
			Estimate	Std. Error	z-value	*p*	Lower	Upper	Std. Est. (all)
Problem Recognition	↔	Individual Recognition***	0.62	0.14	4.503	<.001	0.35	0.89	0.62
Problem Recognition	↔	Constraint Recognition	0.27	0.18	1.526	0.127	-0.08	0.61	0.27
Problem Recognition	↔	Situational Motivation***	0.45	0.11	3.985	<.001	0.23	0.67	0.45
Individual Recognition	↔	Constraint Recognition	0.18	0.20	0.892	0.372	-0.22	0.58	0.18
Individual Recognition	↔	Situational Motivation**	0.43	0.13	3.209	0.001	0.17	0.69	0.43
Constraint Recognition	↔	Situational Motivation***	0.69	0.16	4.279	<.001	0.37	0.99	0.68

*p<.05, **p<.01, ***p<.001

Table 5: Model summary of multiple regression analysis.

Model	R	R^2	Adjusted R^2	RMSE
H1	0.964	0.928	0.924	1.098

Table 6: Analysis of variance results.

Model		Sum of Squares	dr	Mean Square	F	*p*
H1	Regression	1533.881	6	255.647	212.102	<.001***
	Residual	118.119	98	1.205		
	Total	1652.000	104			

*p<.05, **p<.01, ***p<.001

Table 7: Coefficient results.

							95% CI	
Model		Unstandardised	Standard Error	Standardised	*t*	*p*	Lower	Upper
H1	Q1*	0.23	0.10	0.23	1.394	0.019	0.04	0.43
	Q2	0.19	0.11	0.19	1.805	0.074	-0.02	0.41
	Q3	-0.03	0.09	-0.04	-0.371	0.712	-0.21	0.14
	Q4	0.20	0.09	0.24	2.303	0.023	0.03	0.37
	Q5*	0.26	0.10	0.25	2.761	0.007	0.07	0.45
	Q6**	0.29	0.09	0.28	3.120	0.002	0.11	0.48

*p<.05, **p<.01, ***p<.001

Factors impacting risk perception: society model and gender

RQ2: What are the factors affecting these disaster risk perceptions?

Analysis of Variance (ANOVA) was conducted to test the statistical difference in the problem recognition, involvement recognition, constraint recognition and situational motivation of respondents based on their gender, confidence in understanding Japanese and society model of the country of origin. Based on the previous identification of constraint recognition and problem recognition as main predictors of situational motivation (see Table 8 and Figure 2), the ANOVA testing focused on factors that influence situational motivation, constraint recognition or problem recognition, not involvement recognition. The study found that gender and society model of the country of origin are significant determinants of the situational motivation of foreign residents. In particular, it found that foreign women and respondents from communitarian societies have higher situational motivation.

In the analysis on society model, 63% of the respondents came from communitarian societies (e.g. China) and 37% from individualistic societies (e.g. US). Tables 6 and 7 show that respondents from communitarian societies have statistically higher involvement recognition (Q3) and situational motivation (Q8), and statistically lower constrain recognition (Q6) than respondents from individualistic societies.

The second significant factor was gender. The descriptive statistics showed that women have a higher perception of the problem, constraint recognition, involvement recognition and interest (Table 2). This difference, however, is only statistically significant regarding the relation to situational motivation (Q7 and Q8) as shown in tables 8 and 9. The data do not show relevant statistical difference between male and female respondents with regards to problem recognition, constraint recognition and involvement recognition.

Since there was no difference in problem recognition, involvement recognition and constraint recognition, the situational theory of problem-solving model did not explain why women have a higher interest in learning more about disaster risk. This is because the model accounts for individual perception but not for socio-cultural roles and expectations. Harris, Jenkins & Glaser (2006) provide alternative explanations on why women have a higher perception of individual risk. One interpretation is that women devote more time to disaster preparedness activities than do men in Japan, since women are usually employed as part-time workers after they have a family (Charlebois 2014). Another understanding is that women have higher stakes in disaster risk perception because many take care of children and the elderly at home (Dominelli 2020, Petraroli 2020).

The 'non-relevance' of language

Language is often considered the most important factor of vulnerability for foreigners in Japan. However, this study showed that different language levels do not affect the perception of disaster risk. Although language self-assessment and individual recognition (Q4) were statistically correlated (tables 9 and 10), the standard equation modelling analysis suggested that involvement recognition does not affect situational motivation. This supports the argument that language understanding is not the only factor of vulnerability from the perspective of foreign residents in Japan.

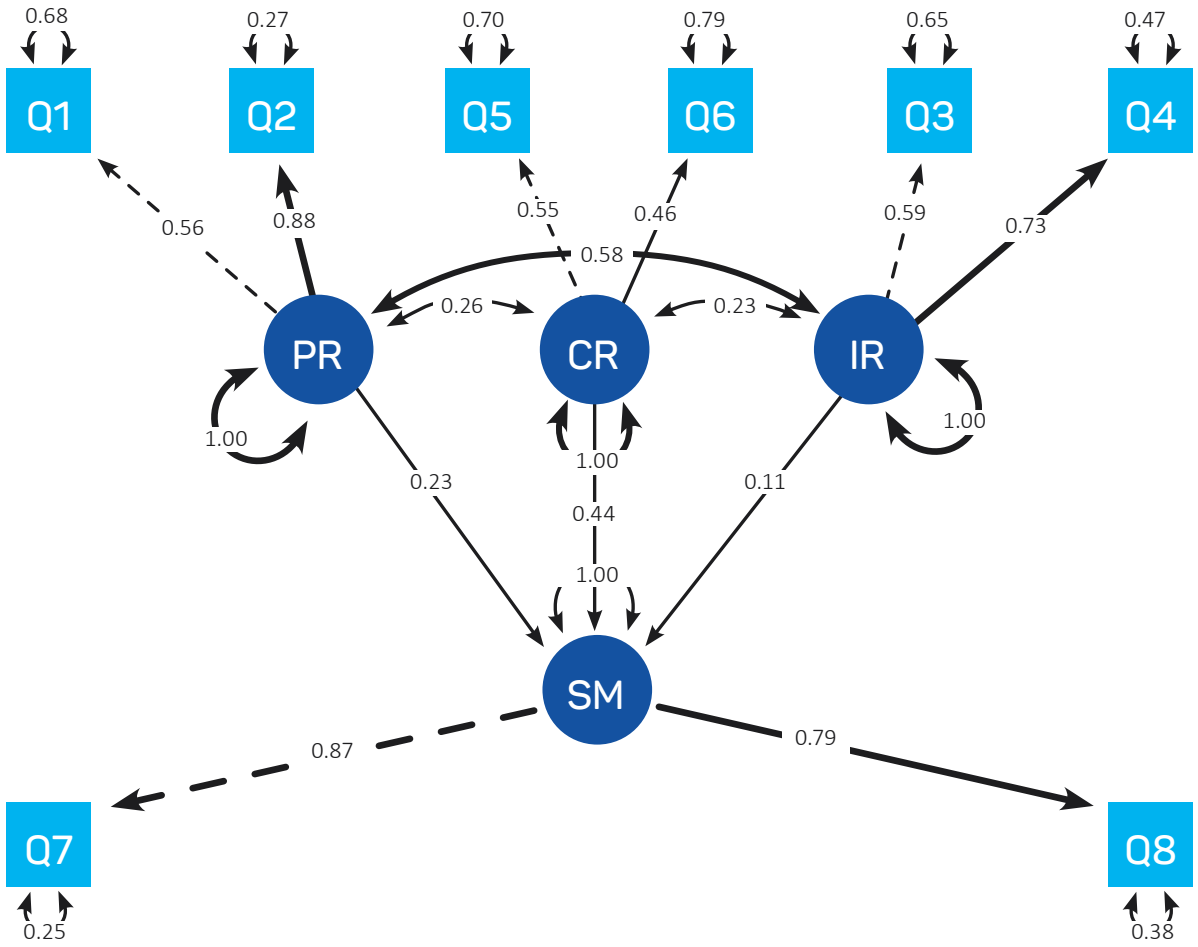

Figure 2: Standard equation modelling analysis showing the relationship between situational motivation (SM), constraint recognition (CR), problem recognition (PR) and individual recognition (IR).

Table 8: Post-hoc comparisons of Society model and Gender and Language levels.

				95% CI for Mean Difference				
			Mean Difference	Lower	Upper	SE	t	ptukey
Q3	**Communitarian**	**Individualistic**	0.61	0.06	1.16	0.28	2.208	0.030*
Q6	**Communitarian**	**Individualistic**	0.64	0.17	1.11	0.24	2.718	0.008*
Q8	**Communitarian**	**Individualistic**	-0.59	-0.99	-0.20	0.20	-2.986	<.004**
Q7	**Male**	**Female**	-1.59	-2.63	-0.55	0.37	-4.252	<.001***
Q8	**Male**	**Female**	0.61	0.06	1.16	0.28	2.208	0.030*
Q4	**Intermediate**	**Advanced Language**	0.64	0.17	1.11	0.24	2.718	0.008*

*p<.05, **p<.01, ***p<.001

Table 9: ANOVA statistics of Society model and Gender and Language levels.

	Cases	Sum of Squares	df	Mean Squares	F	*p*
Q3	Society Model	7.604	1	7.604	5.766	0.018*
	Residual	134.511	102	1.319		
Q6	Society Model	8.666	1	8.666	8.846	0.003**
	Residual	96.978	99	0.980		
Q8	Society Model	4.574	1	4.574	4.777	0.031*
	Residual	94.793	99	0.958		
Q7	Gender	12.266	1	12.266	14.112	<.001***
	Residual	85.174	98	0.869		
Q8	Gender	8.154	1	8.154	8.748	0.004**
	Residual	89.479	96	0.932		
Q4	Language	43.430	4	10.585	5.071	<.001***
	Residual	201.257	94	2.141		

*p<.05, **p<.01, ***p<.001

Conclusion

Implications for communication strategies

This study investigated the perceptions of disaster risk among foreign residents in Japan to help improve preparedness. The 3 findings of this study inform recommendations for effective disaster communication and preparedness activities that target foreign residents in Japan.

The first finding is that problem recognition and constraint recognition are the main predictors of the motivation to learn about disaster risk. Problem recognition is traditionally considered the main factor to increase motivation (Bisri & Sakurai 2014), but this study argues that the perception of constraints in taking action is equally important to understand an individual's motivation to learn about disaster risks. Currently, foreign residents in Japan have a high perception of constraints, illustrated by a lack of confidence in self-help capabilities and the idea that government officials do not consider their opinions. Such perceived constraints, reinforced by language barriers, information gaps and other difficulties of access, are highly detrimental to the residents' motivations in taking risk-reduction actions. Therefore, to increase the resilience of foreign residents, preventative policies should promote higher awareness of disaster risk and easier access to the disaster resources and expertise available in Japan.

The second finding is that gender and society model of the country of origin affect people's motivation in taking risk-reduction actions. This study found that foreign women respondents and respondents from communitarian societies were more motivated to take preventative actions. These considerations allow for better tailoring of preparedness actions targeting foreign populations. In addition, gender-sensitive disaster communication for Japanese women is often available only in Japanese or difficult-to-retrieve online in other languages (Petraroli 2020). A crucial goal of future communication would be to convert emergency and disaster information into languages suited to foreign women in the area. This requires a translation effort and to consider issues that might be irrelevant for Japanese citizens. For example, how to repatriate after a disaster and how to communicate with family back home. Also, new strategies are needed to include and motivate foreign men. Finally, there is a need for adaptive communication for people from individualistic societies who were shown to have lower motivation to minimise their vulnerabilities. Since foreign residents from individualistic countries tend to have fewer social networks (Santos *et al.* 2017), it is important to devise ways to include them, for example, by including methods that reach workplaces, training schools and universities.

Further research

This study encourages a shift in the preparedness narratives for emergency and disaster events concerning foreign residents. It is necessary to move communication research beyond linguistic issues and include comparable and robust data on gender and cultural differences to understand how foreign residents perceive disaster risks and understand and act on information about disasters. In particular, that the country of origin seems to effect motivation and perception indicates that there is a socio-cultural discriminant among foreign populations that needs to be investigated. It is possible, for example, that discrepancy between society models is due to exposure to disasters, since communitarian societies are mostly located in Asia-Pacific regions and are exposed to more natural hazards and disasters compared to people from countries in the West (Wood 2018). Also the gender component requires further study because the difference between foreign men and women is not originated in risk perception but is likely related to their different cultural and social roles. More research is needed to explore these socio-cultural discrepancies to promote truly inclusive and diverse preparedness strategies for disasters.

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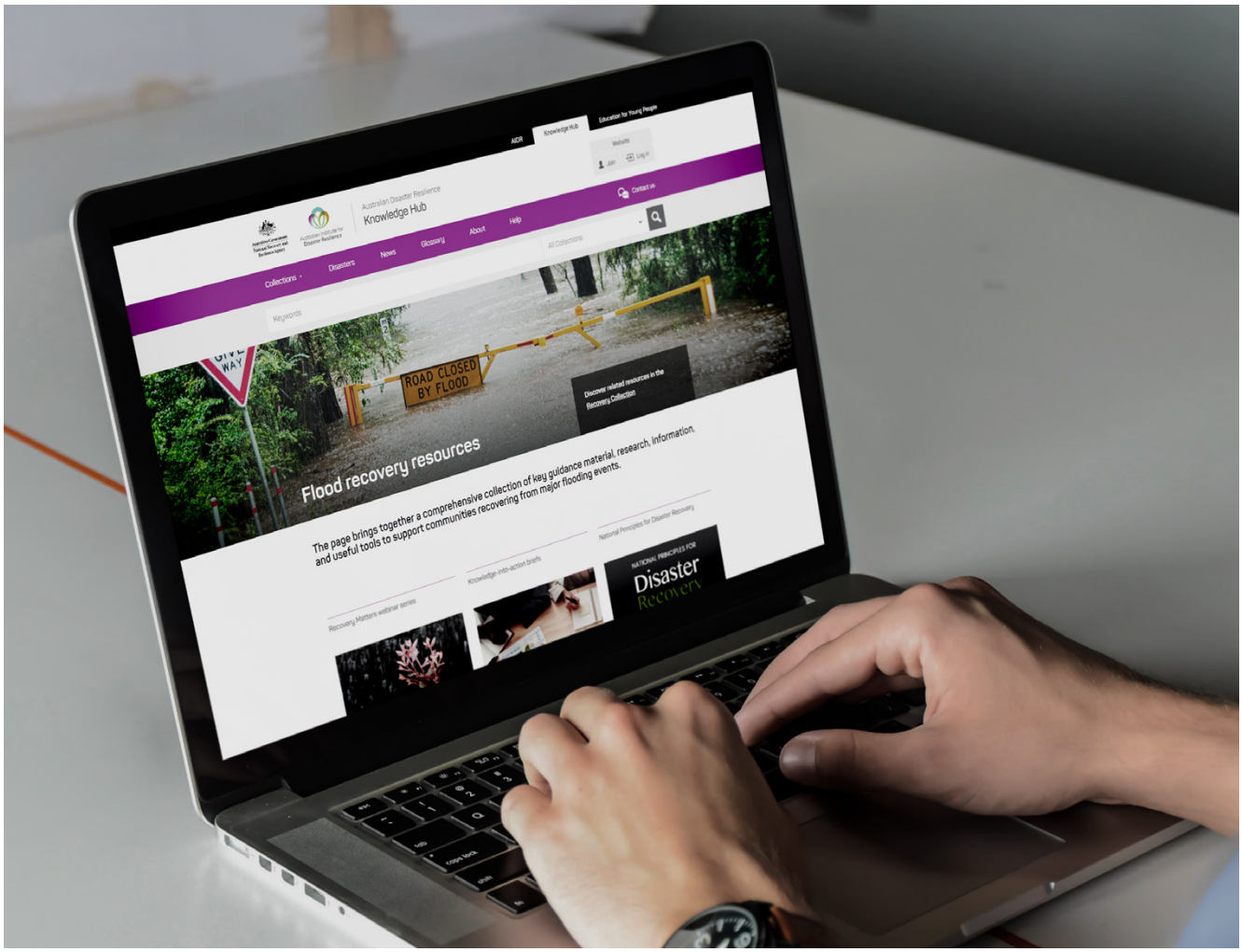

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