Australian Journal of

EMERGENCY MANAGEMENT

Volume 33, No. 2, April 2018
ISSN: 1324 1540

Learning from disasters:

Best practice and lessons learnt Page 28

Australian Institute for Disaster Resilience

Australian Journal of Emergency Management

Vol. 33, No. 2, April 2018
ISSN: 1324 1540

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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 views in the journal are not necessarily the views of the Australian Government nor the Australian Institute for Disaster Resilience and its partners.

Publisher

The *Australian Journal of Emergency Management* is published by the Australian Institute for Disaster Resilience – a partnership between the Australian Government, the Bushfire and Natural Hazards Cooperative Research Centre, the Australasian Fire and Emergency Service Authorities Council and the Australian Red Cross. The journal is published online at knowledge.aidr.org.au.

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Circulation

Approximate circulation (print and electronic): 5500.

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Cover image: Researchers from the NSW Rural Fire Service and the Bushfire and Natural Hazards CRC join forces after the 2013 NSW Southern Highlands fires.

Image: David Bruce, Bushfire and Natural Hazards CRC.

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

Foreword

Iain S MacKenzie, Queensland Government

Welcome to the latest edition of *Australian Journal of Emergency Management*, an edition focused on lessons management. I was pleased to be asked to write this foreword as lessons management is an issue I am passionate about. As I prepared to put pen to paper, my attention was drawn to media statements about the recent fires in New South Wales and Victoria and the views of several commentators advocating the need for us to learn lessons from these tragic events.

If I can be a provocateur in this field, I must ask what it is that we expect to learn that we didn't or shouldn't have already known, and what has prevented these issues being addressed before now?

Raised proudly as an outcome of post-event debriefs and analysis, the term 'lessons learnt' is often used to infer that 'opportunities for improvement' have been identified and corrective actions put in place to prevent similar circumstances recurring. Yet similar observations are often made at future events.

So, what confidence can we give our key internal and external stakeholders that we really do learn?

As dedicated professionals within an emergency management system, we are well-practiced at after-action reviews, debriefs and operational analysis. However, as a sector that encompasses local, state, and commonwealth governments, private industry, not-for-profit and auxiliary organisations, I would argue that we are yet to truly learn how to effectively institutionalise change at a cultural and a whole-of-system level.

My observation is that many processes are overly focused on examining how emergencies were managed rather than considering a complete PPRR approach. Equally, they also often seem to look for deficiencies rather than actively discovering and sharing the very good practices that occur.

We need to embrace a broader 'lessons management' approach. We need an approach that creates and embeds a culture of learning rather than a clinical and rearward looking evaluation process.

We need to clearly focus on those who will ultimately benefit—our communities. Lessons management needs to be a shared, collaborative initiative across all agencies and all levels of government with the community at the core of thinking and planning.

I am encouraged by the tireless work of several individuals in this field and the agencies that are embracing this broader lessons management approach. There are many examples of these in this edition—examples we can all learn from in our endeavours to improve outcomes for our communities.

Iain S MacKenzie

Inspector-General Emergency Management
Queensland Government

2017 Lessons Management Workshop

Mark Cuthbert, Department of Home Affairs

In November 2017, 45 lessons practitioners from across the country spent the day analysing observations from their agencies to identify consistent and recurring issues across the sector.

Participants came from the state emergency services, police, fire, land management, health, defence as well as local, state and the Australian Government.

The Lessons Management Workshop identified insights across sectors and jurisdictions from exercises and operations and allowed experienced lessons practitioners to collaborate and new lessons practitioners to learn. The lessons methodology used for the workshop drew on the Observations-Insights-Lessons Model (OIL) as documented in the Australian Disaster Resilience Handbook 8: Lessons Management (2013)[1], which was developed from the OIL model used by the Australian Centre for Army Lessons.

The workshop was divided into three parts. The first part involved groups coding a data set (in excess of 1500 observations) from multiple jurisdictions to identify themes specific to a focus area. The focus areas were:

- multi-agency interoperability
- decision-making during crisis
- command, control and coordination
- getting from lessons identified to lessons learnt and learning culture
- new and emerging themes.

The second part of the workshop involved groups drafting, presenting and validating the insights to reflect the themes identified in the relevant focus area. The third part involved a debrief of the activity and lessons management generally.

The debrief identified that:

- the OIL process did work
- small groups of experienced lesson analysts with diverse experience can add value by taking an agency neutral approach to collaborative analysis
- there were minor variances in approaches and definitions of lessons terminology between agencies and jurisdictions that resulted in different applications of the process and therefore outcomes when producing insights
- there were inconsistencies in the data including quality of observations and the format in which they were presented.

The report on the insights developed for each of the focus areas is available on the AFAC website.[2]

Noting that this activity was a workshop, the available data were incomplete and neither the inputs nor the insights were approved on any level. The group tasked with looking at new and emerging themes identified as issues:

- Responder health - despite the existence of policy, doctrine and training associated with providing responder health management, there remains significant inconsistency in the application.
- Fatigue management - is not consistently managed throughout all phases of an incident. Planning deployments and work cycles must be sensitive to the conditions and context of operations.
- Immediate medical response - multiple incidents have identified the importance of embedding a medical response capability into initial response. Observations related to both fire and flood incidents.

None of the these insights are suggested to be conclusive due to the data available and the environment in which they were developed but they are offered as an example of how lessons can be used proactively to inform learning.

The one-day lessons analysis workshop followed the second national Lessons Management Forum hosted by the AFAC Knowledge Innovation and Research Utilisation Network in August 2017.

1 Australian Disaster Resilience Handbook 8: Lessons Management 2013. *At: https://knowledge.aidr.org.au/resources/handbook-8-lessons-management/*

2 National Lessons Management Forum 2017. *At: https://www.afac.com.au/initiative/research/free-article/national-lessons-management-forum-2017*

Case studies point to research use

Brenda Leahy, Australasian Fire and Emergency Service Authorities Council

How do emergency services in Australia and New Zealand use research to drive change and innovation? What works, what doesn't and what gets in the way?

A series of case studies, published by the Australasian Fire and Emergency Service Authorities Council (AFAC), provide first-hand insights from researchers and end-users on their experiences of using research in policy and practice in emergency management.

The series tracks and documents how fire and land management agencies both shaped and used research-based outputs from the former Bushfire CRC and current Bushfire and Natural Hazards CRC. Significantly, they capture and share first-hand insights by and for end-users from fire and emergency services.

AFAC members and CRC researchers shared their experiences and understanding on the factors critical to successful utilisation, together with the barriers they faced and overcame in developing and implementing the CRC science-based outputs and resources.

A total of 10 case studies[1] were published between June 2015 and December 2017, each reporting on different examples of research utilisation across the spectrum of science and research, including interpreting fire weather and fire behaviour, managing operations, bushfire and community education, human factors and incident management and land management.

While many of the cases use research conducted in a bushfire context, the findings are applicable to utilisation of research in all hazard contexts.

Each case study confirms that the journey from research to utilisation is different for every end-user due to a range of factors, such as their unique operating contexts and their changing needs and priorities due to operational demands or shifts in policy, practice and resourcing.

There were, however, a number of common themes shared by the researchers and end-users in the critical success factors and in their reflections on the barriers and opportunities. These have provided useful clues on what it takes to use research effectively in contemporary emergency management policy and practice.

These factors generally relate to the capabilities of people (individuals, project groups, teams or multi-agency task forces) to:

- understand, evaluate, translate and communicate the impact of research and its utilisation in emergency management policy and practice
- contribute to collaborative development of practical research-based outputs for use by fire and emergency services
- identify, use or cultivate relevant stakeholders, relationships and networks (for example within AFAC and the CRC) to facilitate and guide research utilisation projects from concept to use.

They also relate to structural or agency-organisational factors, such as strategies, systems and processes, resourcing and policies and their degree of maturity in enabling or supporting change or innovation through adoption and implementation of the research outputs.

At the high level, some of the key themes to emerge in the critical success factors were to:

- understand the end-user problem needs and operating contexts
- understand and agree upfront on the research questions, plan, approach and utilisation deliverables
- consult and engage end users and stakeholders end-to-end from research concept to implementation
- leverage the established stakeholder representative and advisory groups in AFAC's collaboration model to help facilitate utilisation, interpret and translate research findings for policy and practice and evaluate impact and implications for its membership
- provide practical guidance, learner resources, tools and professional development or training for end-users to build understanding and support implementation.

Specific learnings from the cases are summarised in Table 1. These highlight the value of understanding the challenges and opportunities of using research, especially from an end-user perspective, and complement the findings of the ongoing Research Utilisation Report on surveys of AFAC and CRC membership. Further information on the survey can be found at https://www.afac.com.au/initiative/research.

1 These are available for download at the AFAC website www.afac.com.au/initiative/research.

Table 1: Research utilisation critical success factors identified from case studies.

Case study	Research focus	Utilisation outputs	Critical success factors
Research strengthens leadership, learning and development pathways for incident management.	Incident management, leadership and capability development, human factors.	EMPS capabilities for incident management and professional standards. Guidance for continuing professional development.	• Use the CRC research evidence and outputs. • Ensure collaborative development between researchers and end-users. • Provide guidance resources for end-user implementation and operationalisation.
Learning lessons from research insights.	Understanding factors contributing to survival and fatalities from Black Saturday.	National research-based guidance for key messaging for catastrophic bushfires.	• Leverage the AFAC collaboration process. • Build trusting relationships among key stakeholders. • Prioritise learning from lessons from research insights.
Human factors research evidence enhances AIIMS incident management capability.	Human factors research, decision-making, worst case scenarios, incident management, leadership.	Embedded in AIIMS 2017 and related learner resources.	• Make research evidence accessible and meaningful. • Actively engage, involve and inform end-users. • Provide professional development opportunities. • Expect indirect and different routes to utilisation.
Science-backed tools enhance water catchment management.	Fire in the landscape, post-fire soil erosion.	Tools to help end-users identify water catchments susceptible to post-fire soil erosion, flooding and water quality risks.	• Build strong researcher and end-user partnerships from the outset. • Understand the research, scientific approach, findings and the practical implications, benefits and limitations. • Collaborate with stakeholders nationally through AFAC.
Li'l Larikkins - Bushfire Safety Stories for Kids.	Bushfire education for school-age children.	Guidance on bushfire education for primary school-age children nationally.	• Get end-users involved in the project as early as possible. • Research utilisation equals relationships. • Be flexible – turn obstacles into opportunities. • Practice the 3 Ps – persistence, pragmatism and patience.
Multi-agency trial project accelerates evidence-based aerial suppression practice.	Managing operational response.	Evidence-based procedure developed by multi-agency task force for rapid aircraft dispatch in Victoria.	• Ensure industry needs drive the research plan and process. • Make sense of the science. • Tailor communications to maximise understanding and uptake. • Consider a trial/pilot or similar mechanism to determine the scope for application and impact. • Support and resource implementation and practice change.
Taking charge of risk networking towards resilience.	Community engagement, bushfire education, resilience.	Engagement tool developed from research method to connect and prepare communities for bushfire.	• Start with the end in mind. Who needs it? • Provide practical skills and tools and offer hands-on experiences. • Embed the research into professional development and training. • Communicate far and wide.
Bushfire ready neighbourhoods: from informed and aware to engaged and prepared.	Community engagement, preparedness, resilience, risk.	Action research guides agency-wide framework and approach to community development.	• A clear need to improve their approach to community education. • A collaborative action-research method that built trust and shared understanding of the context. • A commitment to re-engineer existing processes and practices to support implementation.
Partnership improves fire weather forecasting.	Weather forecasting, extreme fire weather.	Fire weather science embedded in Bureau of Meteorology national training.	• An organisational commitment to identify, address and anticipate knowledge gaps. • A focus on developing relationships with researchers to stay ahead of the science. • A priority on interpreting complex science for operations.
Managing fire in Mallee heath: from research to practice.	Fire behaviour prediction in Mallee heath.	User guidance for managing fire in Mallee heath.	• Start by asking your end-users: 'What do you need?' • Foster relationships – focus on good communications. • Convert complex science into user-friendly tools. • Apply a funding model that suits your project.

Learning for the future: the emotional cycle of bushfire

Dr Graham Dwyer, Swinburne University of Technology, and Bushfire and Natural Hazards CRC

Learning from previous bushfires can be a painful experience but it can also lead to significant innovation.

Modeling fire behaviour is more advanced than ever, technology has made delivering bushfire warning more efficient, planned burning is now conducted strategically while locally and globally emergency management agencies are more integrated that ever.

However, as bushfires become more complex we need to ask ourselves as a community of emergency management practitioners: how are we preparing ourselves for future bushfires?

We need to recognise that bushfire is a highly emotional context for everyone. While commentators have extensively reported on the emotions of affected communities, there has been less focus on the emotional context of officers who work in incident control and operational firefighting roles who repeatedly find themselves in stressful and dangerous environments every bushfire season.

A recent study conducted by the University of Melbourne and the Bushfire and Natural Hazards CRC has shown that even before flame ignites in the landscape emergency management practitioners will experience anxiety that is particularly acute when severe fire weather conditions are predicted. This is because, cognitively, they relive previous fire events. Despite being well prepared we have seen that when complex and unpredictable fire behaviour arises it constrains and even nullifies the ability of officers to control the resulting fires which causes considerable stress and anxiety.

These emotions continue even after the fire has passed when the damages and losses caused by the fires become apparent. Evidence suggests that many emergency management practitioners experience sadness after severe bushfires and even guilt because they feel responsible for what has occurred.

We need to remember that many of those who plan for and respond to fires are often the first ones to become aware of and even encounter how bad the losses from bushfire can be. We tend to forget that while these people are emergency management practitioners, many of them also live and work close to the communities that are affected by the fire. Sometimes they experience worry while firefighting as they become concerned for their loved ones and property while they try to bring fires under control. We should remember that it is not uncommon for emergency management practitioners—career and volunteer—to have experienced losing their home, friends, colleagues and even family members while they on duty serving the community. Over the course of fire season, even when the worst of a bushfire has passed for one community, emergency management practitioners continue to work relentlessly in incident control centres and on fire grounds for weeks and months afterward to bring ongoing fires under control.

While it may seem obvious that emergency management practitioners live through difficult emotional experiences during a bushfire, commentaries have overlooked this and the effect of public inquiries afterward on the emotional wellbeing of our people.

Scapegoating, vilification and blame have been the focus of too many judicial public inquiries, which have had little regard for their feelings about what happened and why. Moreover, we tend to forget that cross-examining emergency management practitioners will often result in them reliving much of the stress that they encountered when responding the fire event in the first place.

Yet evidence suggests that public inquiry recommendations do enable emergency management practitioners to make changes which they know can help them to plan for and respond to future bushfires. Different aspects of the implementation process seem help rebuild confidence, trust and happiness among those who faced the bushfires and the Royal Commission. However, this seems to be short-lived as a deeper, more reflective learning prompts some emergency management practitioners to focus on the future where they envisage scenarios that the changes they made in the present may not help them for the bushfires of the future. Hence, the cycle of emotionality continues against the backdrop of planning for and responding to bushfire.

Accordingly, we need to ease the emotional burden on emergency management practitioners. If we accept the fact that Australia is a highly fire-prone landscape then we could conduct public inquiries that deliver learning outcomes that build a continuous improvement culture and ultimately avoid the harmful effects of finger-pointing and blame which have become entrenched in our learning culture. Strategically and operationally, we have come so far in building a safety culture for our people yet so much more can be done to recognise the emotional context of bushfire because ultimately, it affects us all.

Volunteers: the ageing and the millennials

Jake Moir, NSW Rural Fire Service

The New South Wales Rural Fire Service (NSW RFS) has over 70,000 members and is rapidly approaching a demographic dilemma. As 'baby boomers' begin to retire, it's time to shift the focus of the NSW RFS to 'millennials' and get ready for the challenges that come with that generation.

Widely, millennials, or Generation Y, are the people defined as those born between 1980 and 2000, who are currently transforming the way workplaces manage and lead their employees. Millennials have developed a workplace reputation as 'high maintenance' and 'needy' and tend to 'job hop' between multiple different careers and jobs across their working life. This is in contrast to earlier generations (mainly baby boomers) who settle in and see a career through until the end. The implications? The NSW RFS now has a growing membership that want to have purposeful work, constant feedback, come with a lot of ambition and want work-life balance.

High maintenance and needy

The needy and high-maintenance reputation of millennials stems from a range of generational differences. Primarily, it's the desire for constant feedback. Young workers want to know how they're doing, what they can do better, where their shortfalls are and most importantly how they can affect the organisation. These employees seek purpose, expect their organisations to continually engage them and place high value on their relationship with their managers.

For NSW RFS, this maintenance and sense of need is inherently a challenge. From the top down, leaders in the organisation are going to have to cater for millennial volunteers. This means engaging them constantly to maintain their interests, but not so much so that the organisation impedes on their work-life balance. The service must utilise the sense of reward millennials can gain from responding to incident calls and regularly upskill millennials to provide them a sense of progression. The service also needs to keep them informed and set a clear vision and mission for this generation to aspire to.

Image: NSW Rural Fire Service

Job hoppers

It appears this rising generation don't like to stay in the one place. Rather than nesting in a career, job hopping involves moving around workplaces regularly, with many spending only two to three years in a career before moving onto something else. This presents a challenge. The NSW RFS needs to keep the millennial generation engaged and interested or risk losing them. This presents an interesting opportunity, where we may see more interstate and intrastate transfers by members.

Diversity research has indicated that there is benefit in a mixed variety of perspectives and experiences, and the NSW RFS may gain from millennials moving around all the time. A volunteer from the Victorian Country Fire Authority may transfer into the NSW RFS bringing a range of skills and experiences the service isn't always used to. This opportunity requires the NSW RFS to work with volunteer fire services across the country and bring accreditation to allow members to do this at their pleasure, or again, risk losing them.

Moving forward

To deal with the changing demographic in workplaces and volunteering, NSW RFS needs to shift its focus from the current membership and proactively chase after the future of the service: the millennials. A good initiative was started with the NSW RFS Young Members Group in December 2010. This group should continue to provide a young perspective on the service and help guide the service into the next generation of captains, group captains and staff.

There is plenty of argument for more incentives such as enhanced employer engagement programs, financial incentives and tax concessions; but largely the service needs to develop its personnel policy to deal with the rising trends of this generation. The nature of what the NSW RFS does isn't likely to change, but the people will most definitely change as time goes on.

The service needs to prepare for this. Leadership at all levels needs to know how to work with these young volunteers and understand what motivates them. From junior captains through to the Commissioner, everyone needs to understand that young members are likely to have different attitudes, but are here to stay.

Millennials want to be engaged in work that has purpose, desire constant feedback and are highly educated. Millennials generally had a youth of high expectations and have developed a high level of ambition. They are described as needy and high maintenance and the NSW RFS must be ready for this generation to begin taking over the reins when older generations hang up their boots. Largely, personnel policy is going to make the difference and positive action must continue to engage, motivate and retain firefighters in the world's largest volunteer fire service.

Image: NSW Rural Fire Service

Image: NSW Rural Fire Service

Connecting communities through volunteering: lessons learnt at NSW SES

Andrew McCullough, NSW State Emergency Service

When the NSW State Emergency Service (NSW SES) is not responding to severe weather events, it is building capability through training and preparing our communities for the unexpected.

Like all volunteer emergency services agencies, traditionally NSW SES has relied on its members to be available regularly and commit to routine training. This can sometimes present a barrier for community members keen to contribute to the service. Recent research from the Bushfire and Natural Hazards CRC shows a shift in volunteering within Australia is under way. Greater female participation in work activities, an ageing workforce, developments in technology and an increase in natural hazards are transforming local communities. In NSW, a growing population and impacts of climate change are likely to increase workload for volunteers. More frequent severe weather events will challenge the capacity of emergency services and volunteers who may sacrifice additional work and family time to contribute to response activities.

The NSW SES Volunteering Reimagined initiative recognises that local risks are best managed by local people with a range of volunteering options to ensure communities are prepared and help is available during emergencies. An increase in the flexibility of membership allows greater community volunteer participation.

NSW SES volunteers (unit members) are the backbone of the NSW SES. They are the first responders; the unit leaders and the teams who have the specialist skills to respond to, and coordinate a major emergency response. Previous attendance requirements have changed and a member's overall contribution to the NSW SES is recognised, leading to flexible volunteering opportunities. In smaller communities without a NSW SES presence, Community Action Teams (CATs) are being established to combat local risks. CATs undertake basic training and provide communities with early warning, assist with property protection and provide intelligence to Incident Management Teams.

During the response to major events, spontaneous volunteers often provide a valuable surge capacity to help the local community respond and recover. The NSW SES has developed processes and policies to effectively use these volunteers and has established partnerships with businesses and government agencies that can supply staff to assist during major events as corporate volunteers. These volunteers assist with basic tasks, or use their existing skillsets in a specialised position to build service capability both operationally and during quieter periods.

What separates Volunteering Reimagined from a short-term recruitment drive is the ability to sustain learning from this innovative project and embed the new volunteering model into the culture of the organisation. NSW SES units have been offering more flexibility to existing volunteers for many years without formal support or resourcing. The project has formalised flexible volunteering arrangements and introduced new policies. Sustaining these initiatives over the long term will ensure the NSW SES and community realises the benefits.

Early input into the project from volunteers and community members ensured a workforce model that would be accepted by stakeholders. In addition to using industry research, the project team used principles of Human Centred Design to develop a greater understanding for some of the NSW SES volunteering challenges and encourage a design-thinking approach to solutions, which offers cultural challenges at a local level. Members have been challenged to think differently about who could be part of the volunteer workforce in line with the NSW SES's mission: saving lives and protecting communities. Volunteering Reimagined has spawned ideas at all levels of the service and as these ideas have evolved, so too has the framework in which ideas are managed. Ideas are developed with the relevant manager and prototyped early, enabling the NSW SES to learn quickly and improve with agility.

Long-held opinions of what volunteering involves can be difficult to change. Volunteering no longer requires the same commitment or level of training for every role. Sharing the success stories from members has been key to building a culture supportive of Volunteering Reimagined and doing things differently. The team used live videos on social media, travelled across NSW to capture digital content and stories and promoted volunteers as the spokespeople for the project. Complex messages were simplified using infographics and diagrams. Effective change management was important to ensure members remained engaged, were empowered to implement Volunteering Reimagined within their unit and had the information to quell any apprehensions.

Firebombing at night – why not!

Richard Adler AFSM, National Aerial Firefighting Centre

Dropping fire suppressant and retardant from aircraft provides great support to firefighters on the ground at bushfires—during daylight. So why isn't standard practice to continue firebombing operations into the night?

Fighting bushfires at night takes advantage of cooler conditions, higher humidity and more moderate fire behaviour. Importantly, controlling a fire overnight may be critical in preventing a major flare-up the following day. So why not?

The good news is .... it does currently happen in some parts of the world and Australian agencies are currently working hard to test and introduce a limited night firebombing capability. The main issue is that firebombing is an inherently visual operation. Pilots need to clearly see and avoid terrain, obstructions, smoke and cloud and they need to eyeball their targets. For some decades, helicopters and fixed-wing aircraft have routinely operated using Night Vision Imaging Systems (NVIS) such as Night Vision Goggles (NVG) to intensify available light at night time to allow safe visual flight. NVIS have their limitations, such as lack of depth perception and a narrow field of view, however, the technology has improved steadily and it is now viable to undertake night firebombing in Australia, at least under some conditions. NVIS are already widely used in Australia in police and air ambulance work, and increasingly in bushfire support for activities that occur at greater heights aboveground than firebombing, such as gathering intelligence and dropping incendiaries. The National Aerial Firefighting Centre has a number of NVIS-equipped helicopters and fire agencies across the country are routinely using NVIS helicopters for bushfire support. A small number of fire and rescue agencies in north America have had NVIS firebombing programs for some time. Overall, this body of experience provides valuable insight for developing a safe and effective night firebombing capability in Australia

There are risks. Firebombing is conducted close to the ground. At night, the chances of flying into low visibility and colliding with obstructions like power lines and trees are increased. Hovering a helicopter (to land or to hover-fill) requires clear visual references that may be obscured more easily at night. Options to deal with aircraft emergencies become more limited. The NVIS systems may be affected by excess light generated by the fire. These risks need to be carefully managed and controlled. There are also significant regulatory considerations. Australian civil aviation legislation is quite progressive in allowing civilian NVIS operations with helicopters but, understandably, high standards are required and there are plenty of hoops to jump through.

Cost is another factor. We would expect that operational and regulatory constraints on night firebombing will affect productivity and that in many circumstances firebombing at night will be more costly than during the day. This will have to be balanced against the likely benefits.

So what's the best way to introduce a night firebombing capability in Australia? Step by step, in a very careful and controlled way! A number of states have been developing plans for staged implementation and at the time of writing, proposals were well advanced for a trial in Victoria during the latter part of the 2017-2018 bushfire season. This trial aims to evaluate the effectiveness of night aerial firefighting and to understand the constraints and limitations from a fire agency perspective; as well as providing aircraft operators and the Civil Aviation Safety Authority with valuable insight into managing the flying side of things.

On the horizon there are plenty of developments that will help make night firebombing in Australia a reality for both helicopters and fixed-wing aircraft. NVG technology continues to improve rapidly. Flight control systems that assist the pilot at critical phases of flight, such as hovering, are becoming common. Synthetic vision systems offer huge possibilities. These use a variety of sensors to re-create the outside world on a screen or heads-up display in the aircraft and are already in routine use by organisations such as the Royal Flying Doctor Service. Of course there is always the possibility that remotely piloted aircraft will play a role in delivering retardants and suppressant to fires in the future, including at night.

There's no doubt that even a limited capability for aerial firefighting at night will be another valuable tool to support firefighters and protect communities. It's on the way.

Helicopter taking water from a quarry at night.
Source: Emergency Management Victoria

A vital layer of safety for Australia's airports

Glenn Wood, Airservices Australia

Airservices Australia provides aviation rescue firefighting services at 26 of Australia's busiest airports to protect and ensure the safety of the travelling public. The principal objective is to save lives.

Airservices Australia's aviation rescue firefighting services are regulated by the Civil Aviation Safety Authority, which lists two key functions: to extinguish fires and rescue people from aircraft that have crashed or caught fire and to control and extinguish fire, and protect people and property from fire or the threat of fire anywhere on the aerodrome. We achieve this by maintaining a level of operational readiness that ensures immediate and rapid response to, and effective management of, emergency situations at airports.

Operational readiness depends on a number of factors including the effectiveness of our training and staff development programs, preventative maintenance conducted on vehicles and equipment, adoption of new technologies and the ability to quickly respond to industry changes and incorporate learnings from incident reviews.

Reviewing major aviation incidents that occur internationally and within Australia allows us to identify where we can make improvements to our emergency response capability through enhancing our training, operating practices and procedures. One such incident occurred in Las Vegas in September 2015. A British Airways B 777-200 experienced a port-side engine failure during take-off that resulted in a major fire. All 157 passengers and 13 crew evacuated safely via emergency slides onto the runway and the airport's emergency services extinguished the fire within five minutes.

Following a review of this incident, we expanded our training program at our central training facility in Melbourne to include scenarios that require the use of aircraft slides to evacuate passengers. The use of these slides add another variable into the decision-making process for our staff when selecting the best possible firefighting response for the circumstances.

Additionally, we have put more focus on flexibility in our leadership training to encourage fire-ground commanders to consider alternative ways of positioning vehicles to gain maximum fire control while protecting people evacuating from the aircraft.

While safety remains our most important consideration as we go about performing our regulated functions, our focus is also to assist industry to maintain continuity of their operations by minimising the impact or disruption caused by an emergency situation or abnormal operation. This means we must respond to all emergency situations without delay. When we arrive at a scene, our actions must quickly make the area safe, effectively manage the emergency and also facilitate a return to normal operations as rapidly as possible.

The focus on operational readiness doesn't stop at the incident scene or crash site, it also includes our role in the broader incident management team as part of the airport emergency plan.

Under the *Air Services Act 1995*, one of our functions is to promote and foster civil aviation. As part of this, we have offered to assist smaller airports without an aviation firefighting service to review their airport emergency plans to ensure roles and responsibilities are clear, developing ways to test capability and capacity, designing emergency exercises and working with other agencies identified in their plans.

Our training and expertise could be of significant value to other airports. It's a potential win-win situation; increasing our contribution to aviation safety as well as giving our highly trained staff greater opportunities to contribute. Airservices Australia Aviation Rescue Fire Fighting Services provides a vital layer of safety for the aviation industry and the millions of passengers who travel in Australia every year.

Aviation firefighters make areas safe and manage the emergency.
Source: Airservices Australia

Case study: urban aircraft deployment in Victoria

Matthew Anderson, Melbourne Metropolitan Fire and Emergency Services Board

This case study explores the management and the deployment of aircraft in Victoria to examine the overall awareness of command staff in responding to and managing aviation assets within the Melbourne metropolitan area.

While the efficacy of aircraft in bushfire fighting has long been recognised, their utility in urban and peri-urban environments is less understood by urban fire agencies. This was highlighted during a multi-agency fire attended by the Melbourne Metropolitan Fire Brigade and the Country Fire Authority (CFA) in late December 2017, which provided an opportunity to examine aerial firefighting in an urban parkland environment.

Through interviews with key incident management staff and individuals associated with the management of the aviation assets, five common themes were identified for further examination. While the use of aircraft was generally recognised as being successful, several opportunities for improvement arose. It is on the back of these lessons that future training and capability may be developed.

The scenario

A fire in parklands on Park Road, Cheltenham started on 27 December 2017. From the initial attack, it was immediately apparent that the operational position was dangerous and unpredictable. The local parkland consisted primarily of native scrub and tea tree vegetation. This is known to be volatile during periods of high fire risk. The Office in charge of the first fire appliances requested more resources due to limited access to the rapidly spreading fire. Several properties were under threat including houses, a primary school and a golf club.

Subsequent situation reports prompted the Operations Commander to request an aircraft to attend. The request, via radio to the communications centre, was interpreted as a request for a Helitack water bombing aircraft. A Firebird Air Attack Supervisor platform also responded for support and coordination roles. This was followed with a Skycrane aerial once more intelligence from media helicopters was assessed. All aircraft were based locally.

Theme 1: Knowledge voids

The requesting Commander was familiar with the availability of the aircraft and their potential efficacy in countering risk to the community. He was, however, largely unfamiliar with the agreed processes involved in arranging and managing an aviation response.

Theme 2: Communications

Incident management staff found communications with the aircraft crew difficult. Incompatible radio networks meant aviation coordination was carried out using unfamiliar systems. In addition, a lack of procedural knowledge meant there was some confusion about which fire ground radio channel to use for ground-to-air communication. Ground crews were not monitoring the aviation channel on the fire line. If they did, it might have enhanced their situational awareness of the aircraft's movements. Ground crews were also not familiar with how to respond when their fire appliances were identified by the vehicle numbers painted on the roof.

When incident management personnel were hosted aboard the aircraft for a reconnaissance flight, they reported the significant difficulties associated with using a handheld radio while wearing a helmet in a deafening helicopter cockpit.

Theme 3: Safety of ground crews

The ground crew's lack of familiarity with working around aircraft caused delays on the fire ground and potentially unsafe conditions. Some firefighters were slow to retreat from the firefront and others remained in the aircraft drop zone while the helicopter approached. This caused delays as helicopter pilots will not drop water until the verbal 'all clear' has been given from the sector commander and the drop zone is visually free of fire appliances and personnel.

Theme 4: Operational planning

While the incident management team generally agreed that the presence of the aircraft was required, there was little integrated planning for their use, which hampered their utility. This was particularly evident by the restricted use of the Skycrane. The close proximity of the airfield and their rapid deployment time (within five minutes) contributed to some operational confusion.

Theme 5: Urban complexities

The nature of urban and peri-urban environments and the tactics adopted by their responsible fire agencies may be intrinsically at odds with the requirements of aviation firefighting. A rapid, aggressive first response by local ground resources using reticulated water supply, puts crews and fire appliances in close proximity to the firefront. This can be an issue for aviation firefighting as aircraft need this area to be clear in order to commence their water bombing attack. Aircraft pilots are, understandably, reluctant to hold water over built-up areas due to the possibility of unintentional water release and the risks that poses to people and structures on the ground.

These issues are of lesser concern in remote area firefighting where ground crews are more dispersed and cognisant of the activities of the aircraft. Pre-determined dispatch (where aircraft are included in the primary response) ensures aircraft arrive and commence a first attack before a coordinated ground campaign is mounted, allowing them to operate free from the concern of protecting ground crews.

Key lessons

The fire in Cheltenham allowed a review of the effective use of aircraft by fire agencies in urban environments. As with any process that is seldom used, there will be problems that arise and opportunities to improve future activations when they occur. Some key learning opportunities were derived when issues under the identified themes were analysed.

Increase awareness

The efficacy of aviation firefighting is well recognised. In order to effectively use aircraft as an urban firefighting asset, increased awareness of command staff related to process and practice for requesting aircraft is recommended.

In Victoria, the responsibility of coordinating the aircraft fleet lies with the State Air Desk (SAD), a functional area within the State Control Centre. Agreed process involve contacting the SAD duty officer by phone and providing the details of the request, including the number and type of aircraft required, the location and name of the 'location control point' and a nominated fire ground communications channel.

Reinforce communications

Greater knowledge of the communications and support arrangements for the use of aircraft once they've been deployed would include understanding the agreed communications systems. The use of CFA fire ground channel 107 for all aviation purposes in the greater metropolitan area and staffing a dedicated aircraft communications officer position within the incident management team are both good examples.

In addition, there are a number of specialist incident management team and support roles that support aviation resources. These are air attack supervisors, aircraft officers and regional aircraft coordinators. These specialists should be called on to provide the technical advice required to effectively manage aviation resources and are available from external partner agencies via state arrangements.

Use Air Observers

Air Observers are airborne crew who provide detailed intelligence to the incident management team on the ground. The near real-time observation data provided by these operators are uploaded to pre-existing (and familiar) systems like EM-COP, which is accessible via laptops or mobile devices. Air Observers are routinely deployed with aircraft on days of high fire danger and can provide maps, video and still photography directly to an incident controller.

Improve planning

In the event that aircraft have been or are likely to be deployed to a fire, command staff should develop a structured plan for their use. This should be done in the context of the overarching operational plan. Such structured inclusion of aircraft should be subject to review and developed early, allowing for the potential rapid response of aircraft to fire grounds.

Use aerial reconnaissance

In the absence of Air Observers during the fire in Cheltenham, the opportunity to undertake aerial reconnaissance flights was afforded to the operations officer. While his ability to communicate with the ground crew was limited, it was an invaluable intelligence-gathering exercise and is recommended for future incidents.

Enhance training

Training is recommended to increase the awareness of operational crew responsibilities related to working around aircraft. Emergency Management Victoria produces a multi-agency training package that is suitable. Knowledge gaps identified in this case study included the lack of situational awareness around aircraft activities, the need to evacuate the drop site, correct fire appliance positioning and monitoring aviation radio traffic.

Summary

Increasing community expectations mean fire agencies must move on from traditional approaches and identify and embrace improved delivery models that enhance outcomes. This is especially relevant for densely populated urban environments.

Case study: lessons management capability in emergency management and beyond

Heather Stuart, NSW State Emergency Service and Mark Thomason, South Australian Country Fire Service

Lessons management is a small but growing capability across the emergency management sector. This case study explores how a number of emergency services organisations have collaborated to grow this capability both internally and across the sector.

Emergency services organisations (ESOs) face both internal and external scrutiny of their operations through formal reviews. The level of external scrutiny has been increasing over the years, beginning with the Royal Commission into the 1939 Victorian bushfires and peaking with the 2009 Victorian Bushfires Fires Royal Commission. These reviews have changed community expectations of ESOs. No longer is it sufficient for them to just respond—and generally respond well—to events. Agencies now need to demonstrate not only that lessons have been identified (or learnt as we commonly see in the media) but that the resultant change in activities or behaviours has been effective and that, as a result, the delivery of services to the community has improved. As a result of these challenges, many ESOs have established a lessons management capability.

At the beginning of 2011, the NSW State Emergency Service (NSW SES) established its Lessons Learned Branch. The aim of the Branch was to help the service learn lessons from both corporate and operational activities that would result in improved organisational performance. This was the first lessons management capability for the State Emergency Services nationally. While not a direct response to a formal enquiry or review of the activities of the operations of the NSW SES, the development of this capability followed reviews in other states and was seen as a proactive approach to improving the services delivered to the communities of NSW.

The South Australian Country Fire Service (CFS) had developed a lessons capacity following the Wangary Fires in 2005. The Wangary fire and other fires on that day were the most destructive fires, in terms of loss of life and property, that the CFS had seen since the Ash Wednesday fires in 1983. Given the losses, community grief and the Coronial inquest into this event, CFS recognised that a more formal approach into learning from these events was required and that the service owed it to the community to demonstrate improvements as soon as possible. This was the first time that a formal approach had been utilised in CFS for collecting, analysing and theming lessons.

As part of the research undertaken to develop the capability, the NSW SES Lessons Learned Branch established a relationship with the National Security Capability Development Division of the Attorney-General's Department. This Division had already developed a capability for evaluating strategic exercises and identifying lessons from these. Work had also commenced on translating these learnings into improved response plans and exercising.

With a growing interest in lessons management nationally, the Attorney-General's Department provided the linkages to connect a number of agencies to share their lessons frameworks and their learnings about the implementation.

In late 2011, Emergency Management Australia hosted a lessons workshop that brought together a diverse range of agencies from across the emergency management and national security sector to discuss and explore lessons management. It was soon discovered that the majority of agencies were in a similar position of attempting to establish a lessons framework and developing strategies to implement the lessons identified. For many of the agencies, conducting debriefs was routine with observations collected and varying levels of attempts made to resolve or action each issue raised within those debriefs. However, this was not demonstrated to be sustainable given the number of debriefs conducted, the capacity of the lessons management practitioners and traction for the capability within the organisations. As a result, observations were rarely analysed and trends were often not used as a means of elevating critical issues. At this stage, for all agencies involved in lessons management, the concept of producing meaningful outputs was challenging.

During the lessons workshop it became apparent that the development of a lessons capability for an organisation was usually confined to one or two individuals who had some organisational knowledge as well as experience in, or a passion for, organisational development. These people were largely working in isolation within their organisation, with limited opportunities for collaboration, sharing ideas or exposure to alternate views on lessons management.

The challenge therefore for all lessons practitioners was to leverage opportunities that would provide benefits to the lessons processes and, as a result, the organisation, as well as opportunities for their personal development. The need and desire for a lessons practitioner network was clearly identified at the workshop, however, before true collaboration and leveraging of opportunities could occur the individual practitioners needed to form relationships and establish a sense of trust between each other. Only then would it be possible to fully share ideas and concepts, areas of poor performance in their agencies and their own limitations in establishing a lessons capability.

A number of attendees from the initial lessons workshop began tentatively to establish their own networks—sharing their knowledge, experience, tools and 'tricks of the trade'. For both NSW SES and CFS this collaboration resulted in the discovery of strategies for managing large volumes of data, learning the value of trend analysis, the importance of publishing results and the approaches used by lessons managers to gain support for the capability from across their agency. As information was shared and explored the relationship between the practitioners from these agencies developed and a level of personal trust was established.

Following the lessons workshop, the Attorney-General's Department instigated the development of a Lessons Management Handbook (Australian Disaster Resilience Handbook 8: Lessons Management, 2013). The Attorney-General's Department, NSW SES, CFS, Fire and Rescue NSW, Victoria Police, the Country Fire Authority and the (then) Emergency Management Queensland came together as a working group to share their knowledge and experience and develop better practices for lessons managers, with the output being the Lessons Management Handbook. This collaboration saw the development of a standard terminology for lessons management and a concept for common coding and analysis of observations across many ESOs. The working group travelled to most states and territories to share their learnings, promote lessons management and the handbook, as well as widen the lessons practitioner network. Through these activities the relationships between the lessons practitioners in the working group strengthened. The members of the working group began to share their lessons frameworks and results of their lessons management activities. As their collaboration increased so did the levels of trust in each other and their agencies. This resulted in open sharing between the agencies of observations of organisational performance, lessons identified and internal publications such as newsletters, standard operating procedures and operational bulletins. Information on the barriers within each organisation that prevented lessons being learnt was also openly shared. This process of close collaboration and sharing helped each of the agencies to develop their own lessons capabilities further, as well as contributing to the development of a resource that is now assisting many other agencies and individuals across the country who are interested in lessons management and organisational development.

As a result of the collaboration on the lessons handbook a common gap in knowledge of data analysis was identified by the lessons practitioners. Fire and Rescue NSW led the way by organising a joint workshop where observations from agencies could be shared and a consistent approach to data analysis developed. This collaborative workshop involved sharing data, discussing events and agency procedures in detail and identifying the root causes of poor performance. The workshop furthered the skills of all participants and resulted in several lessons common across the participating agencies being identified. These 'national lessons identified' were developed into a report and circulated at national, state and agency levels. The open sharing of data regarding agency performance that resulted in the development of these national lessons would not have been possible without the previous close collaboration of the participating agencies.

From their initial contact the lessons managers from NSW SES and CFS identified a number of synergies between their agencies. Although combat agencies for different hazards, the observations, lessons identified, suggested treatment options and communication challenges were similar. Both agencies rely on a geographically dispersed volunteer workforce that presents additional challenges including conducting debriefs in a timely manner, communicating lessons identified and having altered procedures or governance implemented. The lessons managers from these two agencies shared information and experiences in relation to these challenges, which in turn has led to the interstate exchange of lessons practitioners after major events. These exchanges began with the invitation from CFS to NSW SES to assist with promoting lessons management to their senior leadership team and this was followed by a invitation to a larger group of lessons practitioners to assist with the analysis of data and identification of lessons post the major fires of 2014. In 2017, NSW SES invited practitioners from a number of states to assist with the collection and analysis of data from the 2016 floods in western NSW. The previous collaboration and sharing of skills and knowledge between the lessons practitioners had established the relationships that now provided the additional resources that enabled the respective host agencies to analyse thousands of observations gathered during large-scale events, identify lessons and provide reports for their respective agencies in a timely manner. The lessons identified from this collaboration now form the basis for continuous improvement within the agencies.

In summary, collaboration between lessons practitioners in the emergency management sector has provided opportunities for agencies to develop a common approach to collecting, coding and analysing data. Learning lessons as a lessons practitioner is greater than the process itself and an individual agency's activities. Sharing of experiences, organisational challenges and successes provides opportunities for practitioners to leverage from each other, keep pace with good practices and support the lessons capability in the participating agencies. The synergies gained through this collaboration between lessons practitioners across the emergency management sector has contributed to strengthening the lessons capability in each of the participating agencies and has resulted in greater achievements in this sphere than agencies would have achieved working in isolation.

Case study: the preparedness puzzle

Tracy Smith, Muriel Leclercq and Victoria Chuter, Western Australia Office of Emergency Management

This case study describes how the Western Australian Office of Emergency Management developed its emergency management assurance and lessons management frameworks. Their relationship with the Capability Framework underpins successful implementation.

The connection between capability, assurance, lessons management and exercising is, in our view, quite innovative. Strategic decisions create better prepared and more resilient communities. The capability framework provides the context and currency for this decision making.

Following devastating bushfires that destroyed the township of Yarloop during January 2016, the Western Australia Government appointed a Special Inquirer, Mr Euan Ferguson, to review the management of the fire response. Crucially, the review also considered what has been learnt from previous major bushfires.[1]

The narrative to this point is one heard before: An emergency occurs, the incident is reviewed and recommendations are made. Agencies work to implement the recommendations. Recommendations can be tactical or strategic, simple or complex. Difficulties or debates may arise that relate to research, funding or legislative change. This process is repeated following the next emergency event.

New recommendations may add complexity where they duplicate or contradict the previous set. Further, because a new implementation team is established, the momentum of implementing the new recommendations overwhelms the previous, which (unofficially) becomes a lesser priority. Once another incident happens... the cycle continues.

This was the position in Western Australia ahead of the Ferguson review in 2016.

Puzzle pieces

Assurance

The government response to recommendation 1 of the Ferguson report was to create an assurance function for emergency management in Western Australia.

With little precedence of emergency management assurance frameworks nationally or internationally, we undertook considerable research and consulted with major stakeholders; 18 organisations in the first round of face-to-face consultation. We also reached out to the Queensland and Victorian Inspectors-General of Emergency Management for inspiration and started planning for an assurance framework.

The WA Emergency Preparedness Report[2] became central to the assurance concept. An assurance framework could improve the Western Australian Government's confidence in the state's preparedness by increasing the robustness and reliability of the self-reported information that informs the report.

Lessons management

Ferguson's criticism of the lack of systemic monitoring of recommendations from previous major incident reviews[3] allowed us to pause and evaluate how incident recommendations were managed.

The Ferguson review suggested that the Emergency Preparedness Report include the status of outstanding recommendations.[4] As such, we reviewed the status of the 118 unresolved, historical items in addition to the 40 new matters listed in the Ferguson review.

As we processed the seven-plus years of recommendations we identified issues to be resolved, such as the lack of a tracking process; recommendations that are duplicated, vague or unspecific; and a lack of prioritisation. We determined that the way to solve these problems was to map the recommendations to our capability framework and use it to rationalise and prioritise. The alignment with the capability framework also allowed us to use a common language and share learning.

1 Public Inquiry into the January 2016 Waroona Fire - Terms of Reference. At: www.publicsector.wa.gov.au/document/public-inquiry-january-2016-waroona-fire-terms-reference.

2 Emergency Preparedness Report. At: www.oem.wa.gov.au/publications/emergency-preparedness-reports.

3 Ferguson E 2016, *Reframing Rural Fire Management: Report of the Special Inquiry into the January 2016 Waroona Fire, p. 44. At: https://publicsector.wa.gov.au/document/reframing-rural-fire-management-report-special-inquiry-january-2016-waroona-fire.*

4 Ferguson E 2016, *Reframing Rural Fire Management: Report of the Special Inquiry into the January 2016 Waroona Fire, p. 46.*

The capability framework describes the skills and knowledge needed to make Western Australia safer, more prepared and more resilient to emergency events. However, it purposefully does not describe how an organisation should fulfil those capabilities. As such, agencies can leverage their unique culture and expertise to achieve improved outcomes rather than simply implementing an externally controlled process.

Rationalising the historic recommendations provided two realisations. First, what we were calling 'lessons management' was simply recommendation tracking. Second, current recommendations are as much a cage as they are a catalyst. By this we mean that some of the outstanding recommendations were simply too restrictive, as written, to be implemented or they did not work for an organisation's skills and operational requirements. They do not reflect the capability framework's emphasis on flexibility and innovation.

In order to shift the focus from recommendations to lessons, we devised a lessons management process based on the well-accepted Observations, Insights, Lessons (OIL) methodology.[5] We amended OIL to OILL: the extra 'L' highlights that lessons must be learnt, not simply identified (Figure 1).

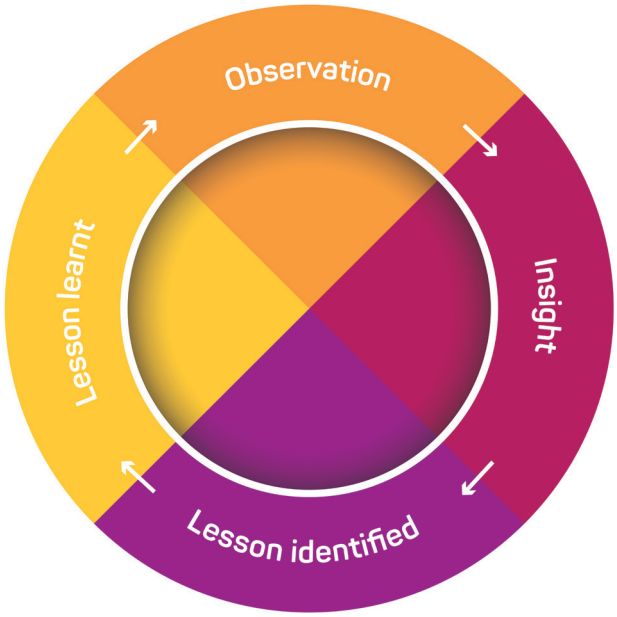


Figure 1: The Western Australia Lessons Management Process.

Observations are objective and come from a range of sources. Observations can be beneficial (things to keep doing or do more of) or remedial (things to do differently or to do less of).

Insights look closely at the observations and investigate issues. For example, liaison with district emergency management committees gathers further observations, considers the impact on different regions and seeks consensus for whether change is needed.

Lesson identified evaluates the insight through the lens of the capability framework. This highlights whether or not the sector meets the desired capability target. A lesson identified contains enough context to clarify the intent of the lesson and the authority to undertake actions to implement. It is important that specific measures are set to evaluate implementation.

Lesson learnt occurs when there is demonstrated behaviour change.[6] To verify that the agreed measures have been met and that the lesson has actually been learnt, a robust checking process is required. There is a wide range of activities that can perform this checking function (such as audits or post-incident reviews). It is our view that exercising plays an important evidentiary role.

Critical to the success of the OILL model is the involvement of agencies. Where a capability gap is found, the relevant agencies must be involved to determine the best approach to resolve it. It is important that decisions focus on the best outcomes and permit innovative solutions, even where it may disagree with a previously recommended action.

Exercise management

This creation of the lessons and assurance frameworks coincided with a planned review of the Western Australia exercise management process. The review considered several aspects of exercising including reviewing the exercise management policy, improving the exercising requirements to better reflect emergency management risks, improving interagency cooperation and better recognition of the state's emergency management capabilities.

The exercise management framework can also target lessons and validate required behavioural changes. This interaction with the lesson management framework enables the exercise framework to demonstrate improvements in capability.

The puzzle revealed

A light-bulb moment occurred when we realised that each of the frameworks, namely assurance, lessons management and exercising, were intending to do the same thing: improve the capability of Western Australia to plan, prepare for, respond to and recover from emergencies and disasters.

The lessons management framework is a critical component to strengthen emergency management capability for Western Australia. It provides a process to check that actions resulting from recommendations and lessons identified are being implemented.

5 Center for Army Lessons Learned 2011, *Establishing a Lessons Learned Program, Observations, Insights, and Lessons. Handbook pp. 11-33. At: www.au.af.mil/au/awc/awcgate/army/call-11-33.pdf.*

6 Ibid p.3.

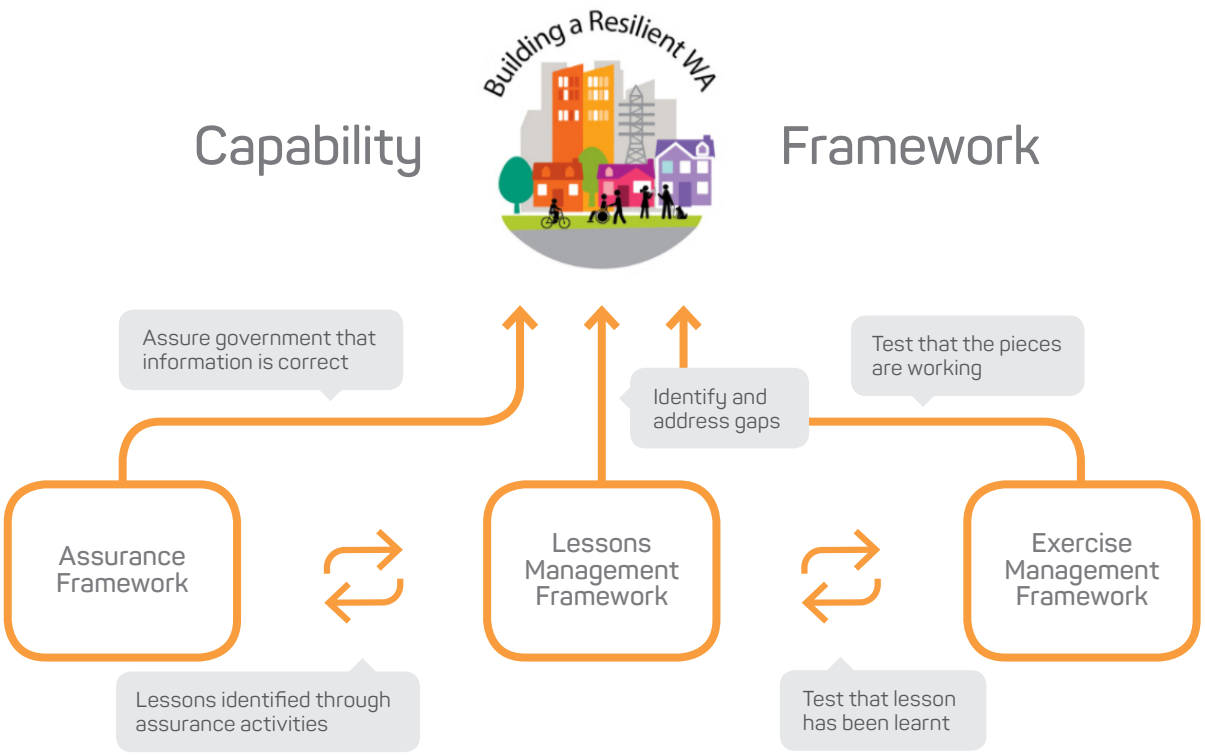


Figure 2: Western Australia Government capability framework.

Simultaneously, it integrates lessons identified through assurance activities. Where a lesson has been identified and actioned, it can be tested through the exercise management framework. Together, these frameworks underpin the continuous improvement of the emergency management sector (Figure 2).

The link to the Western Australia capability framework reinforces two key requirements. First, that improvements should be purposeful and targeted to predetermined capability requirements. Second, that improvements should minimise the impact of emergencies on individuals, communities, government, the economy and the environment by promoting a coordinated, sustainable and progressive approach to emergency management.

The State Emergency Management Committee is keen for continuous improvement in emergency management. They support development of the assurance, lessons management and exercise management frameworks including alignment with the capability framework.

During this development, we identified our own observations. For example, in Australia, the national emergency management capability framework is in its infancy and there is no agreed standardised system for codifying lessons identified. The resultant insight, supported by Cole, Dovers and Eburn is embedding the national capability themes and targets will facilitate the 'synthesis and categorisation of the outcomes of post-event reviews and inquiries'. The national capability framework should inform the development of jurisdictional lessons management frameworks and nationally standardise the codifying of lessons identified.

Contact the Western Australia Office of Emergency Management at 08 6551 4018.

7 Cole L, Dovers S & Eburn M 2017, *Major post-event enquiries and reviews: review of recommendations, Bushfire and Natural Hazards CRC. At: www.bhncrc.com.au/research/policy-and-economics-hazards-3928.*

Case study: the Victorian Emergency Management Community Resilience Index

Melissa Parsons, University of New England and Bushfire and Natural Hazards CRC, Dr Holly Foster, Bushfire and Natural Hazards CRC and Emergency Management Victoria and Sam Redlich, Emergency Management Victoria

This case study describes the experience of using and embedding components of the national-scale Australian Natural Disaster Resilience Index into the state-scale Victorian Emergency Management Community Resilience Index.

The emergency management sector as a whole is undergoing a paradigm shift: working together to realise a sustainable and efficient emergency management system that reduces the likelihood, effect and consequences of emergencies. Associated with this paradigm shift is the prioritisation of evidence-based decisions, and the commissioning and utilisation of research to guide strategy, investment and decision-making. Assessing community resilience is one of the areas in which the sector can support and implement new and emerging research and practice.

Two indexes of community resilience

The Victorian Emergency Management Community Resilience Index (VEMCRI) is being developed by Emergency Management Victoria (EMV) to provide baseline information on community resilience that can be used by agencies and departments to inform recovery planning. The index is an online database of community resilience indicators and is required to be 'live' to incorporate updated indicator data over time. The VEMCRI has an interactive interface through which indicator data are arranged and visualised.

The Australian Natural Disaster Resilience Index (ANDRI) research project is funded through the Bushfire and Natural Hazards CRC (CRC) to develop an index that assesses disaster resilience in Australian communities. The ANDRI is designed with eight themes: social character, economic capital, infrastructure and planning, emergency services, community capital, information and engagement, governance, policy and leadership and social and community engagement. Each theme comprises indicators that represent the latent dimensions of resilience and the index is computed using these indicators. The ANDRI will provide a 'moment-in-time' snapshot of the state of disaster resilience across Australia; the first time this has been done at a national level using standardised methods. The ANDRI outputs are produced in map format with interpretations of the strengths and opportunities for disaster resilience.

The VEMCRI was commissioned within EMV as part of a broader project to improve Victoria's impact assessment processes, while the ANDRI is an applied research project embedded within the CRC philosophy of industry utilisation. EMV is heavily engaged in the CRC research program and is an end-user for the ANDRI project. This critical relationship was used to explore and leverage the adoption of the ANDRI as the Victorian index. Despite similarities in the centrality of disaster resilience and the use of resilience indicators between the indexes, differences in index scope, design, scale, audience, visualisation, user requirements and milestone delivery precluded the direct uptake of the ANDRI for use as the VEMCRI. However, EMV and ANDRI staff worked together to use many of the conceptual, design and indicator components of the ANDRI for adoption into the Victorian index. This saved EMV significant time and resources duplicating the effort of refining and testing indicators independently.

Embedding the research into EMV

Relationships and trust are one of the key factors in research utilisation and knowledge exchange. One of the critical factors in using the ANDRI for the Victorian index was the working relationship between the three main actors: the manager of the VEMCRI, the EMV research coordinator and the ANDRI research project leader. Differences in project goals and the institutional roles of the actors typical in research utilisation (described in Figure 1), can create challenges for embedding research outcomes. Commitment from all actors to work collaboratively was chief in aligning the indexes.

Another key success was to articulate the gains and savings in using the ANDRI within the Victorian index. The ANDRI resilience indicators were developed over two years by experts in the field of disaster resilience and resilience assessment. Rigorous conceptualisation, development and peer review of indicators within the ANDRI project saved EMV time and money because indicators and associated data inputs could be adopted into the Victorian index. Thus, the VEMCRI was developed

and delivered more efficiently and at lower cost because of the existing end-user relationship with the ANDRI project. End-user aligned research is a pillar of the CRC. This end-user model has benefited the direction and outcomes of the VEMCRI as a strategic, sector-wide project.

There were several challenges embedding the ANDRI project wholly into the Victorian index. With many government agencies, working groups formed by subject matter experts have a concrete perspective of how something can be used practically. This can vary vastly from research-based policy development, which in an area like community resilience is still emerging and difficult to operationalise. This required significant project management (communication and updating of the project control groups) and briefings from the ANDRI researchers. Direct communication with researchers reassured stakeholders of the rigour and expertise behind the product that guaranteed their commitment to the project.

Moreover, visualisation was a powerful tool to convince a varied working group the ANDRI could be used for their purposes. To better people's understanding of how the Victorian index would complement their work, prototypes, demonstrations and graphically designed desktop mock-ups were used to demonstrate to stakeholders how the index will complement or enhance existing processes and methods.

Another challenge is that the parameters of a research project may not align to agency priorities exactly. This was the case for the ANDRI project that was aligned to resilience assessment directions but generates a national-scale, one-off snapshot of disaster resilience. The requirement of EMV and its project stakeholders was for a state-level index that could be updated through time and that supported recovery planning. This challenge was overcome by evaluation and discussion and it was resolved that the ANDRI could form a solid baseline from which the Victorian index could build a live capability.

Operationalising community resilience is a new and emerging public policy area. With any emerging theory or paradigm, there is reliance on the Australian Government to provide guidance on how states and territories should implement it. The ANDRI operationalises the latest conceptual advances in disaster resilience thinking by:

- assessing disaster resilience as capacities
- including indicators of emergency services, planning, community engagement and adaptation
- using the most up-to-date statistical methods for index computation.

It was therefore met with some hesitation in the sector. In this case it was state government reform towards community resilience that positioned Victoria to pioneer such an index.

Furthermore, the tradition of commissioning one-off projects to satisfy immediate government needs had to be overcome, particularly when budget was allocated in advance for such work.

For many years, the supplier-provider model has dominated how departments and agencies perceive the process of commissioning and using research. The process of co-generating and embedding external research can be challenging but there are solutions including relationships, collaboration, flexible project design and demonstration of benefits and savings. This case study demonstrates some of the challenges and the benefits from persevering at the research-government program interface.

COLLABORATIVE UNIVERSITY RESEARCHER

- Undertake academic research in line with University strategic research directions.
- Advance new knowledge in the discipline of expertise.
- Balance teaching, research and service roles.
- Build learning networks and collaborators at the science-policy and science-program interfaces.

RESEARCH COORDINATOR

- Work with highly expert, often operational, colleagues who are time poor.
- Make visible external research and the learnings for EMV.
- Champion the importance of collaboration in undertaking and embedding research.
- Balance rigorous academic research with commissioned, consultant undertakings .

RELIEF AND RECOVERY PROJECT MANAGER

- Manage project development timeframes.
- Focus on operational improvement and susceptible to changing priorities.
- Coordination-based work, but a limited group of stakeholders.
- Balance policy alignment and policy development.

Figure 1: Actors in utilisation of the ANDRI into the VEMCRI and their typical roles.

We learn as one: Victoria's journey to collaborative lessons management

Lisa Marie Jackson and Adair Forbes Shepherd, Emergency Management Victoria

In November 2015, Victoria's lessons management framework was released. The EM-LEARN framework established a model for lessons management, including a life cycle that defined cultural characteristics and lessons management process, based on research.

In 2014, the Victorian emergency management sector commenced an exploration of lessons management approaches. Emergency Management Victoria (EMV) conducted an environmental scan of local, national and international lessons management good practice. In addition, research was conducted through Charles Sturt University on what successful lessons management looks like in emergency management.[1]

The environmental scan and research found:

- a strong culture of identifying themes, trends and lessons but not much success at ensuring lessons were learnt by creating lasting behaviour change
- no consistent model for capturing, analysing, sharing and implementing lessons leading to poorly defined roles, responsibilities and expectations
- that blame and shame, although diminished, was still prevalent in some parts of the sector
- a lack of visibility in the process of developing lessons, leading to a perception that personal observations and contributions were not influencing change
- there were many champions of learning practice in the field but there was a risk of losing momentum because of the perceived information 'black holes'
- emergency management agencies (e.g. responder agencies, government departments and non-government partners) were working separately on lessons management, creating silos of knowledge and disconnected learning opportunities
- there was a limited understanding of principles and benefits of lessons management.

Overall, development of a learning culture was recognised as crucial to the success of lessons management. This required a strong foundation of robust collaboration and effective communication.

In November 2015, Victoria's lessons management framework was released. The framework established a model for lessons management, including a life cycle that defined cultural characteristics and lessons management process (see Figure 1). The cultural characteristics include communication, accountability, just and fair, leadership and learning. The lessons management process includes two cycles that define how lessons will be identified and learnt based on the national model for lessons management analysis being observation, insight, lesson.[2] The release of the framework was a key communication and education tool as a first step to clarifying roles, responsibilities, processes, terminology and expectations.

EMV, together with the State Review Team (SRT), developed the framework over 12 months based on the environmental scan, research and extensive stakeholder engagement, including more than 70 meetings with 25 organisations. Through this process, a strong understanding of the sector's shared strengths, challenges and future learning needs was identified. The framework was released as 'approved for discussion' to allow the communication and exploration of the lessons management concepts and lessons management model across the sector. The framework outlined five key project areas to support implementation: governance, communication, process, training and technology.

State Review Team

The SRT (previously the State Debrief Group) is Victoria's key governance committee for lessons management, the development of the framework and championing lessons management over many years. The SRT began as a small group of people passionate about sharing and learning collaboratively, representing the traditional responder agencies. In 2018, it has evolved to consist of representatives from 17 emergency management

1 Jackson LM 2016, *The influence of organisational culture on learning lessons: implementing a lessons management life cycle, Australia Journal of Emergency Management, vol. 31, no. 1, pp. 18-23.*

2 Australian Institute for Disaster Resilience 2013, *Australian Disaster Resilience Handbook 8: Lessons Management.*

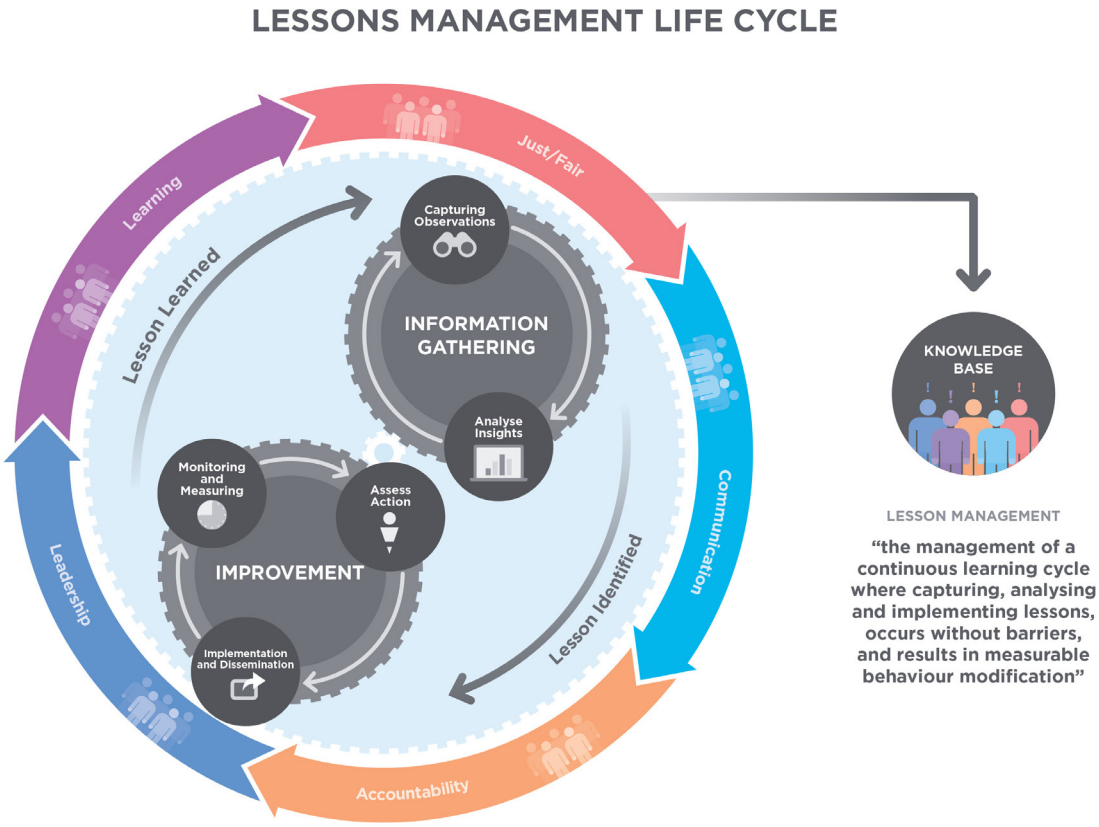


Figure 1: The EMV lessons management lifecycle is based on research and defines cultural characteristics and lessons management process.

organisations including non-government organisations, government departments, local government and agencies. The SRT focus has expanded beyond fire emergencies to a state-wide, coordinated approach. In particular, setting standards, capability and consistency for operational assurance and learning activities (monitoring, debriefing and reviewing) and lessons management processes to ensure continuous improvement. This includes all communities, all hazards, all year round and Class 1 and 2 emergencies, as defined by the *Emergency Management Act 2013*.[3] The SRT is now the leadership group that provides strategic influence, direction and state-level oversight of operational assurance and learning activities to promote sector wide consistency, learning and continuous improvement in a coordinated and effective manner.

Governance

The SRT was originally an informal network that would meet on an ad hoc basis to share, develop materials and work on progressing operational learning and improvement. Over a number of years the SRT has developed into a formal group including:

- meeting monthly with a focus on sharing agency progress and achievements
- a rolling chairperson that is held by representatives of the SRT
- a terms of reference that is reviewed as required
- a formal governance structure where the SRT reports into the State Coordination Team (SCOT) which is chaired by the Emergency Management Commissioner.

The Operational Assurance and Learning Arrangements were approved by the SRT and SCOT in August 2017. The arrangements use the lessons management process in the framework to outline how community, business, industry, government and agencies provide learnings and experiences and how the SRT will analyse for trends, identify lessons, implement change and improvement and conduct monitoring and measuring to highlight lessons that have been learnt and that have resulted in behavioural and organisational change. The arrangements have been used to identify Victoria's first state-level, multi-agency lesson based on 27 observations, across greater than three events and six insights. There are actions being undertaken to support behaviour and organisational change based on the lesson and it is being distributed and implemented across the sector. The lesson has also been a focus during a real-time monitoring and evaluation deployment in late 2017 where further evidence was gathered to support the lesson.

3 Emergency Management Act 2013 (Vic). *At: http://www9.austlii.edu.au/cgi-bin/viewdb/au/legis/vic/num_act/ema201373o2013236/.*

Communication

In the early years, the SRT was sharing learnings and collaborating on the best ways to learn together as a sector and, in particular, it established the Post Season Review process. The Post Season Review Report was a key communication tool for sharing learnings from multi-agency debriefs at the conclusion of the fire danger period to inform continuous improvement activities prior to the next fire danger period. The document was released in 2011-12 and has since evolved to the Emergency Management Operational Review. In 2014-15, the Post Season Review was superseded by the Emergency Management Operational Review, which moved towards a broader focus on:

- year-round – broadened timeframe from the fire danger period to financial year
- multi-hazard – expanded beyond bushfire incidents
- all phases – expanded beyond response only activities
- multi-agency – expanded beyond responder agencies.

The Emergency Management Operational Review is now divided into three sections:

- Section 1 provides an overview and narrative outlining the broad spectrum of emergency management activities undertaken across the sector before, during and after emergencies experienced during the financial year.
- Section 2 includes a selection of case studies that were developed over the financial year and demonstrate the variety of incidents managed by Victorian emergency management personnel.
- Section 3 provides an update on the themes and insights identified during the financial year and highlights good practice, changes and improvements as part of an ongoing cycle of learning improvement.

The Emergency Management Operational Review is available online at www.emv.vic.gov.au.

Process

The SRT is particularly focused on building consistency in operational debriefing, real-time monitoring and evaluation and reviewing processes. Resources are annually produced by the SRT and disseminated across the sector including guidelines, templates and supporting documentation. The Debriefing Guidelines has evolved from a focus on post-fire-danger period debriefing to establishing principles for planning, conducting and managing outputs from debriefs including direction on regional, community and interstate and international deployment debriefing.

The SRT was a key group of subject matter expertise that supported the Victoria Police Strategic Emergency Management Assurance Team (SEMAT) deployments. SEMAT was developed by Victoria Police (VicPol) out of the 2009 Black Saturday Royal Commission. It is a real-time assurance function that VicPol provided to the Emergency Management Commissioner or Chief Commissioner of Police to ensure effective control of response is established for each emergency. In 2014, responsibility for state-level response coordination in Class 1 and 2 emergencies transferred from VicPol to EMV.

The Country Fire Authority (CFA) and Department of Sustainability and Environment (now Department of Environment, Land, Water and Planning) also established a real-time performance monitoring (RTPM) capability after the alpine fires in 2005 to provide quality assurance and feedback of incident management structures. Over time, the program broadened to also apply to response structures at the regional level.

The Department of Health and Human Services (DHHS), the Australian Red Cross and local governments also established a real-time evaluation capability that focused on real time learning during relief coordination at state, regional and local government tiers. In 2015, responsibility for state-level relief and recovery coordination transferred from DHHS to EMV.

Due to the work of the SRT the real-time performance monitoring capability and real-time evaluation functions have developed to form a real-time monitoring and evaluation capability, which is applied during the readiness and response of Class 1 and 2 major emergencies and relief and early recovery phases of Class 1, 2 and 3 major emergencies, superseding real-time performance monitoring and real time evaluation functions. Since the real-time monitoring and evaluation capability has been formed in mid-2017, teams have been deployed at the incident and regional levels to inform real-time learning during a storm event and into the State Control Centre during a heat event.

Training

The SRT has always had a focus on building capability within organisations and across Victoria to support operational assurance and learning activities. In particular, the SRT has contributed to the development,

delivery and participation in training and workshops, including:

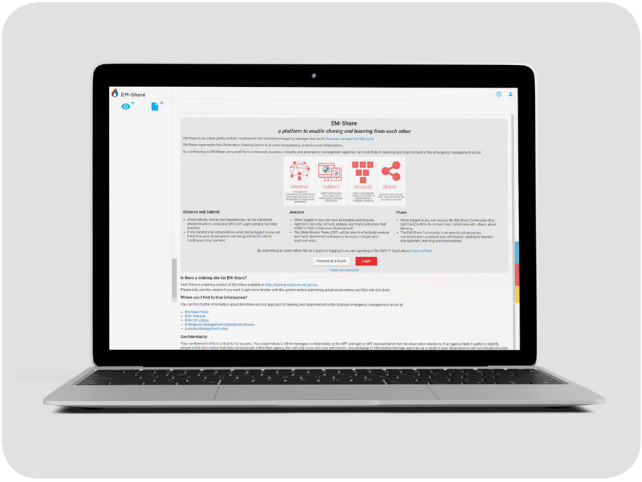
- how to implement a culture that supports learning and improvement
- debriefing training in planning, conducting and managing outputs
- building real-time monitoring and evaluation capability
- developing skills in the lessons management process of observation, insight, lesson analysis
- assisting with organising and attending the AFAC Lessons Management Forum and workshops.

The focus on building multi-agency capability including SRT co-facilitation of training and workshops has supported the implementation of lessons management across the state through empowering individuals to contribute to the continuous improvement of the sector. This can be seen in the diverse attendance at the sessions and local initiatives being undertaken.

The SRT is represented on the AFAC Knowledge, Innovation and Research Utilisation Network and is part of a National Lessons Management Working Group that builds consistency in lessons management across Australia.

Technology

The Observation Sharing Centre (OSC) was established by the CFA as an outcome of the Jones Inquiry (2011) into the arrangements made by the CFA for its volunteers. The inquiry highlighted the need for volunteers to be able to contribute experiences and innovative practices to the continuous improvement of the sector.[4] The use of the OSC increased in momentum and received approximately 100-150 observations a year, including the submission of debrief reports that would be used to inform the Post Fire Danger Period Report.



EM-Share is an online platform that enables emergency management personnel to share observations and files from operational and non-operational activities, view insights and lessons, track user contributions and collaborate with others.

The OSC was a great start to sharing learnings but it was highlighted that an online platform to support lessons management required:

- greater transparency
- further configurability and analytical ability
- clear governance
- increased security, reliability and access
- a capacity to track change and improvement
- all lessons management resources and data to be in one location.

In October 2017, after two years of extensive work by the SRT, a lessons management IT system, EM-Share, was released. EM-Share enables users to share observations and files from operational and non-operational activities, view insights and lessons, track how user contributions facilitate the continuous improvement of the sector and collaborate with others about learning. Since its release, EM-Share has received over 1000 observations, with more than 60 insights identified and one state-level and multi-agency lesson.

Conclusion

Lessons management is about giving people the opportunity to share their experiences and learn from others to ensure continuous improvement. People are empowered to actively contribute to continuous improvement to support the vision of safer and more resilient communities.

Through the collaboration of the SRT and their leadership role in lessons management, the sector is striving to continuously improve in real-time together rather than organisations or individuals learning independently and inefficiently. People are empowered to actively contribute to continuous improvement of the sector to support the vision of safer and more resilient communities. Lessons management provides the platform for holistic learning based on a diverse and comprehensive evidence base that wouldn't necessarily be available to individuals or organisations.

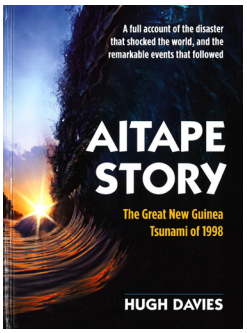
The long-term vision is for continuous improvement activities to support improved behaviour change, organisational performance and service-delivery planning for all communities, all hazards, all phases, all agencies and at all levels. Through the implementation of the framework and the collaboration of the SRT, lessons management in the sector will be integrated, evidence-based, continuous, consistent, transparent and holistic.

Victoria is starting to see a shift towards a learning and improvement culture. It is slowly moving away from recommendations and towards lessons; away from reports and towards case studies and away from action tracking and towards monitoring improvement.

4 Jones DJ 2011, *Report of inquiry into the effect of arrangements made by the Country Fire Authority on its volunteers. At: www.vfbv.com.au/index.php/news/inquiries/jonesinquiry.*

Aitape Story: the Great New Guinea Tsunami of 1998

Reviewed by R. Wally Johnson, Volcanologist, Australian National University, Canberra



Published by Halstead Press 2017

ISBN: 9781925043273

How many of us can recall the details of the tsunami disaster in the Aitape District, suffered in 1998 by our closest neighbour, Papua New Guinea? Halstead Press in Sydney has provided a valuable service by publishing a well-designed book on the disaster. *Aitape Story* concentrates on the remarkable relief and recovery efforts that involved a great range of emergency, medical, media and disaster-management agencies, both Papua New Guinean and international, both government and non-government organisations. These response groups included the Australian Government through its aid program, the Australian Defence Force (ADF) and other organisations such as the Monash Orthopaedic Surgical Team, Melbourne.

The Aitape tsunami struck the north coast of New Guinea island in West Sepik Province a few minutes after dusk on Friday 17 July 1998, and shortly after a series of earthquakes and aftershocks occured below the seafloor only a few kilometres offshore. The tsunami hit most severely along a 45 km-long stretch of coast, and particularly along a quite localised, central, 14 km-long sector bordering Sissano Lagoon. Villagers living in front of the lagoon-many isolated on sand spits at the ocean's edge were swept into the lagoon by a 10-15 metre-high tsunami wave. The exact total of deaths is unknown but likely was more than 1600. Injuries caused by people being tumbled helplessly and violently in the destructive wave that was laden with debris (mainly logs and sand) were extreme. The still-living villagers, and those who were still dying, spent a horrific night abandoned, traumatised and trying to cope as best they could.

The author of *Aitape Story* is Professor Hugh Davies, an Australian and a long-time resident of Port Moresby. Davies has developed over his geoscientific career a strong commitment to the study of geological hazards and to related disaster-management issues, including geologically at-risk communities. This compassionate commitment to the people of Papua New Guinea emerges clearly from the pages of his engaging and definitive account. It is the kind of book that could readily be overdramatised, but Davies's style is objective, clinical, calm and respectful.

Books have been published before on geological disasters, but I don't know of any that have 'drilled down' so deeply to portray so effectively the personal stories of survivors, volunteers, church people, missionaries, trauma counsellors and the medics who worked heroically in hospitals in nearby Wewak and Aitape and at Vanimo Hospital where an ADF field hospital was established. Local volunteer rescuers were especially effective in the first days after the tsunami struck.

Davies was involved in smoothing the way for international tsunami scientists visiting the disaster area in late July and August 1998 in order to assess the cause and impact of the Aitape tsunami. These International Tsunami Survey Teams (ITST) and other inquisitive scientists brought in seismographs as well as marine geophysical equipment including a remotely operated submersible. One scientific hypothesis was that the 1998 tsunami had been caused by a nearby submarine landslide triggered by one of the precursory, local earthquakes, rather than by one of the earthquakes themselves. Such a young landslide could not be identified unequivocally. The ITST scientists, to their credit, returned to the Aitape area in September 1999. They presented their results at well-attended community gatherings and later at a special conference that was held in Madang, which was attended by a wide range of participants, including Aitape villagers and survivors.

Davies finishes with these words:

> *... ultimately the onus to recover was on the individuals, each of whom had suffered some degree of loss, who pulled their families together, rebuilt their houses, carved new canoes, planted new gardens and made the villages. I admired them greatly. It was a privilege to be there and see it happen.*

ABSTRACT

In emergency management organisations, the drive to use research to inform practice has been growing for some time. This paper discusses findings from a survey used to investigate perceived effectiveness of a number of important processes in research utilisation. In 2016, a survey was completed by 266 respondents in 29 fire and emergency services agencies. Questions sought answers on perceived effectiveness in disseminating research within agencies, assessing and evaluating the impacts on agency practice of the research, implementing agency changes that may be needed, monitoring processes to track changes and communicate outcomes of changes made as a result of research. The study found that there were differences in levels of perceived effectiveness between those in senior management and front-line service positions. The differences suggest that front-line services personnel have lower levels of perceived effectiveness in how research is disseminated. The study also found agencies had different approaches to keep up-to-date with research advances. An examination of the activities identified four developmental levels of research utilisation maturity. The findings suggest more work is needed to better understand the enablers and constraints to utilising research to support development of evidence-informed practice.

Based on a presentation at the AFAC Lessons Management Forum, November 2017.

How emergency services organisations can – and do – utilise research

Dr Christine Owen, University of Tasmania, Hobart, Tasmania.
Submitted: 20 January 2018. Accepted: 8 March 2018.

Introduction

Research utilisation is critical not just for organisational growth, competitiveness and sustainability (Standing *et al.* 2016) but also for wide-scale sector development, community and economic wellbeing (Cutler 2008, Ratten, Ferreira & Fernandes 2017). In many countries collaboration and innovation are supported by government policies and initiatives that fund cooperative research centres to take a collaborative approach to research and development. These research centres produce ideas and outputs that can be adopted by organisations and used. However, research examining how research outcomes lead to innovation, including enablers and constraints, appears limited to the medical field in general (Elliott & Popay 2000, Kothari, Birch & Charles 2005) and nursing in particular (Brown *et al.* 2010, Carrion, Woods & Norman 2004, Retsas 2000).

This paper considers this gap for the fire and emergency services sector and investigates the approaches to using research outputs to inform work practice. The emergency services sector gains insights from research undertaken through a range of sources such as direct commission and academic institutions, as well as through bodies such as the Australasian Fire and Emergency Services Authority (AFAC) and the Bushfire and Natural Hazards CRC (CRC).

Emergency services organisations currently grapple with complex and 'wicked' problems (Bosomworth, Owen & Curnin 2017). When engaging with cooperative research centres agencies typically ensure that the research being undertaken is aligned to their needs. Over the past decade there has been increasing scrutiny on these organisations to justify actions (e.g. Eburn & Dovers 2015, Boin & t'Hart 2010). There is an urgent need for these organisations to develop their evidence-informed practice. One way to is to actively use research outcomes from their partnerships with cooperative research centres.

Literature review

The value of utilising research is well established (e.g. Brown & Frame 2016, Cutler 2008, Dearing 2009, Janssen 2003). When research utilisation is done well it enables:

- the pace of adoption processes to be accelerated (Helmsley-Brown 2004, Marcati, Guido & Peluso 2008)
- the number of adoptions possible from conducted research to be increased (Dearing 2009, Retsas 2000)

- the quality of research implementation to be enhanced (Janssen 2003, Kothari, Birch & Charles 2005)
- the use of worthy innovations (Glasgow, Lichenstein & Marcus 2003, Standing *et al.* 2016)
- the research effectiveness at agency and sector levels to be demonstrated (Elliott & Popay 2000).

Research is only one of several ingredients for successful innovation and, in many respects, only the start of the process. Utilisation from research does not magically follow from research outputs. What is needed is a systematic follow through from research insights to consider the implications and to develop processes that support review and, where needed, implementation and change.

Studies of utilisation and the barriers that need to be overcome (e.g. Funk *et al*. 1991, Cummings *et al*. 2007, Brown *et al*. 2010) suggest that research is used through a process by which new information or new ideas are communicated through certain channels, over time and among members of a social system. The process includes:

- disseminating new ideas or findings among members of a social system (Hemsley-Brown 2004, Brown & Frame 2016)
- assessing and evaluating the ideas in terms of their relevance to members of the social system (Carrion, Woods & Norman 2004, Dearing 2009)
- implementing changes that may be needed (Brown et al. 2010, Elliott & Popay 2000)
- monitoring the effects of the changes put in place (Cummings *et al*. 2007, Cutler 2008)
- reporting outcomes of changes made as a result of the new idea (Glasgow, Lichtenstein & Marcus 2003, Standing *et al.* 2016).

Research utilisation occurs through social interaction and the development of shared understanding as well as organisational processes to embed new ideas into work practice.

This brief review shows that a better understanding of the processes to utilise research is important, especially if emergency services organisations are to maximise investment and engagement with cooperative research centres.

Method

A survey was distributed in 2016 to heads of emergency services agencies seeking a stratified sample of personnel within the agency. This included those working at:

- senior management levels including the most senior person in the organisation responsible for communications, training and development, operations, community safety, knowledge management, innovation and research
- middle management levels including regional, operational and non-operational personnel
- operational or front-line service positions (e.g. field operations personnel, community education officers and training instructors).

In the survey 'research' was defined as a systematic approach to answering a question or testing a hypothesis using a methodological study. The researcher enquires into a problem, systematically collects data and analyses these to develop findings to advance knowledge. Doing research in this way is distinguished from gathering general information by reading a book or surfing the internet. 'Research utilisation' was defined as the process of synthesising, disseminating and using research-generated knowledge to make an impact on or change the existing practice. Respondents were asked to consider research that may have come from a source internal to their organisation (conducting its own research) and from an external source, such as cooperative research centres and other research institutions.

In the 2016 sample, 50 agencies were invited and 266 responses were received from 29 organisations. The agency participation rate (58 per cent) is appropriate for online surveys of this type (Barach & Holtom 2008). The median number of years that survey respondents have been in the sector was 22 and the median number of years within the agency was 13; demonstrating the level of experience in emergency services of those responding.

There was a reasonable spread of participation from the kinds of agencies included in the sector with the exception of urban agencies, where only one agency participated yielding 12 (five per cent) of responses. Most of the responses came from people participating in agencies that have multiple hazard roles (n=77 or 35 per cent). This indicates the structural shifts occurring within the sector as well as a broadening of the stakeholder base. Participation from rural agencies was well represented (n=52 or 21 per cent). Land management agencies (n=37 or 15 per cent), State Emergency Services (n=35 or 14 per cent) and agencies with other roles (e.g. critical infrastructure, humanitarian, specialist science roles (n=38 or 15 per cent).

Of the respondents who answered the question about their position in the agency, 29 (15 per cent) were in senior management positions (e.g. directors), 128 (66 per cent) were in middle management roles (e.g. district managers) and 37 (19 per cent) had front-line responsibilities (e.g. training instructors).

The survey consisted of a number of quantitative Likert-type questions where respondents were asked to rate their level of agreement on a scale of 1 to 7, with an option for 'can't answer'. In addition there were qualitative questions inviting comments. One in particular is discussed in detail here. The qualitative responses to the question 'What strategies does your agency have in place to keep up-to-date with research?' yielded comments from 168 respondents. These were initially

coded and discussed between two coders. A sample of 30 comments was coded to develop a framework to discuss. Once the coders achieved an inter-rater reliability of 88 per cent the rest of the comments were coded to four identified themes.

Limitations

While there are processes in place to ensure that the research being undertaken is addressing a gap in knowledge, what has not been discussed is if that research is the best available to advance societal goals (Sarewitz & Pielke 2007). The focus in this paper has assumed that those processes are already in place between agencies and their research suppliers.

The qualitative framework of research maturity (discussed below) is based only on what the participant had recorded, meaning that a respondent's agency may be more active but this was not articulated in the comment.

Results

Perceived effectiveness of research utilisation processes

Respondents were asked to rate the perceived effectiveness of their agency in terms of its processes to:

- disseminate research within the agency
- assess and evaluate the impact on agency practice of the research
- implement any agency changes that are needed
- establish monitoring processes to track changes
- disseminate the outcomes of changes made as a result of research.

Differences were found in the ways respondents rated their levels of satisfaction on these items. On average respondents rated their agency's effectiveness in 'Assessing and evaluating the impact of research in agency practice' significantly lower than they did its effectiveness in disseminating Bushfire CRC research.[1] In addition 'Putting in place processes to monitor and track changes' was also significantly lower.[2] This indicates that while there are higher perceptions of effectiveness with the ways in which personnel receive information about the research, there is less satisfaction with effectiveness in considering the implications or implementation.

Given the sustained effort that the CRC and AFAC have put into packaging materials to make dissemination a relatively straightforward and accessible process for agencies, this may indicate that similar resources and tools are required to help agencies undertake other aspects important in the utilisation process.

What is interesting is that while levels of perceived effectiveness with disseminating research were high overall, there were differences based on the hierarchical role the respondent had in the organisation.
Figure 1 shows the averages and standard deviations for senior managers, middle managers and those working on the front-line. There was a significant difference between senior managers and front-line personnel.[3] The difference suggests that front-line services personnel lower levels of perceived effectiveness in how research is disseminated. This has implications for their roles as these personnel are expected to translate research outcomes into practice (e.g. training and community outreach programs).

Perceived effectiveness with disseminating CRC research within the agency (-/7)

Figure 1: Mean differences with perceived effectiveness with disseminating research within the agency for senior, middle management and front-line services personnel.

Keeping up-to-date with research

Respondents were asked to provide comments on the ways they knew of to keep up-to-date with research. This is a first step to then being able to consider implications for agency practice and whether or not anything needs to change. There were 168 respondents who provided comments in the 2016 survey. These included comments in relation to participating in CRC or AFAC events, such as attending a conference or Research Advisory Forum as well as participating in the research project team as an end-user.

1 Paired t-test: Disseminate the Bushfire CRC research within the agency (M = 3.97, SE = 0.109) and Assess and evaluate the impact of the research in agency practice (M = 3.57; SE = 0.104), t (239) = 5.955, p = 0005, r = .81

2 Paired t-test: Disseminate the Bushfire CRC research within the agency (M = 3.99, SE = 0.108) and Put in place monitoring processes to track changes (M = 3.44; SE = 0.106), t (233) = 6.208, p = 0005, r = .66

3 ANOVA ($F(2, 186) = 4.356$, $p < .014$, $\omega = .045$

Table 1: Research utilisation maturity codes and examples.

Level	Description	Examples in data to question (if yes) what strategies does your agency have in place to keep up-to-date with research?
1 Low (Basic) N=39; (24%)	Systems are ad hoc and unsystematic. Attempts to keep up-to-date with research depend on individual effort.	'Undefined, not clearly communicated within communications. Nil business unit assigned to research and development.' '...the onus for keeping up-to-date is largely upon individuals maintaining an interest, or subscribing to emails.'
2 Moderate (Developing) N=63; (39%)	Some systems and processes are documented, which enables research to be disseminated. There is little or no evidence of analysis or impact assessment.	'We have two people that email CRC updates to staff.' 'Lots of material is distributed via our portal and email to keep staff and volunteers informed.'
3 Intermediate	There are established processes in place for reviewing research (e.g. dissemination and review either through job responsibilities or an internal research committee). No evidence of how the findings are translated or connected to operational activities.	'Developed a research committee.' 'SMEs appointed as capability custodians to ensure up-to-date best practice.'
4 High (Leading) N=23; (14%)	There is evidence of active connections between research and operational activities. Operational and strategic decisions are informed by assessing research using formal research utilisation processes. These processes and systems are widely understood and embedded in multiple areas of practice.	'... a process of ensuring results are read by key specialist staff involved in program design and delivery, are interpreted and analysed for their implications and relevance and then used to inform decision-making and strategy through numerous internal fora.' 'Alignment of evidence-based decision-making in the planning phases of annual planning and the development of indicators around causal factors that inform emergent risk.'

Other ways included keeping abreast of the research from emails or other forms of information dissemination. An analysis of the comments shows that some agencies have formalised processes in place to discuss and review research while other agencies leave this up to individual personnel (Table 1).

Given the importance of the methods agencies use to keep up-to-date with research these comments were further analysed. Four themes emerged that could be identified as developmental in terms of a new variable labelled research utilisation maturity. Examples of these developmental levels are presented in Table 1.

The comments were given a ranking of research utilisation maturity indicated in Table 1. The variable (research utilisation maturity) was added to the database and used to further analyse and compare quantitative responses.

Figure 2 shows the mean scores for each of the coded research utilisation maturity groups. Those coded to the high research utilisation maturity group rated significantly higher levels of perceived effectiveness on all processes associated with learning from research outputs compared to the lower ranked group. Responses on the utilisation maturity framework yielded statistically significant results for perceptions of effectiveness in disseminating research within the agency[4], assessing and evaluating the impact on agency practice of research[5], implementing any changes that may be needed[6], putting in place monitoring processes to track changes[7] and communicating outcomes of changes made as a result of research.[8]

Respondents were asked to rate the degree to which they thought their agency was one that exemplified a learning organisation. This was defined as an organisation that learns from experience of its members or learns from the experience of others. Respondents reporting strategies that were coded to the higher level of research utilisation maturity rated their organisations as significantly higher than those coded to lower levels of research utilisation maturity.[9]

These findings suggest that the approaches discussed by those in the higher research utilisation maturity group may provide insights for others. Leading agencies were ones that had:

- **Established governance processes.** They have established governance processes where business goals include research review (e.g. such as having a research review committee and a research framework as part of the business strategy). They

4 ANOVA ($F(3, 155) = 24.987$, $p < .0005$, $\omega = .326$)

5 ANOVA ($F(3, 147) = 28.614$, $p < .0005$, $\omega = .369$)

6 ANOVA ($F(3, 146) = 25.762$, $p < .0005$, $\omega = .346$)

7 ANOVA ($F(3, 143) = 20.360$, $p < .0005$, $\omega = .299$)

8 ANOVA $F(3, 151) = 31.516$, $p < .0005$, $\omega = .385$

9 ANOVA ($F(3, 147) = 14.5072$, $p < .0005$, $\omega = .228$)

also have active connections between research engagement and operations.

- **Utilisation embedded into job roles.** People have responsibilities for learning and review built into their job roles and into their group work. There is a widespread expectation that all personnel are responsible for learning and innovation and will adopt evidence-informed processes. This is supported by access to professional development opportunities.
- **Active testing of outputs.** They actively engage in testing outputs rather than accepting off-the-shelf products. They consult widely and know where to go for help and can access networks of expertise (internal or external to the agency) when needed.
- **Communities of practice.** They are actively engaged in agency and sector communities-of-practice (including other industries such as health) to communicate and innovate. They recognise that there are no magic solutions and they are able to articulate what is not known, problematic or uncertain that needs investigation. They recognise that learning is a process of continuous improvement.

Discussion

The differences reported between agency hierarchical roles suggests communication between senior management, middle management and front-line service roles needs attention. While it is reasonable to conclude that the onus of decision-making to determine if a change in practice is warranted will remain with senior personnel, if those in front-line positions are not as familiar with research outputs, it will be difficult for them to bring the required changes into practice. A focus on dissemination of research outputs to those responsible for front-line service delivery may be helpful.

In addition, agencies reporting higher levels of research utilisation maturity provide insights for others. It is important to recognise that change and innovation is developmental and requires adjustments to governance processes, job responsibilities and participation in communities-of-practice. These findings indicate that it may be possible to develop an adapted scale of organisational maturity to assess and measure research utilisation. Further research would identify agency profiles of maturity in research utilisation so that appropriate supports can be facilitated.

These findings suggest that more attention on how organisations learn to utilise research is required. Given the significant scrutiny placed on organisations and the emergency services sector as well as the pressure to demonstrate an evidence-base to practice, having a strong approach to research utilisation would seem essential. The study also suggests some other implications for future consideration

- Who is doing the utilisation and for whom? Are the same utilisation processes used for all research outputs or are different approaches needed, depending on the outputs? Is there a double edge to drawing on the perceptions of the 'thought leaders' who have been working in the agency for 20+ years, given that they are likely to be enculturated into established ways of seeing the world?

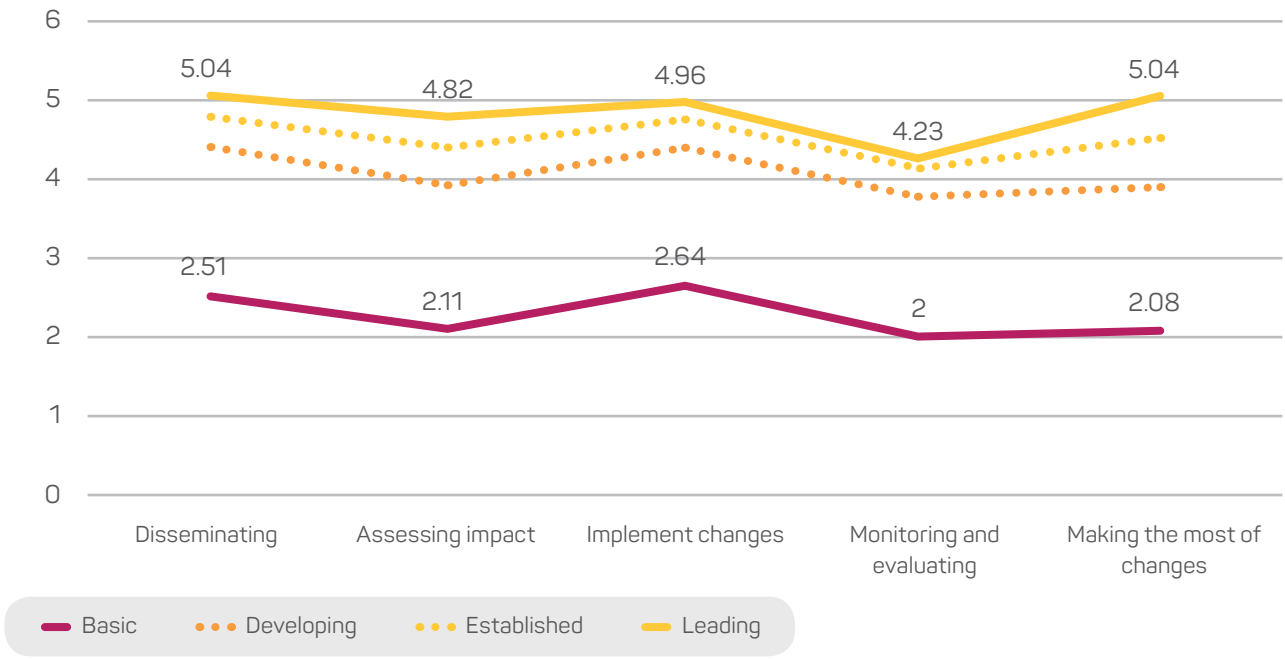


Figure 2: Perceptions of effectiveness for four identified levels of agency research utilisation maturity.

- What is being utilised from research? Are some research outputs easier (or acceptable) to utilise than others? Are there insights and outputs from research that are not utilised and why is this the case?
- Why are some barriers to utilisation more impervious to change? Are there research problems where proposed utilisation of insights or outputs is stifled?

Implications for future research from these findings suggest there is a need to tease out the elements that comprise learning and innovation cultures and what skills, processes and structures are needed. Further work is needed to better understand how perceived barriers can be overcome in order to increase and strengthen cultures of learning within agencies and the sector. Doing so will support goals of agility and innovation within the sector through research utilisation, which include the acceleration of adoption, maximising the value of research and increasing the worthiness of innovation.

It is vital that agencies—and the sector—builds capability in developing robust processes of deliberative review, assessment and evaluation so that evidence-informed practice can be demonstrated. This is necessary if the sector and involved agencies are to reap the full benefits of research.

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ABSTRACT

Significant disaster and emergency management events are invariably followed by formal post-event inquiries and reviews. Such reviews identify lessons to improve future capacities and set the agenda for policy and management reform for emergency management organisations. As a result, there is a substantial body of reflections and recommendations gathered across all hazard types and jurisdictions by formal, structured inquiry processes that contribute to lessons management for the emergency sector. However, whether there is any coherence or core lessons emerging for the Australian sector from the totality of post-event inquiries is unknown. The work reported here identifies the recommendations from these inquiries. A meta-analysis of 1336 recommendations made in 55 Australian major post-event reviews and inquiries since 2009 revealed common themes. The recommendations were compiled into a comprehensive database and categorised into 32 themes. The analysis highlighted recurrent themes from recommendations spanning multiple jurisdictions. The study indicates the potential value for Australian and New Zealand emergency management agencies and jurisdictions of using the aggregate data organised as a resource for lessons management.

Can major post-event inquiries and reviews contribute to lessons management?

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Submitted: 11 January 2018. Accepted: 1 March 2018.

Introduction

Lessons management is an important and increasing focus of organisational theory and practice in a generic sense (e.g. Milton 2010) and in specific sectors such as industrial accidents (e.g. Kletz 2001), the health consequences of accidents and disasters (e.g. Savoia *et al*. 2012) and in emergency management (e.g. Donahue & Tuohy 2006, Handmer & Dovers 2013). In Australia, the Australian Disaster Resilience Lessons Management Handbook (AIDR 2013) summarises the importance of the task, sets out general frameworks and principles for lessons management and provides further resources and references. As the singular and authoritative source for lessons management in Australian, the handbook serves to place the question of post-event inquiries and lessons management in context. The handbook states (emphasis added):

> *'Lessons management' is an overarching term that refers to collecting, analysing and disseminating experiences from operations, exercises, programs and reviews … Interoperability of lessons management systems across agencies, sectors and jurisdictions will facilitate information sharing and national analysis.*
> (AIDR 2013, p. 1)

An investigation of the large corpus of material of possible relevance to lessons management included collecting information, reviews and cross-sectoral and jurisdictional experiences at the national scale. AIDR (2013, p. 15) identifies post-event reviews as a 'collection opportunity', however, the potential of the totality of this resource remains unexplored to date. The handbook describes four steps: collection, analysis, implementation and monitoring and review. This paper deals largely with the first step to establish if post-event inquiries, as communicated through their all-important recommendations, represent a coherent source of issue and reform identification and result in lessons management at an aggregate scale.

Significant natural disasters and emergencies in Australia are almost always followed by formal, complex, post-event inquiries and reviews (inquiries). These inquiries vary in form and focus, however, the common objective is to identify the cause and consequences of disasters and recommend future practices for better outcomes. In some cases, they attribute responsibility or blame for failings.

Formal reviews and inquiries are an important aspect of lessons management (Eburn & Dovers 2015, 2017b). They provide opportunities for identification and learning of lessons relating to how the emergency management sector, including governments, business and individuals can better prepare for, respond to and recover from emergency events. In particular, there is significant interest in understanding how the findings, and the recommendations that distil those findings into suggested actions from formal reviews, can drive continuous improvement by emergency services agencies and others.

The outcomes of major inquiries in one jurisdiction sometimes have ramifications and lead to reform action in other states and territories. For example, following the 2009 Victorian Bushfires Royal Commission, there was widespread consideration of findings and recommendations by interstate emergency management agencies. This consideration led to national initiatives such as revisions to the fire danger rating system and amendments to the Australasian Inter-service Incident Management System. While this may occur in the wake of larger, high-profile events and inquiries, it is unknown whether there are recurring themes and important lessons for the wider emergency management sector in other post-event inquiries. This is independent of whether a jurisdiction- and hazard event-specific inquiry makes recommendations that lead to reform and thus contribute to lessons management. Formal inquiries require a vast amount of effort, both by those who undertake them and those who respond to them. Given their frequency, it is prudent to consider the totality of recommendations in aggregate to permit a comprehensive view of consistent issues.

Study purpose

The purpose of this study was to generate a high-level description of the major recurrent categories of recommendations across multiple post-event reviews conducted in Australia since 2009. The following negative hypothesis was provided to the review team:

> *There are no common themes to be identified when comparing and contrasting major post-incident reviews of emergency incidents, and the outcomes of those incidents and consequent recommendations turn on their own particular facts.*

Testing this negative hypothesis seeks to understand whether there is ongoing value for Australian emergency services organisations in considering the lessons from major reviews and inquiries from other jurisdictions, or whether lessons are too specific and lack broader import. Importantly, this study looked at whether the large corpus of inquiry recommendations is worth considering and organising and using as a national resource of lessons management material.

Method

A core element of this study involved preparing a comprehensive and user-friendly database of recommendations from post-event reviews and inquiries. This can be used to inform lessons identification practices at organisational and, potentially, national policy and management levels.

This review updated and developed earlier work by Eburn and colleagues (2014) that considered the recommendations from bushfire-related inquiries occurring over 75 years (1939-2013). A desktop search revealed that more than 140 reviews and inquiries were undertaken since 2009. The list was restricted to a subset of 55 inquiries by applying criteria to exclude narrow technical or legal inquiries, or those with no recommendations or recommendations that lacked wider relevance. In total, 1336 recommendations were added into the database. Appendix A in Cole and co-authors (2017) provides the full list of inquiries, their type (coronial, agency, independent, etc.), jurisdiction, hazard focus and number of recommendations (summarised

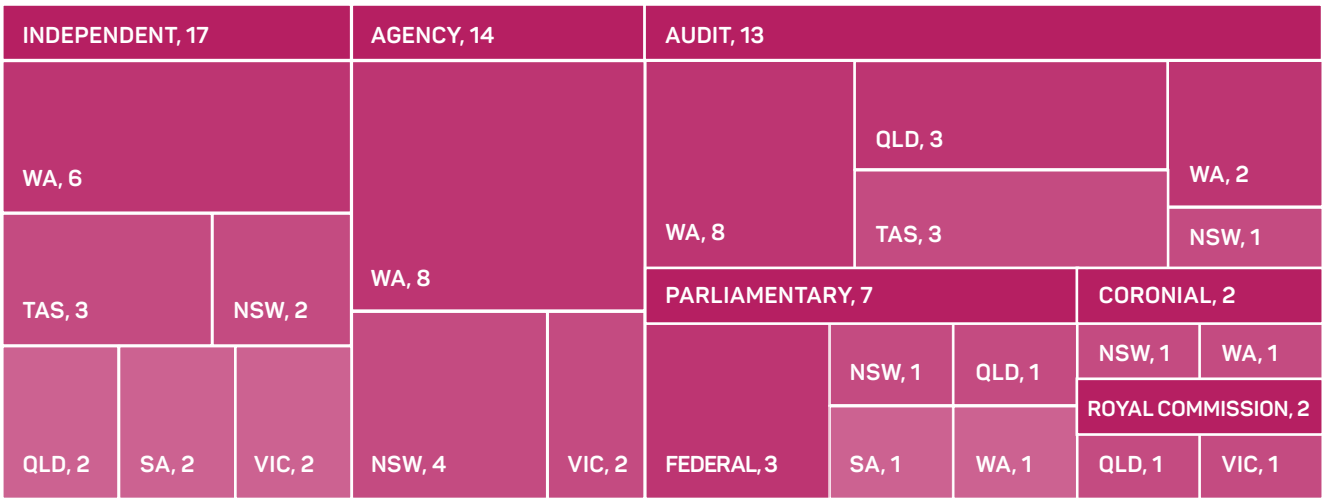

Figure 1: Australian inquiries by type and state and territory jurisdiction since 2007.
Source: Cole *et al.* 2017.

in Figure 1). The database is usable in being searchable on the basis of themes, inquiry type, year, jurisdiction and hazard type. The database links to digital copies of inquiry reports allowing further investigation into the context within which recommendations were generated.

Figure 1 is a graphical breakdown of the types of inquiry included in this review and the jurisdiction in which each was undertaken.

Each recommendation was independently coded into one of 32 themes by three members of the review team. Where there was not complete agreement regarding the coding of a recommendation, each reviewer's interpretation was discussed and the final code was agreed by consensus. Coding was initially based on the categories generated in Eburn and colleagues (2014), with additional categories developed as coding progressed. A small number of recommendations were difficult to allocate to themes; however, these were relatively few. The commonality of major themes across inquiries suggests a robust categorisation, particularly as no theme was covered by only one inquiry and most were covered by more than ten inquiries.

Table 1 shows the themes and the distribution of the themes and recommendations across the 55 inquiries.

A targeted approach to thematic analysis was employed to manage time and resource limitations while providing robust investigation of the negative hypothesis. Initial analysis of recommendations was restricted to:

- the five most common themes
- several themes containing an average number of recommendations
- the five themes containing the least recommendations.

This developed an initial understanding of the main messages (or lack thereof) within a range of themes to confirm that the themes represented reasonably coherent sets of issues, also reported in Cole and co-authors (2017).

Table 1: Major descriptive themes and number of recommendations for inquiries reviewed.

Descriptive theme	No. of inquiries	No. of recommen-dations
Doctrine, plans, standards and legislative reform	42	200
Land use planning/ development/ building codes	11	81
Community warnings and communication	25	76
Emergency management agency organisation, management and authority	21	75
Incident management teams	21	73
Training, skills and behaviours	25	68
Assets and technology	21	61
Whole-of-government response/state government responsibility	18	61
Inquiry, audit and after-action review	22	61
Community education and preparedness	25	58
Role of local government	11	48
Cooperation between emergency services	25	46
Mapping and data quality	18	45
Relief and recovery	14	41
Hazard reduction burns	12	36
Research	13	34
Pre-fire season preparation	16	30
Incident area and inter-agency communication	18	30
Access to fire ground	11	25
Volunteers	9	24
Role of Australian Government	9	23
Funding	11	19
Electricity infrastructure	8	19
Insurance and legal liability	8	17
Evacuation and shelters	8	15
Incorporate local knowledge	9	13
Emergency powers	9	13
Role of police	7	12
Role of business and industry	6	11
Personal responsibility	7	9
Occupational Health and Safety	6	9
Offences	3	3
Total	**55**	**1136**

Note: Reviews and inquiries may have recommendations that relate to multiple themes.

Results and discussion

The analysis demonstrated that the proposed negative hypothesis is false. A significant number of recommendations were identified that are matched by similar recommendations in different jurisdictions. The analysis also revealed a number of recommendations that were not matched by similar recommendations, but were generic in nature and could have broader significance for other jurisdictions.

This study proves the viability of the approach developed here for agencies and the sector to identify and understand the themes and recommendations from major post-event reviews that may be relevant to their jurisdictions. It also provides the means to do this through the preparation of the usable database. In Milton's (2010) terms, 'after-action reviews' (p. 54) are a viable 'formal collect system' (pp. 28-29) of information for lessons management, and that, fashioned into a database, post-event inquiries are 'lesson repositories' (p. 103).

Cole and colleagues (2017) provide discussion of the observations relating to major themes, as well as areas that received less focus than might be expected given their standing in public policy and research. Some broad observations show the potential for further investigation of particular themes, the relevant recommendations and the context in which they were made.

Distribution of recommendations

A number of themes, while raised across multiple inquiries, were dominated by one inquiry. A prominent example is the 'Land use planning, development and building codes' theme that includes 81 recommendations. Of these, 52 recommendations were made by the Queensland Flood Commission of Inquiry and a further 11 recommendations derived from the 2009 Victorian Bushfires Royal Commission. Another example is the 'Access to fire grounds' theme that arose largely out of the Post Incident Analysis Bridgetown Complex (Government of Western Australia 2009). These cases highlight that the magnitude of some themes may appear exaggerated where a singular review has resulted in many recommendations relating to a specific theme. Therefore, caution should be exercised when drawing broad conclusions from aggregated data. What is a prominent issue in one jurisdiction (producing many recommendations) may not be as important in other jurisdictions for a range of contextual reasons including geographies, climate, timing, institutions and emergency management arrangements. However, it is possible that an event and inquiry exposes issues and potential policy and management actions relevant to other jurisdictions, but which have not yet been revealed via a similar event or inquiry.

An important factor to note is that the scope and limitations of inquiries are generally determined by the TOR. This may impact on the recommendations put forward by any one inquiry. This was not examined in detail by this study.

Prominent themes and notable absences

The following themes, or groups of themes, were the major focus of recommendations.

'Doctrine, plans and standards' theme was the largest with 200 recommendations, focusing primarily on the processes and practices within the emergency management sector. In combination with the themes of 'Incident management teams', 'Emergency management agency organisation, management and authority' and 'Training, skills and behaviours', the focus on organisation and function of emergency management agencies was apparent and, arguably, to be expected.

Better coordination between emergency management agencies is often recommended. When combined with the 'Whole-of-government' theme, these recommendations suggest a need to dismantle silos between emergency management agencies to improve policy and management integration across the sector.

'Community warnings and communication' theme was the focus of 74 recommendations and 'Community education' theme the focus of 57 recommendations. The combination of these themes highlight the important role that government is expected to play in preparing and delivering educative materials, information and warnings to communities effected by emergencies.

As a cautionary note, some themes that warn against treating the aggregated recommendations and focus of post-event inquiries as a singular agenda of important issues and actions for emergency management, reflect the limits of post-event inquiries to cover all-important matters.

First, some themes that are reasonably prominent might nevertheless be expected to feature more strongly. 'Relief and recovery' theme for example, could be expected to feature more than it does. A possible explanation for the apparent lack of attention is the timing of inquiries, which may occur before issues with recovery and relief emerge in full. Another is 'Hazard reduction burns', which with 36 recommendations from 12 inquiries, is less than might be expected given the highly contested nature of that practice and constant attention the topic receives.

Second, given the importance of some topics within emergency management and disaster policy, the lack of attention from inquiries towards a number of themes is notable. The following themes received less consideration:

- 'Volunteers' theme had 23 recommendations from nine inquiries. Recommendations relating to this theme are surprisingly scarce given that emergency management capacity in Australia is heavily reliant on local volunteer fire brigades and state emergency service organisations.

- 'Occupational Health and Safety' was a minor theme, with nine recommendations from five inquiries. The lack of attention is noteworthy given disasters are by definition dangerous for staff and volunteers, incidents are not uncommon and, legally, there is a greater responsibility laid on agencies and senior executives for their staff than there is for the public generally.
- 'Funding' and resourcing constraints will always limit the capacity of agencies to do their work, including implementing inquiry recommendations. Nevertheless, funding is only a minor theme within the dataset. It is possible that those undertaking inquiries perceive comments on relative budget allocations by governments as outside the purview of their role.

Perhaps the most prominent gap is the minimal attention given to the roles and responsibilities of non-government actors.

The role of government within shared responsibility

The greatest focus of recommendations was on the role of the government within the emergency management sector. Greater focus on the role of government appears to overshadow the focus of the inquiry on other important themes. The most striking example is the lack of attention relating to the key actors within the policy goal of shared responsibility.

Shared responsibility stresses the complementary roles of government, communities, individuals, households and the private sector. The concept was prominent in the Victorian Bushfires Royal Commission process, and has since been articulated in Australian policy through the *National Strategy for Disaster Resilience* (Attorney-General's Department 2011) and elsewhere, as well as featuring in the *Sendai Framework for Disaster Risk Reduction 2015-2030* (UNISDR 2015).

Despite the importance of shared responsibility as a policy direction, inquiries offer little attention to the topic, or otherwise comment only in a general fashion without issuing tangible recommendations. For example, only a small number of recommendations target members of the community (including individuals and households) through the theme 'Personal responsibility'. Recommendations also gave scant attention to the use of local knowledge and the role of business and industry. Together, the lack of attention that these topics received indicate a disconnect between the focus of inquiries and emerging policy discourse.

Formal reviews and inquiries are typically guided by Terms of Reference (TOR) that define the scope and limitations that must be adhered to during the review process. A simple reason for the disjunct could be that the TOR restricts reviewers to investigate certain matters. While the TORs of reviews were not examined in detail during this study, a cursory look suggested that they are general enough to allow inquiries to head in any direction.

Natural disasters and emergencies are high profile public events and decisions made in response are likely to have (sometimes adverse) political implications (Eburn & Dovers 2017a). Inquiries are also commissioned and often undertaken by government and its agencies. For this reason, it may be politically sensitive to lay expectations, let alone blame, on the community. This may be especially true if it is likely that the outcomes of inquiries will have a negative effect on the government or agencies.

In addition, the political nature of inquiries also applies to the procedural aspect of evidence gathering that feeds into recommendations. Inquiries will consider and respond to issues and information put before them through submissions and, in some cases, before a judiciary. Under these circumstances it is unlikely that emergency management agencies or the public will target affected communities on the issue of shared responsibility in the wake of events that have revealed their vulnerability.

It may also be easier, and thus more effective, to target recommendations at specific agencies and their functions rather than the more amorphous and diverse 'community' or 'private sector'. If the purpose of inquiries is to identify the cause and consequences of emergencies, and to set the agenda for reform to policy and practice in the sector, then it follows that they would do this via the most effective means. The role of government in emergency management is generally well defined and widely accepted by the public. Governments have a clear mandate, and in most cases greater funding, to respond to recommendations. Therefore, there may be a perception that recommendations targeted at the government are more likely to be adopted and implemented than those directed at other actors.

Recommendations database

An objective of this study was the creation of a comprehensive database that is a valuable resource for gaining an overview of, and insight into, the recommendations that are made across multiple jurisdictions, hazards and inquiry types. Given the value of the material described and reviewed, the database is an important tool to support increased inter-jurisdictional learning and lesson sharing.

The Bushfire and Natural Hazards CRC (CRC) owns the database and will maintain the data to ensure it remains current and accessible. The database can assist jurisdictions and policymakers to identify and consider recurring recommendations and themes within their operating and risk environments. The database will be hosted by the CRC through a publicly accessible web-based platform from mid-2018.

Conclusion

Against the background of increasing attention to lessons management in Australian emergency management, this study revealed the presence of consistent themes across multiple post-event inquiries since 2009 and the value of the emergency management sector in considering the totality of inquiry recommendations. A usable database of

inquiry recommendations has been developed. While recommendations are made within the context of specific jurisdictions, there are multiple recurrent recommendations revealed in the dataset. This suggests that there are opportunities for emergency management agencies to learn and benefit from inquiries and from the cumulative insights into a particular theme across inquiries over time. Uptake and continued use of the database by emergency management agencies and others can support lesson management practices to:

- identify and understand the themes and recommendations from major post-event reviews that may be relevant to their jurisdictions or to the sector as a whole
- track a jurisdiction's progress towards implementation of recommendations
- identify themes from other jurisdictions and review their systems to consider whether similar recommendations would be likely to occur.

There is strong potential for deeper investigation into particular issues revealed as recurring or prominent in post-event inquiries. Recommendations are both calls to action and a form of 'index' that provides detailed description and discussion in inquiry reports that lead to recommendations. Research and analysis based on multiple post-inquiry reports would be worthwhile into matters such as training in the sector, inter-agency collaboration, cross-portfolio policy and response capacities and urban planning. These issues are recurrent in inquiries and central to contemporary debates in emergency management.

While caution is required against applying recommendations in a wholesale manner to another jurisdictions, this approach provides a broad indication of the topics that may be worth considering in more detail and in a jurisdictional context. Although the information described here and organised in the forthcoming database is not a complete picture of issues, lessons and actions, it represents a significant and previously untapped input to lessons management and a substantial improvement on the sector's previous capability to manage lessons from across multiple jurisdictions, hazard types and years.

Acknowledgments

This article is based on a project undertaken by Aither. It was funded by the Bushfire and Natural Hazards CRC. The views expressed here are those of the authors and do not necessarily reflect the views of other individuals and organisations.

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ABSTRACT

The Bureau of Transport Economics (BTE) 2001 report, *Economic Costs of Natural Disasters in Australia* (BTE 2001), has been the only comprehensive, national assessment of the economic impacts of disasters in Australia. Statistics and economic impact assessment methodology presented in the report have been widely used for research and policy analysis, particularly for assessing the costs and benefits of disaster risk reduction and mitigation. This is the case even though the data and analysis are over one and a half decades old. It has needed updating in terms of the approach to analysis and the dataset to include the many relevant disasters triggered by natural phenomena from 1999 to 2013. This paper sets out the approach used to update the 2001 report through a National Emergency Management Projects grant, documents the major issues faced, including the need for a new dataset and presents some results. The main differences between the BTE 2001 report and the update concern increase losses from bushfires, the inclusion of heatwaves, with heatwaves responsible for half of all deaths, and changes in the pattern of loss at the state level.

Updating the costs of disasters in Australia

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Submitted: 8 December 2017. Accepted: 16 January 2018.

The need for a national disaster loss assessment

There is a strong demand for information on losses from natural hazards in Australia (Council of Australian Governments 2011). This information would help estimate the current and potential risks (Middlemann *et al*. 2007) and provide input into how government funding is distributed across states and territories for risk mitigation. This demand comes primarily from those responsible for policy and high-level disaster risk reduction and from those with budgetary responsibility. It also comes from the research community seeking to understand long-term trends that impact on losses such as climate change, population growth and shifts in the nature of economic activity (Handmer *et al*. 2012, Hallegatte 2014).

This demand has been partly satisfied by drawing on the 2001 BTE report and a variety of reports and studies into specific events for specific purposes (e.g. COAG inquiry: Ellis, Kanowski & Whelan 2004) and specific hazards (e.g. bushfire: Stephenson, Handmer & Betts 2013). There are also reports by the Australian Business Roundtable highlighting the scale of losses from natural hazards now and in the future (e.g. Deloitte 2013).

With goals such as distributing disaster mitigation funding across states and territories, it is desirable that analysis and decisions are based on up-to-date data. In terms of currently available Australian data, there are three main sets:

- A proprietary dataset held by Risk Frontiers, which is mainly concerned with insurance-related issues (e.g. Crompton & McAneney 2008).
- A dataset from the Insurance Council of Australia (ICA 2015) on insurance losses from 1967 to the present, which is publicly available as the ICA's Catastrophe Database.
- The Emergency Management Australia (EMA) Knowledge Hub (formerly EMATrack, and now the Australian Disaster Resilience Knowledge Hub), which is a long-running Australian Government dataset on disaster loss in Australia.

The EMA Knowledge Hub is the most comprehensive, publicly available dataset, but at the time of writing was not suitable for trend analysis. This was because of changes to event inclusion criteria resulting in the total number of events changing on a few occasions, which raised doubts about its consistency over time (Power *et al*. 2013, Table 3). The ICA dataset is consistent but deals only with insurance payouts and no metadata is available. In addition, many agencies hold time-series data on losses from bushfires, among other hazards, but these are usually neither continuous in time or space, nor available outside the agency concerned. Of these sources, the 2001 BTE report has been the only publicly available consistent time

series of full disaster loss by hazard and across all Australian jurisdictions. It is based on the ICA dataset and the EMA Knowledge Hub.

However, the BTE report is now very dated. To address this, an update project was funded by the Australian Government through a grant from the Risk Assessment, Mitigation and Management Committee of the National Emergency Management Projects program. The project updates the BTE results to present a current national picture of disaster costs, to check the loss data and to update, as necessary, the conceptual basis underpinning the analysis presented in the 2001 report. The update presents an authoritative analysis of disaster costs for Australia over time, by state and by disaster type. In doing this, the final report (Handmer, Ladds & Magee, in press):

- presents a national updated picture of disaster losses and trends
- identifies gaps and types of data that need attention for future improvements in loss assessment and provides a roadmap on how this could be done
- organises the dataset in a form that allows updating and analysis in future.

This paper sets out the main differences between the BTE report and the 2017 update by Handmer and colleagues. Major differences include a new disaster dataset and the application of full normalisation procedures to historic disaster loss data.

The 2001 BTE report

The 2001 report provided a national picture by state, hazard and over time, of the costs of disasters triggered by natural hazards in Australia from 1967 through to 1999. The report used a disaster loss dataset compiled by Emergency Management Australia, known as EMATrack (now hosted by the Australian Institute for Disaster Resilience as the Australian Disaster Resilience Knowledge Hub). The data were based on the ICA's disaster data, which set out insurance payouts for Australian disasters from 1967 to mid-2015 (ICA 2015). The hazards included were defined by the scope of the Australian Government Natural Disaster Relief and Recovery Arrangements: storms, cyclones, floods, wildfires (or bushfires), landslides, tsunamis, storm surges and earthquakes. Droughts and heatwaves were excluded. Indirect and intangible losses were only partly assessed, although the cost of fatalities was included by drawing on the approach used in transport safety assessments (BTE 2000).

The new dataset: AUS-DIS

To undertake this project, a new database of disaster losses in Australia had to be developed to replace EMATrack, which was not suitable for trend analysis. The new database, AUS-DIS, is the basis of the project's findings. It covers the period 1967 to 2013 and is transparent, replicable, easily updated and improved and publicly available.

The database draws on a number of local and international sources with metadata and clear sourcing and reliability estimates for each data-point. Using the threshold of AU$10 million (following BTE 2001) or three fatalities for inclusion in AUS-DIS, 310 disasters were identified and analysed for the period covered by the dataset (the $10 million threshold is based on the value of the Australian dollar at 30 June 2013). It is likely that there are other disasters that meet this threshold, but it is unlikely they would significantly impact on the results of this report because of their small losses and minimal fatalities. The database includes direct losses with some indirect losses, and the intangibles of deaths and injuries. The AUS-DIS database will be available on the Australian Institute for Disaster Resilience Knowledge Hub and at RMIT University's Research and Data Repository. It is currently available via GitHub (Ladds, Magee & Handmer 2015) on request.

AUS-DIS includes the same hazards as the BTE (2001) report with the addition of heatwaves, albeit for deaths only. In addition to the new dataset, there are three major and a number of minor methodological changes from the BTE 2001 to the 2016 update.

- Loss estimates were developed from three approaches, two of which were used to construct the new database. These were:
  - reported loss - event costs assessed from published material
  - insurance with multipliers (as used by BTE) are used to construct AUS-DIS
  - synthetic loss - the estimates compiled from the components of impact by sector and by direct, indirect and intangible. This approach remains under development.
- Metadata is used for each estimate and include its source, reliability, accuracy, method of compilation, etc. The absence of metadata makes it difficult to assess the reliability of estimates or to see where improvements are most needed.
- A key factor in time-series analysis is the normalisation procedure used to make the estimates comparable over time. The Consumer Price Index was used to correct for inflation as well as the use of population and wealth. Wealth was assessed using Gross Domestic Product.

Other methodological and data changes include the use of the Value of a Statistical Life concept based on work done by the Office of Best Practice Regulation (OBPR). The value recommended by the OBPR (2014) is $4.2 million. A serious injury was valued at $853,000, with $29,600 for a minor injury using an approach from the National Road and Motorists Association (NRMA 2012). Results are shown by financial rather than calendar year to accurately capture the timing of an event as most costly events in Australia occur during or close to summer (December–February). Heatwaves are included where there were three or more deaths recorded. Data

on other losses from heatwaves were not available for most heat events. Heatwave inclusion is important, even though data is limited to fatalities, because heatwaves result in more deaths than all other hazards combined, and because increasing heatwave severity and frequency are virtually certain with climate change.

Disaster losses now

Losses from disasters were $171.5 billion (including the costs of deaths and injuries) in 2013 prices during the period 1967 to 2013. The average annual loss from these disasters between 1967 and 2013 was $3.65 billion (including the costs of deaths and injuries). The use of a new database, full normalisation, some differences in values (such as a much higher value for fatalities) and some differences in analysis, mean that these dollar amounts are not comparable with the BTE report's estimates.

However, within the context of the changes in approach between the two sets of data, the pattern of national loss is generally comparable, with some differences. Since 2000, Victoria is the state with the largest loss with 40 per cent of the total, overtaking Queensland and New South Wales. A significant shift in hazard importance is the loss from bushfire over the whole record. Bushfires now account for 16 per cent of the total, which is a large increase over the BTE estimate of seven per cent. (Note that percentages have been rounded to the nearest whole number.)

Numbers and costs of disasters

Between 1967 and 2013, there have been 310 natural hazard disasters with three or more deaths or costing greater than $10 million. This includes 32 events recording only deaths and injury with no other losses. There are 278 events with recorded dollar losses as well as human losses. Slight changes in inclusion criteria affect the number of small disasters in AUS-DIS, but these small events have no significant impact on overall losses.

Figure 1 illustrates the distribution of losses through time and highlights the disproportionate effect of large events. Disasters below $100 million contribute only four per cent of all losses, while disasters above $500 million contribute 81 per cent of losses. In terms of numbers of events, 41 per cent of disasters cost between $10 million and $100 million.

About one-third of the total loss can be attributed to about ten major events including Cyclone Tracy (1974), Ash Wednesday (1983), the Sydney hailstorm (1999), Black Saturday (2009) and the Brisbane floods (2011).

Flooding in Brisbane, Queensland, on 13 January 2011 brought the city to a standstill.

Source: Andrew Kesper, CC BY 2.0.

Trends

There appeared to be an increase in the number of disasters over time in the raw data. This increase can be attributed to the increase in population. When adjusted for population increase, there is no statistically significant trend in the frequency of disasters. Similarly, there is no statistically significant trend in normalised losses through time, although there appears to be a slight upward trend in the last decade (Figure 1). These results confirm that socio-economic trends are key factors driving Australia's disaster risk as noted elsewhere (e.g. IPCC 2012).

Deaths attributed to disasters as a proportion of total population are fairly stable over time. There was a rise due to the Victorian bushfires and associated heatwave in (Figure 2). The strong recent increase in heatwaves, evident in current and projected climate data (Cowan *et al.* 2014, Perkins-Kirkpatrick *et al.* 2016), is expected to result in a significant increase in heatwave-related losses including deaths.

The occurrence of hazards over time has been generally stable (Westra *et al.* 2016). Possible recent exceptions are increasing heatwaves (Cowan *et al.* 2014; Perkins-Kirkpatrick *et al.* 2016) and bushfires (Clarke *et al.* 2013). Given this stability, an increase in the number of disasters over time would likely be the result of more exposure of people or changes in vulnerabilities. When the number of disasters is controlled for population change over time, there are no obvious trends. Similarly, there are no obvious trends in normalised losses.

This all suggests that hazardous areas are neither being avoided nor disproportionately developed. If this was not the case, then the losses and number of disasters trends should reflect that by trending up or down.

One interpretation is that land-use planning and hazard-related building regulations have had no discernible impact on overall hazard losses. The Climate Adaptation Outlook prepared in 2013 by the Department of Industry, Innovation, Climate Change, Science, Research and Tertiary Education came to a similar conclusion. However, for most hazards, there is little in the way of planning to reduce exposure, apart from some flood- and very recently some bushfire-related controls. Building codes have been implemented for cyclones since the late 1970s. However, only part of the building stock in areas hit by cyclones post Cyclone Tracy was built to the new regulations, because much of the building stock pre-dates Cyclone Tracy. As a result, the effects of building regulations may not be well reflected in the cyclone loss record. An alternative explanation for the apparent absence of trends is that the Australian economy has become more resilient and absorbs some of the impacts.

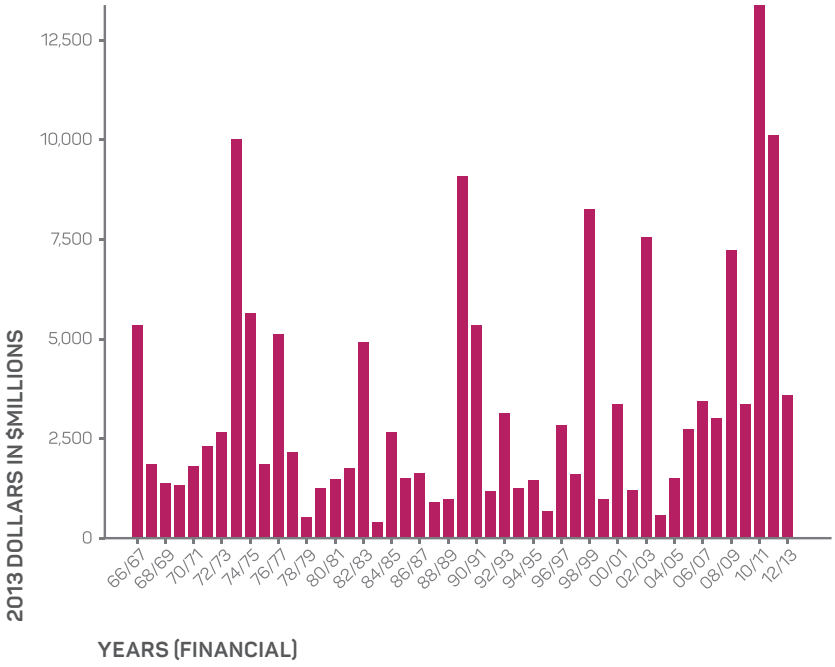

Figure 1: Annual loss from disasters triggered by natural hazards in Australia 1967-2013.

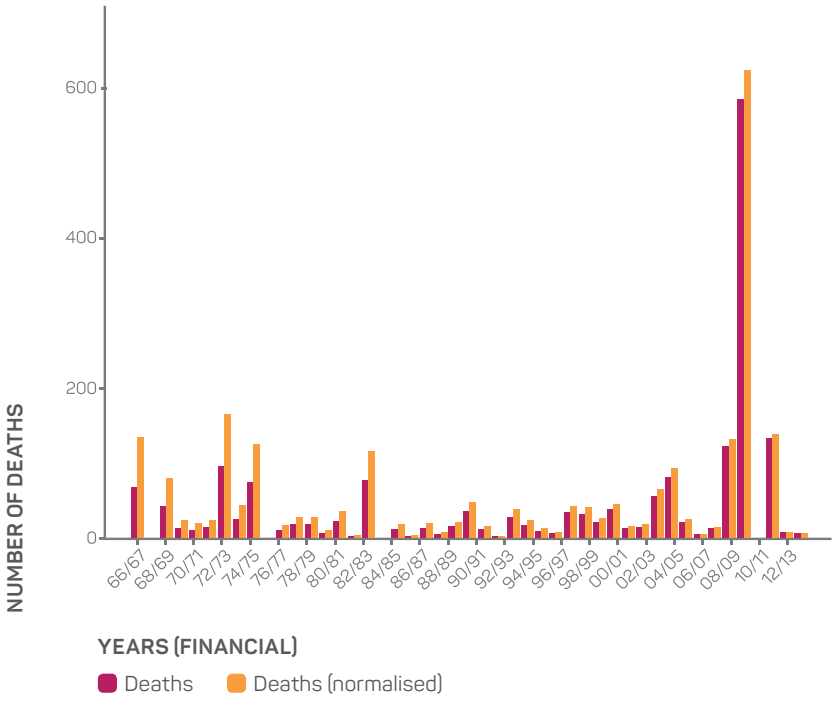

Figure 2: Number of deaths from natural disaster 1967-2013 (raw data and that adjusted for changes in population).

Losses by hazard

Severe storms were the most costly of all disaster types, contributing $49.6 billion or 32 per cent of total losses. Floods (28 per cent of total loss) caused a similar level of damage. Cyclones (19 per cent) and bushfires (17 per cent) also contributed significantly. Together, the combined loss from storms, floods, cyclones and bushfires make up 96 per cent of the total losses from disasters. They also accounted for 93 per cent of the total number of disasters (310 events).

The main differences between the reports concern bushfires and heatwaves. Bushfires (at 17 per cent) now cost almost as much as cyclones (19 per cent) in terms of insurance and total costs, whereas bushfires were far less damaging in the 2001 report at seven per cent of losses. The BTE reported that bushfires resulted in the largest number of fatalities. However, the addition of heatwaves changes the

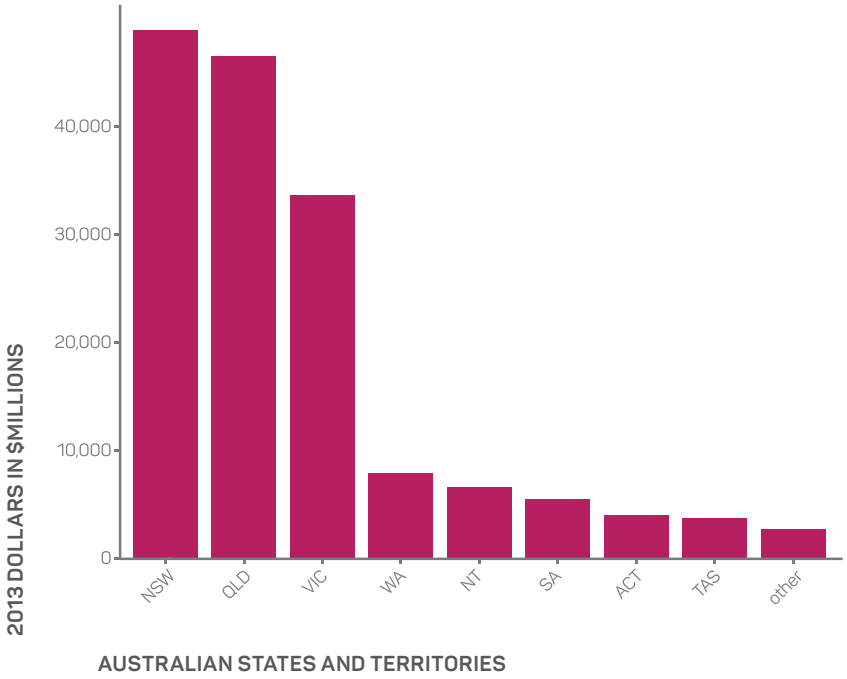

Figure 3: Disaster losses by state and territory 1967-2013. In cases where a single event affected multiple jurisdictions the resultant losses were apportioned between the affected jurisdictions. The cases where this could not be done are included in 'other'.

Figure 4: Losses by type of disaster and state and territory 1967–2013. In cases where a single event affected multiple jurisdictions the resultant losses were apportioned between the affected jurisdictions. The cases where this could not be done are included in 'other'.

pattern of fatalities as they accounted for half of all deaths over the 1967 to 2013 period. Together, bushfires and heatwaves make 66 per cent, or about two-thirds, of the losses due to deaths and injuries.

Another difference between the reports is that severe storms result in the highest losses in the update, while BTE found that the highest loss came from floods. Severe storms went from 26 per cent of total losses to nearly 32 per cent and floods stayed the same at about 29 per cent.

Losses by state

This update project found some differences in the pattern of state-level loss (Figure 3). Over the time series from 1967 to 2013, as with the BTE report, Queensland and New South Wales recorded the highest losses associated with disasters ($49.9 billion and $44.8 billion, respectively) although their order is now reversed, with Queensland recording the largest loss. In the 2001 BTE report, New South Wales was the clear loss leader. Victoria now contributes considerably more to the total losses. New South Wales, Queensland and Victoria account for about 83 per cent of total losses nationally. If only the period since 2000 is analysed, these three states account for about 90 per cent of the loss. For the period since 2000, Victoria is the state with the highest disaster loss (40 per cent of the total).

New South Wales and Queensland accounted for 61 per cent of total disaster costs and 63 per cent of the total number of disasters over the period 1967 to 2013 (Figure 4). Victoria now accounts for 22 per cent of costs, with 15 per cent of frequencies of disasters over the period 1967–2013. Western Australia ranked fourth (5 per cent), followed by the Northern Territory (4 per cent), South Australia (just over 3 per cent), the Australian Capital Territory (3 per cent) and Tasmania (just over 2 per cent).

The main hazards in terms of costs are storms, floods, cyclones and bushfires, with storms and floods dominating (Figure 4).

Gaps and limitations

Despite being an outstanding contribution to the understanding of disasters and natural hazards in Australia, the BTE report had a number of gaps and limitations. These include the absence of heatwaves, no readily accessible metadata, limited normalisation of the dataset and the lack of estimates for indirect and intangible costs.

The update project addressed these major gaps by including metadata and fully normalising the database. However, indirect and intangible losses remain a weak area both for loss identification, data collection, recording and analysis. There is also limited data for heatwaves.

Conclusion and pathways to improvement

The BTE 2001 report has been the only publicly available, comprehensive, national assessment of the economic impacts of disasters in Australia. This update involved developing a new database of Australian disaster losses between 1967 and 2013. Analysis included adjustment of the data for inflation and changes in wealth and population.

The main differences between the findings of the BTE report and the update concern bushfires, heatwaves and the pattern of loss at the state level. Losses from bushfires as a proportion of total disaster losses have more than doubled (to 17 per cent) and now cost almost as much as cyclones. Unlike the BTE report, the update includes heatwaves, which account for half of all fatalities between 1967 and 2013. The BTE report identified that bushfires were the most deadly hazard. Taken together, bushfires and heatwaves now make up nearly two-thirds of the losses from deaths and injuries.

The national time series of loss shows no strong trends: there is no obvious climate change trend, nor is there a trend to show that improved disaster risk reduction has had an impact. However, the state-level pattern has changed, with Victoria now contributing much more to national losses.

There is an unprecedented level of international activity on assessing the effects of disasters and, in particular, on climate-related events as part of climate change adaptation. This activity is a mix of new initiatives and long-established international approaches to improve disaster data and analysis globally. It makes sense to work with these international efforts, drawing on their expertise and recommendations (Handmer, Ladds & Magee 2017).

Within this international context there are issues that require attention to improve understanding and measurement of disaster losses in Australia.

Indirect and intangible losses

The primary long-standing data gaps concern the identification and data collection, recording and analysis of indirect and intangible losses. In 2001, the BTE report argued for 'a system for the consistent collection of disaster costs' (p. xix), improved understanding of intangibles, that 'are at least comparable with direct costs and possibly much larger' (p. xix). These concerns have yet to be addressed. The value of general health impacts and loss of memorabilia are long-standing research questions in the study of intangibles. A research issue that has assumed increasing importance since the 2001 BTE report is the potential value of ecosystem services. In some disasters, such as severe bushfires, these can constitute a major part of the total loss (e.g. Stephenson, Handmer & Betts 2012).

Research on indirect losses needs to consider the extent of disruption to people's lives and livelihoods as well as to local economies. This can occur from events with little direct loss. It needs to consider the extent of real indirect loss to a state, as well as the regional or city economy, given that lost production and expenditure are often transferred elsewhere within the same local economy (Handmer, Read & Percovich 2002). These are not new questions. Other questions that are becoming increasingly important concern the 'just in time' nature of supply chains and the near total dependence of Australian society and economic activity on uninterrupted electricity supply, which heightens vulnerabilities. Failure of a critical supply chain could cause considerable loss. This should be examined as part of further analysis of indirect losses.

Research on specific hazards

While improvements would be welcome everywhere, research on specific hazards, in particular heatwaves, is required. Heatwaves are increasing as a hazard and are poorly documented other than for fatalities. Current data do not support loss assessments for heatwaves.

There is a higher-level issue of whether disaster loss assessment should be broadened to consider other natural hazards, in particular, drought. The update analysis was organised around standard rapid-onset hazards generally associated with disasters in the global literature. An alternative or complementary approach would be to include other impacts of concern to emergency management agencies: this could include drowning, lightning strikes, etc.

Assessment methods

Assessment methods used in this update are standard well-established methods, albeit with modifications made necessary by data availability and quality. It is recommended that the synthetic approach be developed further as it promises to be of value, especially where data are of uneven quality or missing. Variations of the approach as used in the U.K. and elsewhere have proven to be cost-effective ways of assessing loss and making investment decisions..

Acknowledgements

This paper is based on research funded by the Attorney-General's Department under the National Emergency Management Projects program. The 'Updating the 2001 Australian Bureau of Transport Economics study on the Economic Costs of Natural Disasters in Australia' project was supported by the Australian and New Zealand Emergency Management Committee through its Risk Assessment, Mitigation and Management subcommittee. The authors appreciate the Australian Government and RMIT University funding for this project and also especially thank Ed Pikusa, Jill Edwards, Dr Holly Foster, Susan Henry, Samantha Chard, Ash Rentmeester, Adriana Keating and Dr Richard Thornton.

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The Total Flood Warning System: what have we learnt since 1990 and where are the gaps

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Submitted: 15 December 2017. Accepted: 16 February 2018.

ABSTRACT

April 1990 was a month of severe flooding in eastern Australia. Two months later, a national workshop was held in which a large number of flood management specialists sought to capture the lessons of the floods while they were still fresh. Many aspects of the management of the events were examined, with flood warning highlighted as a key function. A second meeting the following year resolved to produce a best-practice manual to help guide practitioners in the development of flood warning services. The term 'Total Flood Warning System' (TFWS) was adopted to describe the need to integrate the many elements of effective warning. The need to help those in the path of a flood to understand the warnings they received and take effective action was recognised as central. The manual was published in 1995 and revised and updated in 1999 and 2009. This paper asks what has changed and improved in the flood warning field since 1990 and what is needed in TFWS terms to further help communities and individuals manage their flood risk.

Recent history of flood warning in Australia

What might be called the 'modern era' of flood warning in Australia can be considered to have started during the 1960s (McKay & Robinson 2012). Then, the Bureau of Meteorology (BoM) began to use hydrological modelling in a limited number of river valleys to produce flood forecasts[1]. Telephone and, later, computer telemetry was used to improve BoM access to the growing number of rain and river gauges. Over time, the number of locations around the country for which flood warning services were provided increased. Locally-defined 'minor, moderate and major' flood levels were adopted for specified gauges as a means for creating a general understanding of how severe an approaching flood would be in areas close to the gauges. These were often called the 'reference areas' of the gauges.

By the late 1980s, the BoM had established a flood warning presence in each state and the Northern Territory. The warning service had become more or less standard in conceptualisation, content and format. Forecasts were provided in the most part by the BoM with alternative arrangements in the Northern Territory and the Melbourne metropolitan area. Warning messages included the expected class of flooding (in many but not all cases with a forecast peak height and time) at the nominated gauge and included observed water (gauge) levels along the watercourse. Peak forecasts were often made only after upstream peaks had been observed. Messages were sent to radio and television stations broadcasting into the regions expected to experience flooding and to local council and emergency services organisations within those regions.

The personnel of these responder organisations made decisions about what they and community members should do, but there was little consistency of practice. In most areas the information in the BoM warnings lacked the necessary detail to allow much to be inferred or said about the probable consequences of the coming flood. As a result it was not always possible for responder agency personnel and communities to develop a clear picture of where the water would go, what depths would be reached, which people would be affected and what they should do to lessen the coming impacts.

This problem, exacerbated by a tendency for the agencies to emphasise organisational priorities (e.g. resupply, sandbagging, rescue, evacuation operations, etc) rather than those of community members as clients, limited the value of the warnings that were provided.

1 Flood forecasting is an important component of flood warning, where the distinction between the two is that the outcome of flood forecasting is a set of forecast time-profiles of channel flows or river levels at various locations, while flood warning is the task of making use of these forecasts to tell people about coming floods (American Meteorological Society 2017).

At the end of the 1980s it appears, in general, that there was considerable distance between the BoM forecasters and the emergency responders. The two groups did not speak the same language and nor had they reached a common understanding of the purposes of flood warning. Flood warning had not developed to a high level of sophistication and its methods and practices were in need of evaluation and reform. This was especially so in the context of recognising community members as end users with an interest in being able to protect their own interests as floods approached. Critically, too, the lack of information ('flood intelligence') to 'unlock' the meaning of a flood prediction in areas facing floods limited the utility of warnings.

Some very serious floods were soon to occur. These floods were to give flood warning practitioners real opportunities to push their craft to higher levels of utility to people who live and work in locations prone to flooding. The floods across eastern Australia in April 1990 were to prove critical.

Reform of Australian flood warning practice: the early 1990s

April 1990 saw severe floods in the three eastern mainland states of Australia. Flood height records were broken and there was much community devastation and loss. The inland areas of Queensland and New South Wales were especially hard hit and large areas were inundated or cut off from the outside world. The towns of Charleville and Nyngan had to be evacuated virtually in their entirety. Nyngan's levees were overtopped despite desperate community efforts to augment them with tens of thousands of sandbags. Nearly all the town's dwellings took in water and 18 helicopters had to be organised to take the town's almost 2500 people to safety. At the same time Charleville (approximate population 3000) was swamped by the Warrego River and about 80 per cent of its houses along with most of the industrial and commercial premises were flooded. Almost the entire population was evacuated and housed temporarily in a large tent city at the local airport. Then intense rain over Victoria's high country caused flooding along several Gippsland rivers, and many people had to leave their homes with attendant damage to property and agricultural assets and production (BoM 1992).

The occurrence of such severe flooding affecting many communities at once and necessitating large-scale relief operations and costly recovery measures, led to a national, multi-agency debrief to tease out the lessons learnt and to consider appropriate future community responses. A four-day workshop was held at the then Australian Counter Disaster College (later the Australian Emergency Management Institute) at Mt Macedon, Victoria. It was attended by BoM weather and flood forecasting specialists, representatives from the emergency services (principally state and territory emergency services and police), employees of state water and community services agencies, local government representatives, academics with expertise in floodplain management and individuals from media organisations. More than 50 people attended the workshop with all Australian states and territories represented.

The multi-agency nature of the attendance was significant. In April 1990, as had been the case in some areas since the BoM began providing flood forecasts, flood warning activity was largely confined to BoM flood predictions with emergency services organisations (encompassing the State Emergency Services, police and local government officials) delivering on a limited role in motivating community responses to predicted coming floodwaters. However, by late 1989 the BoM had taken steps to increase the input of the emergency services and state water agencies to flood prediction processes. It did this by creating state-based Flood Warning Consultative Committees (FWCCs) under the chairmanship of the BoM's respective regional directors. The role of the FWCCs was to advise the BoM on how to make improvements to the provision of its flood forecasting services. Many of the attendees at the Mt Macedon workshop were drawn from the various FWCCs. In retrospect, the formation of the FWCCs and the holding of the workshop constituted the beginning of genuine, multi-agency participation in flood warning in Australia. The two initiatives were to be catalysts for the codification of the principles of flood warning and the identification of better ways of generating and delivering warnings to communities about to be hit by floods.

The workshop considered a range of matters including:

- the nature of the weather systems that had caused the flooding
- the efforts that had been made to warn communities about it
- the management of the large-scale evacuations that had been undertaken
- what had been done to organise the welfare and engineering aspects of the recoveries in the three states
- the flood responses of the three states (by way of comparison)
- the strengths and weaknesses of what had been done
- ways of improving management practices.

Participants agreed that flood warning procedures and practices in particular needed further examination. Accordingly, a second workshop was scheduled for October 1991 with a similar attendance to the meeting of 1990. It was at this workshop that a new term, the Total Flood Warning System, came into vogue. It captured the developing consensus that if flood warning was to genuinely help communities facing floods, the involvement of several agencies was required with their inputs coordinated and integrated. Flood warning could not, it was agreed, be effective if it was to remain largely the province of the BoM. The BoM's involvement was seen to be critical but not by itself sufficient.

A recognition developed that flood warnings needed to be 'value-added' in terms of the likely consequences of impending floods and how people in their paths should react. It was also recognised that the BoM, a scientifically based forecasting agency, could not be expected to add that kind of information to the level of

detail required. More input was needed from emergency services and other locally based organisations with interests and personnel located in or close to the communities targeted by the warnings. Those entities had, or had the means to develop (through detailed flood studies and with the help of floodplain management consultants) the flood intelligence (information on what would happen at different gauge heights as a flood rose towards its peak) essential to enable communities to understand the intent and purpose of flood warning messages. Figure 1 illustrates the relationships.

Further, it was recognised that not only were flood warning messages limited in content but that they were not generally capable of 'breaking through' to

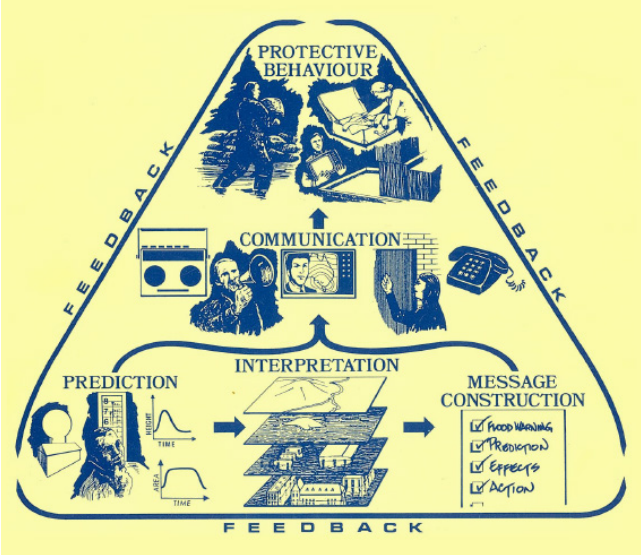

Figure 1: Total Flood Warning System relationships (AEMI 1995).

people's consciousness or instilling a sense of the need to act with positive action (e.g. to protect items of property or evacuate to safety). Information needed to be communicated more effectively to flood-prone communities. Both the content and the style of the messaging required re-thinking, and the use of a wider range of dissemination techniques considered. The tone of messages was seen to be vital in motivating appropriate responses on the part of individuals whose interests were under threat.

This second workshop decided that a core need was a guide to best practice in the field of flood warning. A manual defining best practice and giving guidance on how it could be achieved by involved entities was proposed. The resulting document, Flood Warning: an Australian Guide, was published 1995 (AEMI 1995, also Keys *et al*. 1995). Later that year, small workshops were conducted in states and territories to familiarise local practitioners with its contents.

The manual focused on five questions, answers to each were provided in some detail:

- How far will the water reach at the nominated gauge, and when?
- Where will the water go at the predicted height?
- Who will be affected by the flooding, and in what ways?
- What do these people need in order to respond effectively?
- How can those people best be given the appropriate information?

The manual created a modern conceptualisation of flood warning processes and to codify them. It focused on flood height prediction, the use of flood intelligence to help determine where the water would go at forecast heights, who would be affected by it and in what ways, what those people needed to know and how to communicate with them in ways that would motivate appropriate response behaviours. In doing these things it emphasised the multi-agency character of the warning task and the need for the integration of the activities of specialists in different agencies. Most importantly, it widened the scope of the task beyond the BoM's traditional forecasting role.

Reviews and updates to the manual and to better practice

No manual of practice in any field is fit for purpose indefinitely. Manuals can only incorporate current knowledge and ideas about the functions discussed. They are therefore creatures of their time.

Best practice in flood warning is an evolutionary process as for all endeavours. New ideas are formed and adopted and management practices improved. Examples include:

- recognition that attention to information and messaging is critical (ANZEMC 2014)
- development of rain and flood forecasting techniques
- adoption of new ideas on flood predictions (e.g. clearly defining the areas to which forecasts apply)
- improvements in the dissemination of warning messages
- making use of specialist floodplain management consultants to provide flood intelligence on the impacts of flooding. While the latter was not something routinely sought decades ago, it is increasingly well recognised that it should be a routine deliverable from flood and related studies.

Not long after publication of the original flood warning manual, it became clear that there was a need to provide an updated product for flood warning practitioners. Updated versions of the manual were published in 1999 and 2009 (EMA 2009a) with the revision task carried out by panels made up of specialists from various fields and organisations. A companion manual on flood preparedness incorporated material about how to engage with communities in an educative manner (EMA 2009b).

In the not too distant future, a further update of the flood warning manual will be required in order to document the latest shift in good (best) flood warning practices and how more recent lessons have been translated into improved practices.

It should be noted here that there have been some technical advances in flood warning practice in recent

times, not all of them noted in the manuals. These include provision by the BoM, on request from State Emergency Services of ensemble forecasts in the lead-up to significant flooding events, the extension of flood watches to the whole of Australia and other internal developments aimed at streamlining the BoM's internal forecast process.

Lessons and the ongoing challenge

Forecasting

Ideas are changing in relation to good practice for flood forecasting. Two or three decades ago, a good flood prediction was considered one which accurately forecast, with some lead time, the peak and the time that peak was reached. Nowadays, this is often considered to be insufficient. With access to increasingly detailed flood intelligence, it is obvious that the peak is not the whole and often not even the main story. Consider the situation of a rapid initial rise in river level followed by a slower one as the flood approaches its peak. If the important consequences occur early in the period of the rise, the time taken to reach the peak may be largely irrelevant because the necessary response actions will have had to be undertaken well in advance of the peak being reached. Should the forecast not be released until the rapid rise has begun, opportunity to undertake the relevant actions will have been lost. Moreover the degree of precision in the peak forecast will be of small importance and the forecast will have little value.

The learning is clear. A forecast and time to achieve critical levels associated with key consequences, on both the rising and falling limb of the flood hydrograph, when provided with adequate lead time, is important, useful and informative to an at-risk community. A warning that includes the forecast hydrograph (rather than just an interim or peak height and time) has significant utility to an informed community and the emergency services that support it.

Similarly, a move to the delivery of ensemble flood forecasts (wherein imprecision associated with translating a point measurement of rainfall to an area and the subsequent flood forecasting process is translated through to the predicted hydrograph) adds additional value. It is desirable that the uncertainty inherent in a flood forecast is communicated to those at risk as it informs decisions about likely consequence and appropriate responses.

Linking the forecast with the need

It is suggested that what should guide the forecaster is the usefulness of the prediction across the full hydrograph, not the precision of a point on that hydrograph and the technical rigour of the analysis. It follows that the response agency needs to ensure that the forecasting agency understands what flood levels are critical in terms of actions on the floodplain. One way of achieving that understanding is via the specification, at community level, of forecasting requirements including the amount of time needed by community members and responder agencies to carry out necessary tasks some of which, such as evacuation, will often take many hours. This can only be done beneficially using clear knowledge of the heights, at the relevant gauge, at which important flood effects occur. Floodplain management consultants can be used more than has so far been the case to provide information on probable consequences, within the reference areas of gauges, at different gauge heights.

How it will be interpreted

Even so, having established a specification, it must be known and followed by all agencies. Stories from Lismore in March 2017 (e.g. Gissing & Leeuwen 2017) when ex-Tropical Cyclone Debbie was about to produce severe flooding, suggest that a warning of impending flooding over a recently constructed levee was provided too late. The order to evacuate from the central business district and its immediate surrounds was implemented too early. The consequence was that people were unable to protect stock and records in shops and offices and items of value in dwellings. A clear understanding of how the various TFWS elements fit together is essential across all involved entities, including the at-risk community, if intended benefits are to be delivered.

Linkages and the importance of timing

Flood warning messages should indicate how much time is available for property-protecting tasks before evacuation becomes necessary. They must also counter the tendency for people in the path of a flood to delay their responses until they can see the floodwaters. Too often potential response time is lost and responses are less effective than they should be.

Pre-scripted warning messages

A NSW SES initiative related to the preparation of pre-scripted warning messages to be broadcast via media outlets for different forecast heights. This was promoted in the 2009 version of the manual. It was recognised that under the operational stresses of floods the preparation of such messages in the real time of an event rarely achieved optimal standards of communication and frequently failed to motivate effective responses within communities. Important information was missed and the language used was clumsy. Better results could be achieved if, in 'planning time', messages were created and stored ready for use when floods were actually developing. For a particular gauge for which flood forecasts were to be provided by the BoM, messages could be prepared for a number of increments in height (say from the threshold of minor flooding up to beyond the level reached by the flood of record). 'Banks' of messages could be developed, critiqued and fine-tuned to ensure that likely consequences and needed response actions were incorporated and appropriate tones (for example in terms of urgency) were used. The intent was that the pre-prepared messages could be used on the

day with added information specific to the developing event.

Understanding flood risk and warnings

Warnings, it must be recognised, are unlikely to motivate appropriate responses from community members unless the flood problem is understood by the people in the communities to which the warning messages are targeted. In a sense warning of floods should be treated, like flooding itself, as a hazard that people need to prepare for and helped to comprehend in advance. This is particularly the case in communities for which levees and other structural means of flood mitigation have been provided. These measures can be highly effective in keeping out quite large floods, but this effectiveness has the result of reducing flood experience among community members and thus their consciousness of the flood problem. In essence levees in particular become more trusted than they should be. As mitigative devices virtually never eliminate the flood problem (and can also be subject to failure), an antidote to the downside they generate (the notion that the problem has been fully overcome) is needed if community resilience against floods is to be maintained. Most importantly, warning messages need to note specifically when overtopping or failure has become possible and indicate that urgent responses (usually including evacuation) will be needed.

Flood intelligence

Flood intelligence is central to the TFWS. Developing and collating this information through comprehensive flood studies, sharing it with the at-risk community (e.g. as maps or tables), updating it based on actual experience and using it to drive forecast delivery is fundamental to establishing a user- and risk-focused service that is driven in a bottom-up manner. In turn that assists in building flood resilience within the community. Risk and need must drive forecast scope, delivery and location.

Communication

None of this means that warnings provided must be perfect in predicting flood severity, gauge heights or every potential consequence. It does mean that they must provide warning information that people understand. They must also provide it in ways and within timeframes that will motivate people to act in ways that will protect their interests. Many messages simply do not get through. Witness, for example, the frequency with which people drive into or otherwise enter floodwaters, too often with tragic consequences (Haynes *et al*. 2016), despite the campaigns featuring the messages 'If it's flooded, forget it', and 'You don't know what you're getting into'. Clearly, the educational messages are not working optimally, which means they must be re-evaluated rather than being repeated. When more than half of the flood deaths in Australia since the turn of the 21st century have been caused by people entering floodwaters, mostly in motor vehicles, the efforts to educate can be lacking (Gissing 2017). In this regard it is not sufficient simply to explain the deaths as examples of people's stupidity.

Flood education

Flood education in Australia, generally, remains not fully developed. Too often, people fail to react to floodwater until they see it near their properties, by which time it may be too late for effective responses to be implemented. What has been done has been demonstrated to be inadequate and many people with interests on floodplains remain largely ignorant of the risk they face. This is an area that needs further consideration and development. Education workshops attract little interest, but providing people with critical (for them) flood heights at a nearby gauge merits attention. This has been tried only very rarely and is worth trialling.

The role and Influence of social media

Social media and the internet are playing an increasingly large and changing role in our lives. How we communicate risk and the consequences of flooding and how we disseminate warnings and related information must have regard for how communities communicate, how they share information, their trusted sources and how these change. This is not a static environment. Agility and adaptability are essential.

Sometimes the processes of communication go awry, partly because of misunderstandings about the relationship between a flood warning and the relevant information for an area in the path of the expected flooding. Two examples illustrate this problem, which is quite commonly experienced. In June 2007, as a flood approached Maitland, in the NSW Hunter Valley, local responders built a sandbag levee to protect the central business district, which had not been flooded in much bigger events than the one forecast on this occasion (Keys 2008, p. 96). Effort was wasted on unnecessary activity and the credibility of the response was damaged. A similar lack of understanding of the flood risk was apparent in Horsham, Victoria, in June 2011 where, again, a line of sandbags was built in an area with no risk of flooding (as was indicated in flood extent maps that had been shared with the community). Sandbags were wasted, undue pressure was placed on emergency services agencies and many people who needed sandbags missed out (Mintern, Aziz & Fennell 2017).

Consultation and review

The potential for the FWCCs to make a difference and provide a focus for the development of the multi-agency and risk (or user) based approach to TFWS development is huge but as yet not fully realised.

Recent public reviews of significant flood events and by extension performance of the TFWS provide further evidence of lessons learnt (e.g. Comrie 2011, QFCI 2012, Blake 2017). The authors have resisted pulling these reports apart and translating the findings for this paper. Regardless, the next update of the flood warning manual must have regard for commentary, community and

agency feedback and recommendations embedded in these reports.

Conclusion

Flood warning services today are a significant step forward from where they were in early 1990. The improvement journey is, however, far from over. There remain examples where best practice has not been consciously sought (e.g. Keys & Cawood 2009).

There is an unfortunate truth about flood warning in Australia: for example, it has not yet lived up to its potential to counter loss in the way that levee-building has. Virtually every significant flood sees damage done to communities (including injuries and deaths as well as property losses) that could have been avoided had people heeded the warnings that were provided or had the warnings been better tailored to suit the risk in terms of focus, content and messaging. At least part of the reason is that the agencies involved in forecasting and warning of coming floods have not fully engaged with the communities that their activities are intended to help. The consequence is that the forecasts and warning messages provided are not sufficiently relevant and community members have not understood what has been provided to them. Perhaps, too, recent reviews of flood management practice have given less attention to warning as a flood management tool than ought to have been the case.

Since the first flood warning manual was published there have been concerns that the take-up of the manuals has been disappointing. To the extent that this concern is valid it can be argued that the recommendations have not altered agency forecasting and warning practices to the desired extent. For example, forecasts do not necessarily respond to risk and need and response agencies have not, in most cases, developed suites of pre-scripted messages. Nor have they all developed strong educational programs to help people become aware of the risk from flood or of the nature and purpose of flood warning and the behaviours they need to undertake upon hearing a warning as a flood is approaching. What is probably needed is a national workshop of key emergency services personnel to re-familiarise them with the recommendations of the current manual and help them to come to grips with implementing those recommendations

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Understanding the role gender plays in survivor responses to disasters: evaluating the Lessons in Disaster Program

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Submitted: 13 November 2017. Accepted: 13 March 2017.

ABSTRACT

This paper evaluates four pilot training sessions conducted in August 2015 by Women's Health Goulburn North East, Women's Health In the North and the Monash University Disaster Resilience Initiative as part of the Gender and Disaster Pod initiative. The Lessons in Disaster Program promotes the understanding of the role that gender plays in survivor responses to disasters. The program embeds these insights into emergency management practice through training delivered to emergency management practitioners. This papers describes an independent evaluation of the program and reveals positive outcomes for participants in the emergency management and community sectors as well as highlighting key areas for further improvements.

Introduction

The Gender and Disaster (GAD) Pod is an initiative of two Victorian women's health organisations of Women's Health Goulburn North East (WHGNE) and Women's Health In the North (WHIN) that worked in partnership with the Monash University Disaster Resilience Initiative (MUDRI). Formally established in 2015, the GAD Pod promotes an understanding of the role gender plays in survivor responses to disasters.[1] Embedding these insights into emergency management practice builds on the initiatives emerging from WHGNE's foundational research of the 2009 Black Saturday bushfires in Victoria and earlier research on improving the health, safety and wellbeing of women (GAD Pod 2018).

In Australia and other countries, a growing body of research points to the significance of gender in determining disaster experience, recovery and resilience. Bushfire reveals itself as far from gender-neutral and greater than a 'natural hazard', exposing the distinct cultural and historical gender relations that underpin such events (Eriksen 2014). For women, gender-based issues during and following disasters include increased vulnerability through previous and existing family and domestic violence, as well as new or increased violence in the aftermath of the disaster. Relationship violence, child abuse and divorce all increase after disasters (Parkinson & Zara 2013) as does demands on women for unpaid work. Reduced health and community services and difficulty in accessing the services that do exist, add to risks and isolation for women. Lack of childcare and transport due to damaged infrastructure or through family and friends relocating away from disaster-affected regions inhibits women's return to employment more than it does for men. This reflects the social construction of women caring for children while men generally (Parkinson 2015) have priority use of vehicles in families. Most jobs created in recovery and reconstruction phases have been traditionally jobs for males; further disadvantaging women (Enarson 2012).

1 The authors recognise that the term 'natural hazard' is more frequently used, however they have retained the term 'natural disaster' as it is the title of some program sessions.

The demands on men to 'protect and provide' together with some men's demonstration of 'hyper-masculinity' in disasters increases the risk for men (Parkinson 2017). Pursuing 'ideal' masculinity takes a toll on men's health, from unnecessary risk-taking to refusing to seek help for physical or mental health issues. Sadly, expectations of traditionally defined male 'courage' are real and there may be career penalties for men who seek psychological help, both in the workplace and at home (Zara *et al.* 2016). After Black Saturday in 2009, the increase in self-harm behaviours by men, such as alcohol abuse, mental health issues and suicide were widely noted (Parkinson 2017).

Distinct risks also exist for the LGBTI community (Dominey-Howes, Gorman-Murray & McKinnon 2014, Gorman-Murray, McKinnon & Dominey-Howes 2014). This occurs through emergency management policy neglect and through exacerbation of discrimination and marginalisation. Disasters can destroy the home that provides a safe space away from judgement for people of diverse gender and sexual identities (McKinnon, Gorman-Murray & Dominey-Howes 2016). Evacuation centres may present risk of verbal and physical abuse through homophobic responses from personnel or others displaced by the disaster. In addition, bathroom facilities may be problematic, particularly for trans people (Gorman-Murray *et al.* 2014, Gorman-Murray *et al.* 2016). Research has found that definitions of family often excludes same-sex couples and gives priority to traditionally defined families (Dominey-Howes, Gorman-Murray & McKinnon 2014). It has even been the case that LGBTI people have been blamed for the disaster itself (Dominey-Howes, Gorman-Murray & McKinnon 2016).

During and after disasters, while women and people of diverse gender and sexual identities can be particularly vulnerable, they are also well placed to increase community resilience and 'build back better' (UNISDR 2014, Parkinson *et al*. 2016).

The Hyogo Framework for Action (2005-2015)[2] and its successor, the *Sendai Framework for Disaster Risk Reduction 2015-2030*[3], recognise a broad cycle of disaster that includes planning, response and recovery. The frameworks recognise the need for a whole-of-society, multi-sector response that engages all stakeholders. These frameworks focus on building resilience and recognise the needs and vulnerabilities of diverse groups, including women.

> *Disaster risk reduction requires an all-of-society engagement and partnership. It also requires empowerment and inclusive, accessible and non-discriminatory participation, paying special attention to people disproportionately affected by disasters, especially the poorest. A gender, age, disability and cultural perspective should be integrated in all policies and practices, and women and youth leadership should be promoted. In this context, special attention should be paid to the improvement of organized voluntary work of citizens.*
> (Sendai Framework for Disaster Risk Reduction 2015-2030, Para 19 (d)).

In particular, the Asia-Pacific Input Document for the Post-2015 Framework (UNISDR 2014) highlights the tension between practices focused on women's health and safety and practices focused on disaster management. Though 'the call for inclusivity covers the need to include women', an outstanding need for a 'clear, stand-alone message' in disaster management remains.

> *...gender-based social, economic and cultural constructs marginalise women across all community groups irrespective of class, caste, economic standing, status, ethnicity and age, [women are] differently vulnerable to disaster risk in comparison to men within the same social groups.*
> (UNISDR 2014, p. 20).

In the Australian emergency management sector, notions of inclusivity and diversity are gaining traction. Reflecting a shift from its origins in Civil Defence command-and-control practices (Krolik 2013, p. 44), the Australian Defence Force, the Australian Federal Police and the Victorian Country Fire Authority have reviewed their culture of gender inequity (Australian Human Rights Commission 2014). At a national level, increasing recognition exists for a 'whole-of-nation resilience-based approach...to enhance Australia's capacity to withstand and recover from emergencies and disasters' (Attorney-General's Department 2011). Addressing the needs of diverse groups including, but not limited to, LGBTI communities, the elderly, young people, Aboriginal and Torres Strait Islander peoples, cultural and ethnic groups, women and people with a disability, offers the greatest potential for building resilience and ensuring participation in disaster response and recovery.

The National GEM Guidelines are high-level and strategic guidelines, devised specifically as a gender-sensitive approach to the planning for and delivery of disaster relief and recovery. Specific examples and an Action Checklist are provided to indicate ways that states and territories can operationalise them within a local context. A comprehensive literature review provides the evidence base. Using the GEM Guidelines enhances current systems and improves recovery capacity by:

- involving women and people of diverse gender and sexual identities
- promoting self-care (e.g. by countering gender stereotypes)
- acknowledging and addressing domestic and gender-based violence in times of emergency
- raising awareness of the gender spectrum and the way gender assumptions and gender stereotyping can contribute to trauma
- creating awareness of gender or cultural practices that may endanger women and people of diverse gender and sexual identities in times of disaster
- acquiring gender-disaggregated data

2 United Nations *Hyogo Framework for Action 2005-2015*. At: www.unisdr.org/we/coordinate/hfa.

3 United Nations *Sendai Framework for Disaster Risk Reduction 2015-2030*. At: www.unisdr.org/we/coordinate/sendai-framework.

- progressing uniformity across jurisdictions, enabling staff to transfer resources and support with ease.

The guidelines relate to the principles of the National Principles for Disaster Recovery, in particular, 'understand the context', 'recognising complexity', 'acknowledging and building capacity' and 'employing effective communication'. The GEM Guidelines progress these principles specifically through use of a gendered approach.

Recent advances in disaster risk management requires Australian emergency management systems to adapt to change. Change involves challenging closely held cultural beliefs about the role of men and women and contests male privilege and institutional bias. Collaborative efforts across the community and emergency management sectors need to raise awareness, provide education and build capacity to include gender considerations in policy, planning and service delivery. The Lessons in Disaster Program forms part of this effort to incorporate a gendered framework into the emergency management sector. This paper details the findings of an evaluation of the 2015 Lessons in Disaster Program.

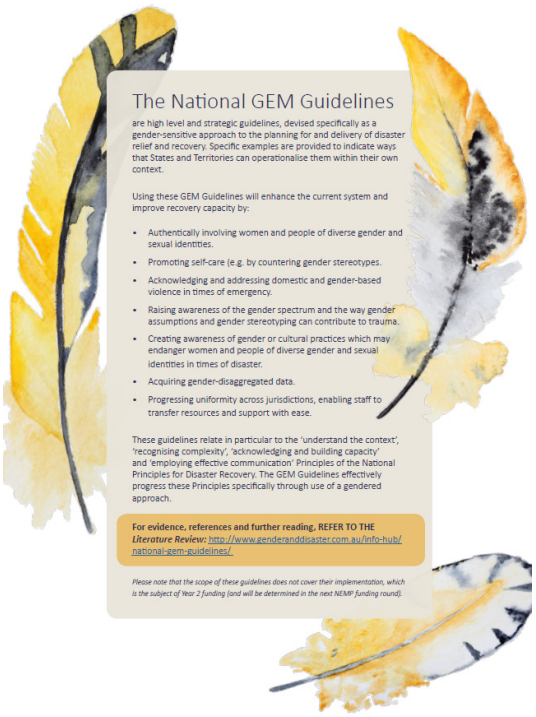

Image: The National GEM Guidelines

Table 1: Module aims and objectives.

Modules	Design team and development process	Aims	Objectives
Identifying Family Violence After Natural Disaster	Women's Health Goulburn North East	To assist in ensuring the safety of women and children after natural disasters, to offer participants the knowledge and skills to identify family violence and to provide referrals where appropriate to specialist organisations.	Participants should gain knowledge of the definition of family violence, the causes of family violence, the connections between disasters and family violence, and of ways to talk about and approach family violence.
Gender Equity in Disaster	Design Team (base session developed by Women's Health In the North)	To understand the impacts of gender in the delivery of effective emergency management services and develop strategies to address gender inequalities.	Participants should be able to better recognise their personal values around gender, gain knowledge of the correct use of gender terminology, learn the value of building a gender responsive organisation, and develop gender-sensitive skills and programs.
Living LGBTI in Disaster	Design team (base session developed by La Trobe University)	To broaden the understanding of the impacts of current emergency management practices on LGBTI people and to assist services to develop strategies to address inequalities.	Participants should be able to better recognise their personal values around LGBTI identities, learn the value of building a LGBTI-responsive organisation, and develop LGBTI-sensitive skills and programs.
Men In Disaster	Women's Health Goulburn North East	To broaden the range of constructive behaviours for women and men before, during and after disasters.	Participants should gain an understanding of the concepts of sex and gender and their impact on men's responses to disaster, and an awareness of the challenges faced by men in disaster contexts. Participants should recognise the consequences of hyper-masculine behaviours on men, other people, families and organisations, identifying the implicit and explicit behaviours and practices that support rigid gender roles.

Table 2: Module attendance, participant recruitment, module delivery and venue for sessions.

Modules	Attendance	Participant Recruitment	Module Delivery	Venue for Sessions
Identifying Family Violence After Natural Disaster	21	Senior members of the GAD Task Force identified and invited middle management from their organisation. The invitation snowballed into other organisations.	Each session attracted a diverse group of emergency management personnel together with local government, church representatives and community members	Victorian Emergency Management Training Centre, Craigieburn, Victoria.
Gender Equity in Disaster	17			
Living LGBTI in Disaster	17			
Men in Disaster	23			

Training

The Victorian Government's Natural Disaster Resilience Grants Scheme funded the Lessons in Disaster Program, which contained four modules. The experienced design team targeted sessions to practitioners in middle management; recognising that they play a key role in turning policy into action and in fostering behaviour change. The four modules are:

- Identifying Family Violence After Natural Disaster
- Gender Equity in Disaster
- Living LGBTI in Disaster
- Men in Disaster.

The GAD Pod team drew on what they learnt from the literature review and the research following the 2009 Victorian bushfires with two studies on women and men respectively. The GAD Pod team contracted a consultant to design the graphic and instructional material for all modules, which subject experts supplemented. Table 1 details the modules sessions, who developed the session and the sessions' aims and objectives.

Table 3: Breakdown of survey participants across each module.

Module	Attendance	Participants Contacted for Survey	Participants Agreeing to Participate
Identifying Family Violence After Natural Disaster	21	12	6
Gender Equity in Disaster	17	14	4
Living LGBTI in Disaster	17	16	5
Men in Disaster	23	5	5
Total	**78**	**47**	**20**

Evaluation methodology

The Evaluation Steering Committee, consisting of the MUDRI team, two project managers and the Chair of the Project Advisory Group, met and agreed on the evaluation parameters. The committee provided project documentation and responded to requests for further information and clarification during the evaluation. In addition, to contextualise the evaluation, a focused literature review summarised the challenges of delivering training on gender and LGBTI inclusivity to the emergency management sector. Monash University Human Research Ethics Committee approved the research project.

The MUDRI team, working as external evaluators, used a three-pronged approach to the evaluation:

- A document analysis of project and training documents to understand the context and implementation processes. MUDRI evaluated the four modules, focusing on the number of participants, their organisation or community, participant feedback, perceptions and key implementation issues.
- Interviews by telephone with a sample of session participants from all four modules using a structured survey tool designed to gauge participant perceptions of the program.
- A focus group to understand the perspectives of the program developers and facilitators.

One training session for each module was delivered to between 17 and 23 participants at each session. Table 2 details how many participants attended each session, participant recruitment and the venue for the sessions.

Findings

Document analysis

The program development team completed a literature review and consulted with subject experts to underpin the program context and content. The four modules demonstrated a sound philosophical approach to content and program delivery reflecting contemporary approaches to the program context and adult education

Table 4: The aggregate of feedback for the sessions.

Sessions resources 'accessible' or 'very accessible'	Sessions 'useful' or 'very useful'	Session resources	Usefulness of session	Key concepts from sessions	Awareness of issues	Quality of session presenters
90% (18)	95% (19)	Useful, interesting, of high quality and relevant to their work.	Six key themes emerged: knowledge, resources, increased awareness, discussion, presenters and contacts.	Gained knowledge.	Increased awareness of the issues and found the group discussions and exercises very useful.	Commended quality of presenters, their knowledge, how they spoke with a level of authority and expertise, valued meeting new people in the area.

principles. The program documentation, administrative and learning resources were comprehensive in quality.

Participant interviews

The evaluation team contacted 47 of the 78 participants for a telephone follow-up survey; 20 agreed to participate. Table 3 shows the breakdown of participants across the modules.

The majority (90 per cent, 18) of survey participants attended because they were 'interested in the topic' and 10 per cent reported that their manager recommended their participation. Most participants (40 per cent, 8) came from an emergency services organisation, 30 per cent (6) came from a local government authority, 25 per cent (5) came from state government and five per cent (1) came from the community. They had a range of positions including advisers, senior managers, coordinators, emergency management providers, officers and policy and strategy roles.

Table 4 shows how most participants responded to the session resources.

Participants gave positive feedback and identified six key themes, noting that the well-informed presenters helped them gain knowledge and increase their awareness.

Of particular interest was how participants used the materials and content from the sessions to implement change in their workplace or practice in the months following participation. The most common theme was 'greater awareness', and participants' efforts to apply their learning to their practice or share information. Nine participants reported having a deeper understanding and awareness of the practice of others and of having more consideration when attending emergencies and interacting with those affected by fires. One participant commented that the 'learnings had been so useful and had transferred in so many ways at home and at work'.

Another reported implementing a proactive approach to domestic violence in training. Another found the learning helpful for dealing with workplace issues.

Survey participants from three groups reported making changes. The types of changes made included implementing domestic violence training, joining a gender- and disaster-related subcommittee and incorporating information into handbooks and community resilience plans, but participants provided no details about the specific changes they had made. Survey participants from the LGBTI session reported the most changes, including incorporating LGBTI information into internal council materials, White Ribbon activities, school projects and family violence and recovery policies. Members from other groups reported planned changes. Only three participants reported making no changes.

Focus group

Four people responsible for the design and delivery of the program participated in the focus group. The focus group identified practical implementation challenges as key issues. For example, a significant regional fire outbreak affected one of the sessions, resulting in a number of absences. A key LGBTI session facilitator was unable to attend due to illness and the group noted the loss of the extensive knowledge of this presenter. The group also indicted that the venue as problematic. While its location was accessible and the room suitable, participants were asked to keep the noise level to a minimum, which may have influenced discussions.

Themes that emerged from the focus group suggest a deep understanding of the challenges and opportunities for training. The facilitators had a collaborative, strengths-based approach to building training content. They showed an awareness of the potentially confronting nature of the content and made a conscious effort to 'join the dots' for participants without 'preaching to them'. The facilitators reported that

they had expected some pushback, saying 'I was ready for pushback, prepared for it but, by-and-large, it didn't come'.

The facilitators agreed that the implicit theoretical underpinning for the program was the public health model approach. The training delivered crucial information for intervening to minimise harm by increasing resilience and decreasing vulnerability at the three key stages: prevention, early intervention and ongoing care.

The evaluators felt that considering time pressures and the nature of the content, the perceived success of the sessions was largely due to the high quality of the content, the recruitment strategy and the facilitators' skill levels. The facilitators preferred face-to-face delivery style. However, they recognised that not everyone could attend an in-person session and felt this provided an opportunity to develop online training resources. The facilitators noted that this training does not represent a 'silver-bullet' solution, but rather represents part of an ongoing practice to address inclusion and gender equity issues in disaster management.

Suggestions and feedback

A strong sentiment among participants confirmed that the sessions were 'very important and need to be implemented more widely', that they were 'fascinating' and 'delivered well'. One participant commented on the professionalism of the facilitators and the value of having a male instructor to involve participants who may have otherwise been difficult to engage.

While most felt it was a worthwhile initiative, some revealed a sense of 'preaching to the converted', and that the session content could have been more challenging for those with issues related to LGBTI communities. One participant suggested that 'breakout' spaces could have been provided for participants to manage the 'highly emotional content' more privately.

One LGBTI participant reported that there were better, shorter courses elsewhere, but did not elaborate on what service provider ran similar sessions. In the Identifying Family Violence After Natural Disaster group, suggestions included having facilitators from an 'appropriate academic background' and spending more time on practical strategies, giving more 'information on impact assessments in the community' and on 'reform and broader context'. Encouragingly, 75 per cent (15) of survey participants said they would be interested in follow-up for themselves and 85 per cent (17) said they would be interested in follow-up from WHGNE for their organisation. This indicates a good level of engagement with the materials.

Conclusion

The Lessons in Disaster Program met its aims and objectives with excellent and positive feedback from survey participants and focus group members. Some limitations of this evaluation include the lack of baseline measures for knowledge, behaviour and attitudes and the absence of long-term impact measures. While the number of participants surveyed from each group appears low, there was a 20-30 per cent response rate from each group. This is considered an acceptable outcome for this type of evaluation.

Survey participants from all four groups reported greater awareness of the issues and a better skill set to deal with relevant concerns. Participants expressed limited negative feedback and showed high levels of interest for follow-up sessions from WHGNE. The short-term outcomes from the project, as assessed by how the participants made use of the information and experiences gained from their participation in the program, demonstrates a greater awareness of the session content and encouraging self-reported change in behaviour because of their participation.

Although this evaluation was unable to obtain base-level data on knowledge and attitudes, the contextualising document suggested a lack of knowledge about inclusivity and a bias against incorporating gender and LGBTI-responsive emergency management practices. In this context, these findings offer potential positive outcomes by working at the intersection of disaster and gender. Translating knowledge from the women's health and LGBTI sectors to managers and influencers in the emergency management sector showed encouraging potential to build resilience and foster whole-of-community participation in planning, response and recovery.

The GAD Pod has now advanced the first two modules, combining elements of the Identifying Family Violence After Natural Disaster and the Men in Disaster modules. The LGBTI module has been redeveloped following research into the experiences of LGBTI people in disasters. The GAD Pod will continue to roll out the Lessons in Disaster Program informed by this evaluation. The advisory group accepted the evaluation report and included it in the final report to the project funders.

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ABSTRACT

Incorporating animals into emergency management is complex and involves many stakeholders who may not be core members of the emergency management system. This presents challenges as individuals and groups with veterinary and animal rescue knowledge are called upon, or offer, their assistance during emergency events. This paper uses a case study of the animal emergency management response during bushfires at Sampson Flat in South Australia in January 2015. South Australia incorporates animal welfare into emergency management planning and response arrangements. This case study draws on in-depth interviews with people directly involved in animal care during the bushfire response and examines their contributions and the successes and challenges involved in the response. The interviews revealed that the overall response was considered a success, especially in the areas of cooperation and coordination among the groups involved and the positive outcomes for animal welfare. The challenges identified related to communication, engaging with volunteers and staffing the response. This paper offers an example of best practice for animal welfare in emergency management. The challenges, and the responses to them, show the importance of flexibility, cooperation and learning from experience.

Animal emergency management in South Australia: a case study of the Sampson Flat bushfire

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Submitted: 4 May 2017. Accepted: 25 September 2017.

Introduction

In recent years there has been increased recognition that animals need to be considered and integrated into emergency management and disaster response. Such considerations pose additional challenges for those involved in responding. Extra preparation, knowledge and skills are required to ensure the safety of animals, their owners and responders (Austin 2013, Edmonds & Cutter 2008, Leonard & Scammon 2007, White 2014). The behaviour of people during a natural hazard emergency is influenced by animals, whether owned or unowned. It is documented that people risk their lives to rescue animals or do not evacuate in order to protect their pets. These actions can endanger the lives of others, especially responders involved in rescue (Bird *et al*. 2011, Coates 19, Haynes *et al*. 2016; Heath, Beck, *et al*. 2001, Heath, Voeks, *et al*. 2001, Irvine 2006, Smith & McCarty 2009).

Consideration of animals also requires the integration of other response agencies, such as agricultural agencies and primary industries. In addition, 'secondary responders' may be included, such as the RSPCA and local veterinarians. Inclusion of these secondary responders enhances capacity, although resources may still be stretched. Members of the public can also provide additional capacity if they have skills in animal rescue and animal handling that are scarce in formal response teams.

There is little research documenting the experiences of animal emergency management in Australia. However, there is an increased awareness of the importance of plans and legislation considering animals and their owners in emergency situations (Taylor, Eustace *et al*. 2015). Recent research in Australia as part of the Bushfire and Natural Hazards CRC Managing Animals in Disasters (MAiD) project showed that emergency services organisations and stakeholder groups face challenges and uncertainty regarding their roles and responsibilities in the management and rescue of animals and in their interactions with owners of animals (Taylor, McCarthy *et al*. 2015). In some jurisdictions, ambiguity surrounding official responsibilities, a more distributed response system and increasing media coverage of animals in the wake of natural hazard emergencies can contribute to the public perception of a vacuum in emergency response in this area. This has led to 'spontaneous volunteers' attempting to rescue animals or assist animal owners in

dangerous situations. While these people may be well-meaning, they are untrained in emergency management.

Optimisation of animal response coordination in emergency situations is needed. The case study, part of the MAiD project, looks at the animal emergency response during the Sampson Flat bushfire and examines the contributions of different groups. It includes discussion of the successes and challenges of the response and reflects on how the inclusion of animal organisations within the official response structure may help to manage spontaneous volunteers.

Method

Ten in-depth interviews were conducted with people directly involved in the animal response during the bushfires at Sampson Flat. Participants were recruited from the researchers' networks and snowball sampling. This included five interviews with representatives from animal-related organisations included in the South Australia State Emergency Management Plan (SEMP). In addition, representatives from non-animal-related official response organisations were interviewed due to their involvement or familiarity with the response. Three interviews were conducted with staff from the Adelaide Zoo and the volunteer group, Fauna Rescue South Australia. These organisations are not 'Participating Agencies' under the SEMP, however, they were invited to assist in the recovery phase (Table 1).

Interviews were semi-structured using an interview guide gathering participant backgrounds in animal-related emergency management and the experiences of the Sampson Flat bushfire. The semi-structured nature of the interviews allowed for emergent themes to be explored. All interviews were audio recorded and transcribed. Interview data were coded and analysed using qualitative research analysis software NVivo 11. The interviews were used to document the animal-specific response during and after the Sampson Flat bushfire. In addition, major themes emerging from the interviews relating to the successes and challenges faced by individuals and organisations were included.

Table 1: Number of interviews conducted and the organisations represented in the sample.

Organisation status	Organisation	Number of interviewees
Officially in SEMP (animal)	SAVEM	2
	RSPCA South Australia	1
	Animal Welfare League	1
	Primary Industries and Regions South Australia	1
Officially in SEMP (non-animal)	South Australia Police	1
	Country Fire Service	1
Not included in the SEMP (animal)	Adelaide Zoo	2
	Fauna Rescue South Australia	1
Total		**10**

Attempts were made to recruit spontaneous volunteers who endeavoured to help during the Sampson Flat bushfire. Interviews were conducted with some volunteers, however, they all had previous natural hazard emergency experience and were part of an established organisation. No non-affiliated spontaneous volunteers were located to participate in this study. This may be due to the nature of spontaneous volunteering as it occurs during the emergency event and initial recovery phase, and these volunteers have no ongoing organisational affiliation to identify and contact them. Furthermore, the relatively well-developed animal emergency management arrangements in South Australia may mean there is less opportunity, or need, for spontaneous volunteers.

This research was approved by the Macquarie University Human Research Ethics Committee (Ref. No. 5201500803).

Animal emergency management arrangements in South Australia

South Australia has an integrated approach to managing animals during natural hazards comprising of emergency management doctrine that references animals. The *Emergency Management Act 2004* and *Animal Welfare Act 1985* caters for animals (Taylor, Eustace, *et al.* 2015). The SEMP outlines flexible regulations and comprises functional services incorporating different areas of expertise, each with their own Participating Agencies. The Participating Agencies for the Agricultural and Animal Services Functional Service (AAS) (now referred to as Agricultural and Animal Services) have responsibilities for animals (Westcott & Prelgauskas 2013).

Primary Industries and Regions South Australia (PIRSA) is the lead agency for the AAS with specific responsibility for livestock in emergencies (PIRSA 2017). Participating Agencies include animal organisations such as the RSPCA and Animal Welfare League (AWL). South Australian Veterinary Emergency Management Inc. (SAVEM), a volunteer-based registered charity, is also a Participating Agency established to enable the veterinary community in South Australia to mount an effective response to an emergency incident involving animals. SAVEM is unique to South Australia with the 'appropriate resources to enter a disaster area post-event and to search for and manage all animals (in particular companion animals, wildlife and horses) in a holistic veterinary context' (Westcott & Prelgauskas

A Fauna Rescue volunteer treating an injured koala. Volunteers with animal rescue and emergency management training are a crucial component in animal emergency response.

Image: Rachel Westcott

2013, p. 49). Registered volunteers include vets, vet nurses and wildlife carers who have completed SAVEM training in emergency management. This allows sufficient, on-call resources with dedicated emergency management training and authorisations under the SEMP (Westcott & Prelgauskas 2013). Within the AAS, SAVEM and RSPCA staff have authority to enter a fire ground when deemed safe by the South Australia Country Fire Service (CFS). In addition, SAVEM has the authority to invite other groups to participate when further assistance and skills are required away from the foreground.

The Sampson Flat fire

Sampson Flat is 30 km northeast of Adelaide in the Adelaide Hills. The area is about 6 km from the peri-urban interface and includes a high number of residents who commute to the city for work meaning they are away from home during the day. The area is home to many hobby farms and numerous horse agistment properties (Every *et al.* 2016). The Sampson Flat bushfire started on 2 January 2015 and burned for six days until it was classified as 'contained' on 7 January. The bushfire burnt approximately 12,500 ha within a perimeter of 237 km destroying 24 homes. Although there was no loss of human life, the animal toll was significant with reports of 960 sheep, 30 cattle, two horses and 10 dogs and cats dying as a result of the bushfire (Every *et al.* 2016). The actual numbers are, however, believed to be significantly higher as there is no requirement to report animal death. In addition, countless numbers of wildlife perished and a dog and cat boarding facility burnt down resulting in the death of over 40 animals. The loss of this boarding facility gained significant media and community interest.

Sampson Flat animal response

When the bushfire started, those within the AAS liaised with PIRSA and took direction from the Chief Veterinary Officer. They were told it would be approximately 48 hours before they would be allowed onto the fire ground. During this time SAVEM prepared their first response team and took phone calls from community members requesting assistance. Calls came from people who were unable to take their animals when evacuating their homes and those still at home in the fire ground who had concerns about their own animals or wildlife. All of these calls were logged to be responded to when it was safe for allied official organisations to enter the fire ground.

On 5 January, SAVEM and RSPCA staff were briefed with staff from CFS and South Australia Police. They were able to enter the fire ground, although some areas were still unsafe and inaccessible. Two SAVEM teams were deployed; initially one was with an RSPCA vehicle responding to requests from community members. The other team included a vet, scribe, vet nurse and a spotter/carer who would survey particular sections of the fire ground. They would attend to injured animals to determine if they could be treated on the fire ground, needed to be taken away for treatment, or euthanised. SAVEM set up a field clinic at the oval in Kersbrook. This provided a place where animals could be brought from the fire ground for further treatment. After their initial treatment at the oval, animals could then be collected and taken into the care of other animal organisations or private veterinarians.

Research findings

Successes

The main successes of the response as reported by interview participants were in the two areas of:

- cooperation and coordination
- animal welfare.

The cooperation and coordination of the response, led by SAVEM, was noted by interview participants as a particular success. Prior to each bushfire season, SAVEM, RSPCA and AWL establish how they will cooperate during an event, identifying the main tasks and priorities. In the initial days of the response, SAVEM and RSPCA focused on animal welfare assessment and treatment of animals in the fire ground. When required, animals were transported elsewhere for further treatment. AWL complemented the work of SAVEM and RSPCA by:

- opening their shelter facilities so community members could board their animals if they evacuated
- transporting animals from the oval in Kersbrook to, for example, Adelaide Zoo or private veterinarian clinics for further treatment
- offering their animal cremation facility at no charge to bereaved community members to cremate their dead animals
- coordinating donations of goods from the public with the RSPCA
- updating their website and social media channels with information about the animal response.

SAVEM has the authority to communicate with people and groups outside of the official structure to assist with their duties. During the Sampson Flat response and recovery, assistance was required with the treatment and care of large numbers of injured wildlife. This led to contact with Adelaide Zoo and Fauna Rescue. SAVEM volunteers used their networks to fill gaps in capacity. One volunteer recalls:

> *We were getting these joeys and koalas that were coming in injured and so they just couldn't go to a wildlife carer because they were injured…one of our senior office vets is a part-time worker at the zoo and he said, 'Look, I think we'll ask the zoo if we can send animals there?' Which is what we did and that happened…they were great and they had their staff pro bono round the clock… that was a bit of an incidental finding, and we've had more debriefing and meetings with them as well over the last two months.*

Before the bushfire, a volunteer from Fauna Rescue had completed the first stage of SAVEM training. As such, she was able to provide the needed expertise in koala rescue and rehabilitation. She stated:

> *There was a koala that was very high up in a tree. They couldn't get a cherry picker in there so they rang me and so I got myself and two other rescuers and went out there with the team. They had to come with us, the SAVEM people, they actually saw how we rescued the koala…that was good for them to see. They did not know what we could do.*

Having staff with veterinary and emergency management training permitted to enter the fire ground is important for animal welfare. It enables a quick response, which is crucial for alleviating animal suffering. RSPCA officers have the jurisdiction to enter properties without owner permission to assess, treat or euthanise animals. SAVEM and RSPCA cooperated in ways each other felt important. For SAVEM staff, having an RSPCA officer with them meant they could respond to animal needs without permission to enter a property. As an RSPCA officer stated:

> *Under the Animal Welfare Act we're authorised to inspect [animals]. So we can enter a property without permission for the purposes of rescuing an animal and I can take anyone with me who I deem would be helpful in my role. So, that's the way that SAVEM could come with us and assess animals on properties without getting themselves in trouble for trespassing.*

For RSPCA officers, SAVEM volunteers provided on-hand veterinarian and emergency management expertise to assist in assessing situations and providing treatment.

Interview participants valued their work due to improved animal welfare and they recognised the link between animal and human wellbeing. As a SAVEM volunteer noted, 'the main reason for [treating some animals rather than euthanising], apart from the fact that its good animal welfare, was the psychological wellbeing of the community'. SAVEM and RSPCA received many calls from people effected by the bushfire requesting them to check their animals. SAVEM received 80 requests for assistance in the first three days of the response and they responded to over 750 calls in the six weeks after the fire. In many cases this involved a welfare check and ensuring animals were healthy and had access to food and water. Others required treatment or euthanasia if suffering could not be alleviated.

There is an increasing expectation that animals should be included in emergency response. This was recognised by the AWL by its opening of its shelter facilities for the pets of people who needed to evacuate. As an AWL staff member commented:

> *The people who needed to evacuate and were perhaps reluctant to because they had pets* [could] *bring their pets down to us at Edinburgh north* [where the shelter is located]. *So, to sort of help them to make that decision to leave.*

This is significant, as animals, with the exception of assistance animals, are not permitted to enter evacuation and relief centres in South Australia (PIRSA 2017).

Challenges

The challenges that emerged during the Sampson Flat bushfire response, as identified by interview participants, were in three areas of:

- communication
- engaging with volunteers
- staffing the response (this includes sufficient numbers of personnel and ensuring physical and psychological wellbeing).

Although organisations within the official response had discussed ways and channels of communication in preparation for an event, some still felt uncertainty about their role. As one animal welfare worker noted:

> *...we sort of felt, is there something else we should be doing? Or should we not be doing this? Or are we doing this correctly? That sort of thing... communication around what's going on now, where's it heading now, that sort of thing that I think we sort of thought we might be more in the loop about.*

Organisations and individuals involved in previous responses were more confident about their roles and actions. In response, those with experience provided support to those with concerns and worked together to provide clarification of roles and updates on progress. After the recovery phase concluded, one organisation strengthened their internal policies and staff information related to their role in future events.

Further challenges emerged regarding lack of knowledge about disasters and emergency management among volunteers. Some volunteers with significant wildlife rescue knowledge offered to help on the fire ground, but were unable to without having completed SAVEM training. This was a cause of frustration for those wanting to assist. In response, SAVEM staff discussed with them the personal danger of entering the fire ground and strongly encouraged these volunteers to complete the training to enable them to be deployed in future events.

The response to the Sampson Flat bushfire was long; SAVEM and RSPCA were active on the fire ground for eight weeks. Adelaide Zoo and Fauna Rescue continued looking after animals for four months before releasing them back into the bush. Combined with high levels of volunteerism, this created challenges for staffing. Volunteering was crucial to the animal response to the bushfire. SAVEM, for example, has no paid staff and relies on people volunteering their time. Other participating agencies such as RSPCA and AWL have paid staff who have an obligation to respond if activated in an emergency. However, their other day-to-day duties continue. As a staff member from RSPCA explained:

> *We don't have a lot of staff resources and so we couldn't just throw our entire staff at the effort because we still had our core business that we had to attend to. People are still cruel to animals and animals still need rescuing, so we have to still provide those services while endeavouring to help in Sampson Flat as well.*

Paid workers were considered to be 'volunteering' for long hours during the response and for many weeks after. Staff at the Adelaide Zoo found the assistance they offered a significant commitment. As one staff member commented:

> *I would say, it took a good couple of weeks before we actually realised the extent of what we put ourselves into because firstly, you're just doing first aid on animals...but they were with us for four months and needed initially, daily bandage changes and then three daily bandage changes and then weekly bandage changes, and all of them had to be done under anaesthetics. So suddenly we were doing like six, seven, eight anaesthetics a day and they were taking an hour or so each.*

For many workers their personal contribution and sacrifice of work and personal time was significant. Time committed to volunteering can result in conflict between the demands of family and the demands of volunteering, contributing to the risk of burnout (Kulik 2006). SAVEM was able to rotate 70 trained volunteers over the course of the response, although other groups reported difficulties in this area. In addition to rotation of tasks, the risks involved with this level of commitment can be reduced through a system of debriefings and access to psychological first aid programs. The interview participants reported they reflected on the successes and challenges of the response both internally and through a formal process of after action reviews with other organisations. The aim was to improve both human and animal wellbeing in future responses.

Discussion

The experience of the response at Sampson Flat contributes to the understanding of, and raises some important questions about, the management of animals in disasters and emergencies. Official arrangements in South Australia extend beyond animal welfare and the logistics of animal movement, feeding and placement. There is recognition of the link between animal welfare and human wellbeing, which is responsive to community member concerns about animals.

SAVEM occupies a unique space in emergency management in Australia; volunteers are trained in emergency management and function within the established system. Yet, SAVEM differs from traditional emergency volunteering in two ways. Firstly, the ability and desire to coordinate with other animal-related organisations outside of the official structure displays a certain level of improvisation and innovation often associated with emergent volunteer groups (Whittaker *et al*. 2015, p. 362). This enables some of the skill and knowledge gaps that appear during a response to be filled. Secondly, SAVEM training is important to help people with the interest and skills in animal rescue and handling to be deployed when needed without making a long-term commitment to emergency volunteering. This is one way for those who may otherwise be spontaneous volunteers to contribute and be properly managed, thus improving safety and managing risk.

Still, many people are not motivated to do training prior to an event creating considerations of how to resource future responses. The experience of Sampson Flat highlights how events are unpredictable, meaning not

all prepared operational guidelines will be followed (Carlton & Mills 2017). In addition, when relying on volunteers, staffing is unstable due to multiple factors, including professional and personal pressures. As the findings suggest, despite clear plans and a perception of predetermined roles, there is a need for clear expectations around communication and direction to aid understanding of roles among different groups. A recent report by PIRSA (*Managing Animals in Emergencies: A Framework for South Australia*) may assist to fill this gap as it aims to 'support animal owners, the community at large, government agencies, non-government organisations and businesses to understand their role and responsibilities towards managing animal welfare before, during and after emergencies' (PIRSA 2017). Since the Sampson Flat fire, public information about planning for animals in emergencies from the emergency management sector and a range of animal organisations has been updated. This includes targeted promotions to the emergency services and veterinary sector to improve knowledge of formal arrangements for animal emergency response and encourage more skilled volunteers to train with the appropriate organisations, particularly SAVEM.

Although this study is specific to the Sampson Flat bushfire, the successes and challenges are relevant in other contexts. The response at Sampson Flat was successful, occurring in a state with good integration of animal management into its emergency management structure. The challenges are not intended to diminish the importance of a dedicated animal response. The aim was to illustrate the problems that arise and highlight the need for agility and learning from experience in emergency response.

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ABSTRACT

During and after a disaster, affected communities grapple with how to respond and make sense of the experience. The physical and mental health of individuals is often adversely affected, as is the wellbeing of the community. In early 2014, a fire in the Morwell open-cut coalmine adjacent to the Hazelwood power station in the Latrobe Valley, Victoria burned for approximately 45 days, shrouding surrounding communities in smoke. As authorities struggled to put out the fire, the nearby communities became increasingly concerned about the perceived health risks of exposure to the smoke, particulate matter and gas emissions from the burning coal. The Hazelwood mine fire, initially treated as a fire emergency, 'evolved into a chronic technological disaster ... and a significant and lengthy environmental and health crisis' (Government of Victoria 2014, p. 28). In response to the crisis, people turned to social media as an alternative space in which to share information, tell their stories and organise for the purpose of activism. This paper takes the Hazelwood mine fire as a case study to examine how a community used social media (specifically Facebook) during a complex technological crisis involving health effects. It examines the issues facing emergency organisations and communities in relation to information and trust, and identifies the strengths and pitfalls of social media use in relation to community empowerment and engagement.

Community empowerment and trust: social media use during the Hazelwood mine fire

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Submitted: 27 June 2017. Accepted: 23 September 2017.

Introduction

Social media platforms increasingly play a key role in the communication landscape during and after a disaster. From the perspective of emergency organisations, social media use has the potential to promote disaster resilience and to keep communities informed about hazards. Social media monitoring can provide emergency organisations with reports from the community that can help inform the emergency response in a fast-moving crisis and can also provide important feedback to emergency organisations on whether they are meeting the community's needs. Like any technology, much depends on how social media is adopted and used in a social context.

The Hazelwood mine fire

In February 2014, a bushfire in the Latrobe Valley in south-eastern Victoria spread into the Morwell open-cut coalmine. The bushfire was brought under control fairly rapidly, but the fire had ignited the brown coal and burned for 45 days. It shrouded nearby communities in smoke, in particular the town of Morwell located a few hundred metres from the mine. A judicial inquiry (the Hazelwood Mine Fire Inquiry) was set up in response to widespread community concern about the impact of the smoke event. The inquiry expressed strong criticism of the communication from government authorities and the mine operator during the crisis (Macnamara 2015, p. 16, Government of Victoria 2014, pp. 25-28). The inquiry also found that the mine company was 'inadequately prepared to manage the fire' and that there were 'significant shortcomings by government authorities, in communicating throughout the emergency' (Government of Victoria 2014, p. 16, 23).

As the mine fire continued to burn and the community continued to experience the effects of prolonged exposure to the smoke, they turned to mainstream and social media to seek and share information about what they were experiencing. A distinctive feature of this crisis was the extent to which people were expected to continue to lead a relatively 'normal' life because of the absence of an immediate threat of loss of life or property. However, the long duration of the event, the pervasiveness of the smoke, the near-impossibility of avoiding exposure without physically relocating, and the many reports of detrimental effects on people's health[1] led to increasing concern

1 The Hazelwood Mine Fire Inquiry report (Government of Victoria 2014, p. 309) listed the physical symptoms experienced during the mine fire. These included headaches, nausea and vomiting, sore and stinging eyes, blood noses, shortness of breath, raised blood pressure, tight chest, sneezing, coughing, tiredness, raspy voice, sore throat, mouth ulcers, rash, diarrhoea, chest pain, sinusitis, ear infection, gastric upset, fatigue/lethargy, confusion, decrease in concentration, unusual metallic taste in mouth, loss of appetite and bleeding gums. There was also 'a psychological impact on the community as a consequence of the mine fire. The lack of information about the potential short and long-term effects of the exposure to smoke and ash has caused significant distress to the community' (p. 318).

and anxiety. Crisis communication theory suggests that when a crisis occurs, this creates a demand for information within the affected community (Mcnamara 2015, p. 7). The communication shortcomings exacerbated this information vacuum and, as a result, people sought to fill this gap, particularly through their use of social media.

During the Hazelwood mine fire, community members posted content on a wide range of social media, including Facebook, Twitter and Instagram, as well as using social media pages and Twitter accounts run by media organisations (such as the ABC and the *Latrobe Valley Express*). Three community driven Facebook groups became especially active during this time (The Air that we Breathe, Occupy Latrobe and Voices of the Valley) and were selected for this study. They were chosen because they were created and used by community members and they were specifically posting about the mine fire. These sites do not represent the views of the entire population. However, by examining these Facebook groups insights can be gained into how members of the community who were motivated to speak in these forums experienced the event.

Method

This research was conducted in the context of a larger study of community wellbeing in relation to the Hazelwood mine fire (the Hazelwood Health Study).[2] Our focus within this larger study was on the impact of the smoke event on community wellbeing, and effective communication during and after the event. The findings in this paper are based on the analysis of 475 social media posts collected from the three Facebook groups during the 45-day timeframe in which the fire was active, as well as interviews with four social media administrators from these groups. Textual analysis was conducted to identify key themes. Interviews conducted with four mainstream media professionals were also drawn on where they made direct observations regarding the functions and uses of social media. Approval for the interviews was gained through Federation University's Human Ethics Committee. Informed consent was gained from all interviewees.

Social media and disasters

The most popular social media platform in Australia is Facebook (We are social 2016). Facebook allows users to access information and connect with others in a community. In Australia, social media such as Facebook and Twitter emerged as a significant method of disseminating information during the 2011 floods in Queensland (Emergency Management Victoria 2014, Bird, Ling & Haynes 2012). Bird and colleagues note that 'Facebook community pages appeared almost simultaneously with the floodwaters' (2012, p. 28). Similarly, the Facebook pages in this study emerged out of the smoke of the mine fire.

Social media's affordances (Gibson 1979) include timely information exchange and promotion of connectedness (Taylor *et al*. 2012); qualities that are particularly important to users during a crisis. Kulumeka (2014, p. 55) conducted a study comparing the use of Facebook during the Hazelwood mine fire with the use of Chinese social media platform Tianyua during the 2008 Sichuan earthquake. He found that in both cases, these sites were used by those affected to share or seek information, support each other, express emotion, try to make sense of events and organise action.

Social media plays a substantial role in disaster communications by emergency services organisations and within communities. A considerable body of literature now exists on the use of social media in disasters, including disaster management. Emergency Management Victoria note that it is:

> *...widely accepted that social media – predominantly Twitter and Facebook – is now a critical channel for the distribution of emergency warnings and information, and that it represents a shift from more conventional means of communication.* (Emergency Management Victoria 2014, p. 47).

Kaminska and Rutten (2014, in Dufty 2016, p. 52) found three main areas where social media has potential for use in disaster risk reduction and crisis response being public awareness, situational awareness and community empowerment and engagement. The first two are related to information dissemination, while the third aspect relates to social relations.

Information dissemination by disaster management authorities is traditionally top-down, flowing from emergency organisations to the public (Low *et al*. 2010, in Simon, Goldberg & Adini 2015, p. 614). Only a small proportion of people rely solely on social media as an information source. Social media serves as a distribution mechanism, directing people to official sources of information, according to Taylor and co-authors (2012, p. 24). However, Taylor and colleagues note that the task of maintaining trust and rebutting misinformation 'requires a high level of active management that can be challenging to community-based SM channels' (2012, p. 25). Public officials also tend to view peer-to-peer communications with mistrust, as 'backchannels' with the capacity to spread misinformation and rumour (Keim & Noji 2010, p. 47). While this does occur, social media also plays an important role in enabling communities to hold the authorities to account. Information dissemination is thus linked to community empowerment and engagement, as demonstrated by the two key themes discussed below.

Information and trust

A key theme is the close relation between information and trust. Initial findings on the uses of social media during the Hazelwood mine fire show that there were significant issues around which organisations and information sources are trusted.

2 The Hazelwood Health Study is funded by the Department of Health and Human Services and was set up in response to community concerns, in order to investigate potential health impacts resulting from the smoke from the fire (http://hazelwoodhealthstudy.org.au/).

The literature on disaster communications emphasises the influence of trust on how the community regards and responds to information provided by authorities during a crisis. Grannat (2004) argues that creating and sustaining trust between official organisations, the news media and the public is crucial for developing effective partnerships. Evidence suggests that people trust those they know, and that emergency and other disaster communication should be issued by as local a source as possible (CFA 2013, Cohen, Hughes & White 2007). While communities expect emergency communications to come from the appropriate authorities (such as police, emergency services and government departments), the authority of the information is undermined, along with trust in the organisation, if the information received is contradictory (Hagan, Maguire & Bopping 2008). Trust in authorities is built over the long-term (Hagan, Maguire & Bopping 2008) and is easily damaged.

During a crisis, social media occupy an important space in communities as they fill the gap between face-to-face communication and mass media. Social media is viewed as a space where community members can post their accounts of what is occurring, in the form of local knowledge and eyewitness accounts. This role becomes particularly important when official sources of information are perceived as inadequate or untrustworthy. However, social media can become a space of conflict, and in the case of the Hazelwood mine fire, this was exacerbated when apparently conflicting messages were posted or information was misinterpreted.

As one interviewee noted:

> *No one knew … where to go, … what help was available. … What we were getting from the media and other services seemed to contradict each other.*
> Social media administrator

One of the overwhelming messages that came through via social media and interviews with social media practitioners, was that those expected by the community to provide correct and timely information about the health effects of the smoke event did not do so. Information from key organisations such as the Department of Health, the Country Fire Authority and the Environmental Protection Agency was questioned and contested on social media.

> *At the time when we were told by that woman, …that we were okay, … that the smoke won't harm us, she admitted that she didn't know that at the time. … For me personally at that particular time when she was telling us information, she'd lied to us in, in effect.*
> Social media administrator

This confusion, as well as what was interpreted as silence from authorities on important matters, fuelled suspicion and lack of trust due to questioning of the accuracy of information provided through official channels.

In times of crisis, communities need readily accessible and trustworthy information. When this is not available, community members become anxious and may look to social media to fill the communication gap (Mcnamara 2014). Rather than relying on the mainstream media, or on government authorities involved directly in emergency management for relevant information, social media users turn to other online sources. Yet some of these information sources are not subject to the forms of gatekeeping that exist in mainstream media and can be inaccurate. This can further complicate an already confusing information space.

A 2012 study by Bird and colleagues on Facebook used during the Queensland floods found that most of their respondents trusted the locally sourced information posted. A key benefit was that it provided local knowledge inherent in the community (2012, pp. 30, 31). However, the social media administrators of the Facebook groups in this study highlighted the risks in providing information from local sources because of the difficulty in verifying its accuracy. As explained by two active members of one Facebook group who were receiving posts regarding conditions inside the mine:

Social media administrator 1: *It becomes hard to know what to share and how do you verify it's true?*

Social media administrator 2: *And protecting the people that were giving this information as well; the last thing you want to do is put them at risk.*

Local knowledge may have been less trusted in the case of the Hazelwood mine fire because, in contrast to a flood, where local eyewitnesses can report roads cut and river heights from their own observation, information about the smoke was contested and dependent on expert scientific reports rather than direct observation by non-experts.

Community empowerment and engagement

Another theme was the key role of social media in community empowerment and engagement. Social media sites can have positive and negative impacts on a community members' relations with one another and with the authorities responding to the crisis. An important role social media groups had during the crisis was bringing this to the attention of the mainstream media. However, disagreements occurred over who could speak for the community and what experiences were 'real', 'true' and representative. Despite their success in gaining media attention, the organisers of the three Facebook groups were not necessarily seen as representing the community's views. During and after the mine fire, some community members questioned whether the voices emerging strongly via social media could speak for the community. For some, the concern arose out of a lack of ongoing connection (and by implication commitment) to the Morwell community, which was the case for one 'media talent' who was active on social media but had moved away from the area. It was acknowledged that news media play a part as to who was given air space to talk about the event. As one journalist explained:

> *I think that groups like Voices of the Valley have gained a real credibility with government and have almost become some sort of de facto spokesperson for the Latrobe Valley community. I think the media*

certainly has a responsibility to take there. I think and it comes back to that point I made before about in the absence of being able to have other people to speak to you're constantly going to the same people – their profile inevitably gets lifted.
Local journalist

It is not simply that there was an apparent few who seemed to have greater exposure on social media, but that this highlighted the divisions within the community. The interviewees felt that social media made these divisions more obvious but didn't create them.

On social media I've noticed a big divide between people, ...it also caused in a lot of ways - oh not the page didn't cause it but it became apparent in the community there were people who thought we should have just sat back, shut up and dealt with it. We got blamed for the downfall of Morwell.
Social media administrator

A consequence of using social media (and mainstream media) as platforms to highlight inadequacies in emergency response and recovery, is that those speaking out may be seen as exacerbating the difficulties the community is experiencing, despite the fact that their efforts may lead to necessary actions to address shortcomings.

Conflict and disagreements arose over who was genuinely affected by the event and whether or not it was legitimate to complain and to criticise the emergency response. Some in the community regarded this as 'whingeing':

So then anybody that got funding to leave town, oh yep they got bagged out and anyone who couldn't get it was whingeing and complaining and bagging. It was like them and us and none of us could be in it together, they [the authorities] created these divisions. It was social and geographical.
Social media administrator

As with any set of social processes, the formation of an online community is not without its challenges. On the other hand, social media had positive functions. They were used to bring people together to organise and advocate for changes. Social media can fulfil a 'watchdog' function, holding government, private companies and other organisations to account, for example on matters of public safety. As one interviewee observed:

Unfortunately the people, the watchdogs that are supposed to do it have failed, so the communities had to ... take it back and do it themselves.
Social media administrator

This is viewed as beneficial for community cohesion:

I think the social media is good for keeping the community, holding the community together.
Social media admininstrator

Community groups can form and organise themselves using social media and take on an advocacy role. They can also assist with rebuilding efforts by promoting initiatives and providing a space for considering 'the way forward'. In doing so they can promote a community's disaster resilience, defined as the ability to 'bounce forward' after a disaster (Dufty 2012).

The relative intimacy of social media, where community members know others in the group, means they may feel comfortable speaking in that forum when some wouldn't go elsewhere with a problem or issue. As a result, community members affected by the Hazelwood mine fire have become better at speaking out and have discovered they have a community voice. This was particularly apparent with the role played by the Voices of the Valley, where, as one journalist explained, this became a avenue through which calls for government and industry responsibility and culpability were made.

Researchers argue that social media can play a significant role in building disaster resilience (Dufty 2012, Keim & Noji 2010). Social media can enable communities to take on important roles during and after a disaster such as advocacy and information sharing. However, Dufty (2012) points out that for emergency managers to take advantage of this potential it requires a 'paradigm shift' from being the 'combat agency' telling others, to one of community engagement; to fully obtain the benefits of social media through shared responsibility'.

Conclusion

Social media plays a role in helping communities to cope during a crisis and to recover after a crisis, in other words, in developing resilience. Affected communities gain resilience by 'replacing their helplessness with dignity, control as well as personal and collective responsibility' (Keim & Noji 2010, p. 47). Social media can provide a means for empowering communities to help themselves 'through provision of accurate, timely and relevant information and a mechanism to connect with others' (Taylor *et al*. 2012, p. 26). These two functions, provision of timely and trusted information and connections with others, are closely related.

When communicating, it is important to understand the community's perceptions of authorities, why they do or do not trust these organisations and which information sources they do trust. Social media can provide a window into community perceptions and how effectively a response is being managed. The Hazelwood Mine Fire Inquiry found there were significant shortcomings in the emergency communication during the mine fire. It also made the point that 'social media can be a very effective tool for hearing and reading what the community are saying and how they are responding, in turn enabling interventions to acknowledge and correct rumour and innuendo' (Government of Victoria 2014, p. 400).

The findings of this case study suggest that social media plays a complex role during a crisis and people turn to it when they don't trust the information they receive from authorities or are looking to share what they know. Social media fills an information gap, but can also confuse rather than inform. They can empower communities, but they can't necessarily overcome existing divisions.

Positive outcomes depend on the levels of trust within the group and with the community; the provision of accurate, trustworthy information; offline partnerships among participants and follow-up action that delivers

results. In this context, important steps are being taken by Emergency Management Victoria to develop a community based emergency management plan in which community consultation and 'bottom-up' communication plays a key role. As the draft framework states: 'adopting and using the CBEM approach recognises that community members are knowledgeable and should participate in the decision-making processes that affect them' (Mackie 2017). Case study interviews made it clear that social media cannot replace face-to-face communication and this is necessary for rebuilding the fabric of a community. Both the communications literature and findings in this study show the importance of using multiple communication methods and channels to communicate accurate and timely information.

Acknowledgements

The authors thank the interviewees for their willingness to share their insights. They made an important contribution to this research. Thanks also to research assistants Dr Larissa Walker and Dr Haydie Gooder for their assistance with the data collection and literature review and to Professor Judi Walker, Dr Matthew Carroll and anonymous reviewers for providing invaluable feedback on this paper.

This research was funded by the Victorian Government through the Department of Health and Human Services.

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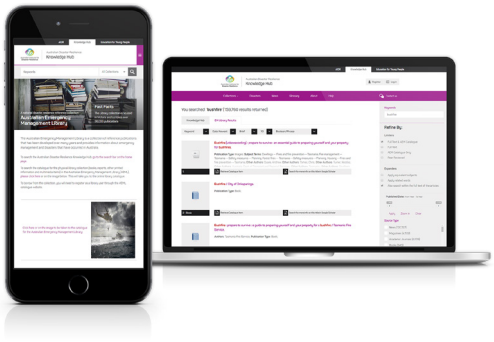

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