

Public Information and Warnings



Australian Government
National Recovery and
Resilience Agency



Australian Institute for
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AUSTRALIAN DISASTER RESILIENCE
HANDBOOK COLLECTION

Public Information and Warnings

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The Australian Institute for Disaster Resilience
Level 1, 340 Albert St, East Melbourne Vic 3002
Telephone: +61 (0) 3 9419 2388

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Australian Disaster Resilience Handbook Collection

The Australian Disaster Resilience Handbook Collection provides guidance on national principles and practices for disaster resilience.

The Handbook Collection:

- provides an authoritative, trusted and freely available source of knowledge about disaster resilience principles in Australia
- aligns national disaster resilience strategy and policy with practice, by guiding and supporting jurisdictions, agencies and other organisations and individuals in their implementation and adoption
- highlights and promotes the adoption of good practice in building disaster resilience in Australia
- builds interoperability between jurisdictions, agencies, the private sector, local businesses and community groups by promoting use of a common language and coordinated, nationally agreed principles.

The Handbook Collection is developed and reviewed by national consultative committees representing a range of state and territory agencies, governments, organisations and individuals involved in disaster resilience. The collection is sponsored by the Australian Government Department of Home Affairs.

Access to the Handbook Collection and further details are available on the Australian Disaster Resilience Knowledge Hub: www.knowledge.aidr.org.au/handbooks

Australian Emergency Management Arrangements

Community Engagement for Disaster Resilience

Communities Responding to Disasters: Planning for Spontaneous Volunteers

Community Recovery

Disaster Resilience Education for Young People

Emergency Planning

Evacuation Planning

Flood Emergency Planning for Disaster Resilience

Health and Disaster Management

Land Use Planning for Disaster Resilient Communities

Lessons Management

Managing Exercises

Managing the Floodplain: A Guide to Best Practice in Flood Risk Management in Australia

National Emergency Risk Assessment Guidelines

Public Information and Warnings

Safe and Healthy Crowded Places

Systemic Disaster Risk

Tsunami Emergency Planning in Australia

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Warnings group members

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Australian Broadcasting Corporation – Anthony Gerace

Australian Capital Territory Emergency Service Agency – Kaylee Rutland

Australasian Fire and Emergencies Authorities Council and Australian Institute for Disaster Resilience – Amanda Leck

Bureau of Meteorology – Carla Mooney

BushfiresNT – Akshy Athukorala

Country Fire Authority, Victoria – Angela Gardner

Department of Fire and Emergency Services, Western Australia – Anni Fordham

Department of Home Affairs, Emergency Management Australia – Steve Dwyer

Emergency Management Victoria – Andrew Crisp and Reegan Key

Fire & Rescue New South Wales – Philip Lindsay

Fire Rescue Victoria – Barry Gray

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New South Wales Rural Fire Service – Anthony Clark

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Northern Territory Police, Fire and Emergency Services – Mark Cunnington

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South Australia Country Fire Service – Fiona Dunstan

South Australia Fire and Emergency Services Commission – Sita Bacher

South Australia Metropolitan Fire Service – Nicole Ely

South Australia State Emergency Service – Liz Connell

Tasmania Fire Service – Peter Middleton

Victoria State Emergency Service – Fiona O'Loughlin

Contents

Australian Disaster Resilience Handbook Collection	iii
Acknowledgements	iv
Preface	vii
Purpose of this handbook	vii
Who is this handbook for?	vii
How is this handbook has been developed?	viii
Companion documents	viii
Context	ix
Public information and warnings as a priority	ix
Part of a broader approach to disaster resilience	ix
An evolving discipline	ix
Part 1: Warning fundamentals	1
1.1 What is a warning?	2
1.1.1 What is public information?	2
1.2 Warning principles	3
1.3 Why we warn	4
1.3.1 Warnings empower people and foster shared responsibility	4
1.3.2 A mandate and responsibility to warn	4
1.3.3 Public value	4
1.3.4 Community expectation	4
1.4 A total warning system	5
1.4.1 Elements of the Total Warning System	6
1.5 How do people react to warnings?	8
1.5.1 Trust and personal verification of warning	8
1.5.2 Interpretation of risk and decision to act	9
1.5.3 Taking protective action	10
1.6 Who provides warnings?	11
1.6.1 Statutory providers of warnings	11
1.6.2 Established emergency broadcasters	11
1.6.3 Individuals and community members	11
1.6.4 Private warning publishers or disseminators	14
1.6.5 Working with warnings republishers	14
Part 2: Delivering effective warnings	15
2.1 The decision to warn	16
2.1.1 A scaled approach	16
2.1.2 Factors informing a decision to warn	16
2.1.3 Managing uncertainty in dynamic events	17
2.1.4 Public information: complementing official warnings	18
2.1.5 De-escalation messages	18

2.2 Essentials of message construction	18
2.2.1 The issuing authority	18
2.2.2 Call-to-action	18
2.2.3 Structure	19
2.2.4 Consistency	19
2.2.5 Timing and frequency of issue	19
2.2.6 Maps and visuals	20
2.2.7 Easily shared	20
2.2.8 Accessible	21
2.2.9 Targeted to specific locations	21
2.2.10 Tailored for local communities and diverse audiences	21
2.2.11 Managing a wealth of information	23
2.3 Getting the message out	23
2.3.1 Tailoring warnings for different channels	26
2.3.2 Standard Emergency Warning Signal	26
2.3.3 Communicating with hard-to-reach communities	26
2.3.4 Reaching people beyond the geographic warning area	26
2.3.5 Working with changing technology and user expectations	27
2.3.6 Warning publishing systems	27
2.4 Planning for system failures and unexpected challenges	27
2.4.1 The importance of consistent education: Do not expect a warning	28
2.4.2 Loss of power and telecommunications networks	28
2.4.3 The importance of local networks and resources	28
2.4.4 Capacity of public information resources	29
2.4.5 Failure of publishing and dissemination systems	29
2.4.6 Increased use of social media	29
Part 3: Evaluating public information and warnings	31
3.1 Evaluating public information and warnings	32
3.1.1 A lessons management approach	32
3.1.2 An outcomes focus	32
3.1.3 Readiness to review	33
References	34

List of Figures

Figure 1: A timeline of key events in the warnings landscape in Australia and internationally 1989-2018	x
Figure 2: Australia's Total Warning System	5
Figure 3: The decision to warn is based on risk	16

List of Tables

Table 1: Australia's warning principles	3
Table 2: Elements of Australia's Total Warning System	6
Table 3: Jurisdictional statutory roles and responsibilities for warnings	12
Table 4: An example of data and questions used to inform assessment of the need to warn	17
Table 5: Different factors about each community should inform the tailoring of warnings	22
Table 6: Common channels of communication when disseminating public information and warnings	24

Preface

Purpose of this handbook

The effective communication of public information and warnings is a critical element of emergency management, with the power to save lives. This handbook provides insight and guidance to people who have responsibility for communication with the public in the event of an emergency. The handbook presents nationally agreed principles for warning policy and practice and explores the essential elements and discipline of effective public information and warning delivery.

This handbook is designed to be of value across a wide range of hazards. Whether it is a natural hazard or weather event, a public health emergency, or a hostile attack in an urban setting, the principles, importance and discipline of effective communication are broadly applicable.

The handbook aligns national disaster resilience strategy and policy with practice, notably the *National Strategy for Disaster Resilience* (COAG 2011) and *Strategic Directions for Fire and Emergency Services in Australia and New Zealand 2021–2026* (AFAC 2021), by guiding and supporting jurisdictions, agencies and other organisations and individuals in their implementation and adoption. It also responds to Recommendation Two of the *2014 National Review of Warnings and Information* (ANZEMC 2015), to advance a national approach through improved knowledge management.

The scope of the handbook spans public information and warnings and has a specific and intentional focus on the delivery of warnings. Future revisions of the handbook will expand discussion to include relevant good practice on the provision of public information.

The handbook is not intended to be operational in nature. Organisations with responsibilities for the provision of warnings have local arrangements in place, tailored to their role and responsibilities.

See Part 1.1 *What is a warning?* for definition and use of warnings and public information terms.

Who is this handbook for?

This handbook is designed to support organisations and individuals with specific responsibilities for developing and disseminating public information and warnings in an emergency. It will benefit Australian leaders and practitioners in emergency management, meteorological services, policing and security, health agencies, and other hazard management organisations. Broadcasters and other organisations committed to sharing warnings effectively will also find the handbook useful.

Individuals and community groups, regulators, auditors- general, the legal fraternity, international practitioners in disaster resilience and emergency management, and those working in communication and behavioural science may also value the information and research presented.

This handbook is available on the Australian Disaster Resilience Knowledge Hub at knowledge.aidr.org.au/resources/public-information-and-warnings-handbook

How has this handbook been developed?

Public Information and Warnings (AIDR 2021) is part of the Australian Disaster Resilience Handbook Collection. The handbook takes into account that there are diverse arrangements and specific requirements for public information and warnings practice across Australia. The Handbook Working Group has set out to present a shared perspective on known and emerging good practice, with an all-hazards view. The handbook does not necessarily capture or reflect current policy and practice across all agencies and is not intended for this purpose.

The handbook is presented in three parts:

- Part 1: Warning fundamentals
- Part 2: Delivering effective warnings
- Part 3: Evaluating public information and warnings

While references are provided throughout, it is important to note this handbook is not an academic paper. References for further reading are provided at the end of this handbook.

The 2021 revision of *Public Information and Warnings* includes latest research outputs from the Bushfire and Natural Hazards Cooperative Research Centre communications and warnings research project and to reflect the adoption of the Australian Warning System, endorsed by ANZEMC in March 2021.

Companion documents

Three separate companion documents are available online to support people's use and application of *Public Information and Warnings*. These companion documents have been updated in July 2021 to ensure currency:

1. Warning Message Construction: Choosing your words (Guideline 1)
2. Warnings Republishers (Guideline 2)
3. Australian Warning System

Terms used in this handbook

Warning is defined in this handbook as point-in-time information about a hazard that is impacting or is expected to impact communities. Warnings describe the impact and expected consequences for communities and include advice on what people should do.

Public information is information provided to the public immediately before, during and after an emergency to reduce the potential impact of an emergency or hazard.

Total warning system describes a means of collecting information about an impending emergency, understanding the nature of the threat, communicating that information to those likely to be affected by it, and facilitating protective action and timely response (Mileti & Sorensen 1990; Sorensen 2000).

Early warning system is an integrated system of hazard monitoring, forecasting and prediction, disaster risk assessment, communication and preparedness activities systems and processes that enables individuals, communities, governments, businesses and others to take timely action to reduce disaster risks in advance of hazardous events (Source: United Nations Office for Disaster Risk Reduction, 2009).

Call-to-action is a clear instruction of the (protective) action people should take.

Event, incident and emergency are used interchangeably throughout this handbook, unless noted otherwise.

The Australian Disaster Resilience Glossary on the Knowledge Hub provides further detail on terms and definitions used in emergency and disaster management: knowledge.aidr.org.au/glossary

Context

In an emergency, the provision of public information and warnings plays a significant role in making people and communities safer. Timely, targeted and tailored information and warnings empower people to make informed decisions, to take protective action, and to reduce the potential impacts and consequences of a hazard.

Public information and warnings as a priority

Warnings are a critical component of emergency management, and the evolution of both policy and practice over recent years has been transformative. A series of significant and devastating emergencies across Australia including the Black Summer fires in 2019–20, major flooding in Queensland during 2010–11 and Victoria's Black Saturday bushfires in 2009, highlighted the power of warnings to save lives and a need to learn more about why some warning strategies were more successful than others.

Today, the provision of warnings is seen as a priority action in any emergency, equal to any other aspect of traditional response. This applies to any hazard, whether it is a natural hazard such as fire, flood or heatwave, an incident of public safety and security, or a health-related event such as a pandemic. Across Australia, Commonwealth, state and territory governments and their emergency service organisations and statutory bodies hold responsibilities for issuing warnings. Community members and organisations also play a shared role in communicating warnings.

Part of a broader approach to disaster resilience

Public information is one part of an integrated approach to emergency management and the building of disaster resilience. Activities such as community engagement and education about risk and preparation for emergencies, have an integral role in enhancing the impact of public information and warnings. People have a greater likelihood of acknowledging and acting on a warning if they have prior awareness of local risks and confidence to act.

Warnings on their own will never be able to assist everyone, every time. We know complex factors impact every person's situation and decision-making, particularly during times of significant stress. Thus, the practice of warning effectively embraces shared responsibility for public safety and disaster resilience with communities and the pursuit of good practice continues.

An evolving discipline

Experience and research on the effectiveness of warnings and their role in motivating people to take protective action has shifted over time (see Figure 1). Warnings once tended to focus on describing a hazard and providing instructions without relevant information or justification. Greater emphasis is now placed on interpreting and explaining both the impacts and consequences a hazard will have and including a clear call to take protective action. The use of simple language, specific information on affected locations, and practical advice on actions people can take are all features of what is now considered good practice.

Over the previous decade, there has also been rapid expansion and improvement in capability, systems and policy to develop and deliver public information and warnings. Today, messages are created and disseminated using a diversity of channels from sirens and radio, to websites and social media, community meetings, and targeted text messages. The role and capability of communities in shaping and sharing information and warnings during emergencies is also increasing, bringing shared responsibility for public safety to life. As technology improves our fire and emergency service agencies adapt and innovate to deliver new warning systems and products. While communities increasingly expect the provision of near 'real time' warnings, this is limited by technology failure during major disasters. An over reliance on this by communities can create greater risk.

These are not insignificant shifts. A national, multi-hazard collaborative approach supported by a program of research assists agencies and public information practitioners to drive change.

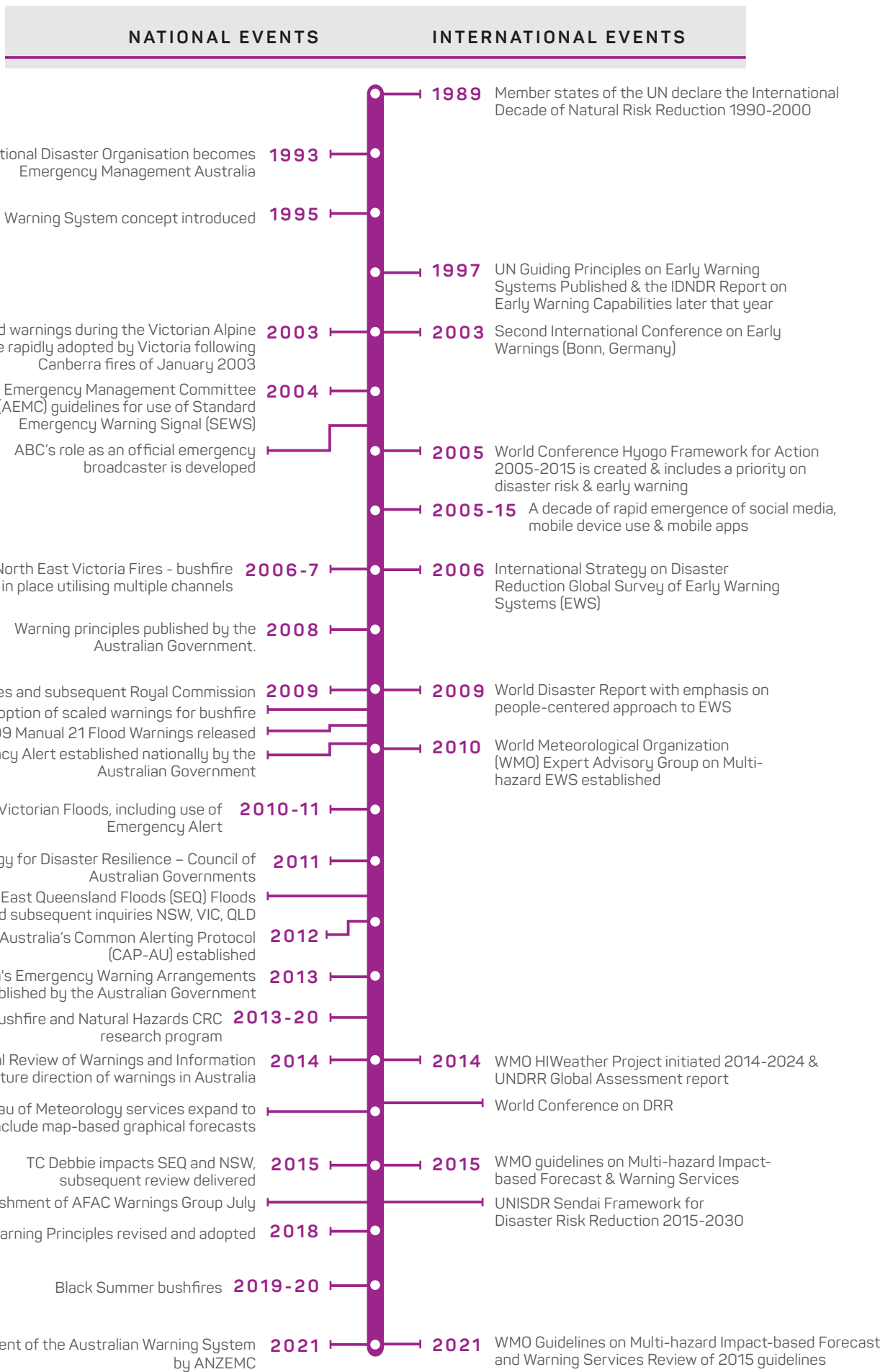


Figure 1: A timeline of key events in the warnings landscape in Australia and internationally 1989-2021

Source: Adapted from Anderson-Berry, L., et al. 2018, Sending a message: How significant events have influenced the warnings landscape in Australia, *International Journal of Disaster Risk Reduction*



Part 1: Warning fundamentals

1.1 What is a warning?

A warning provides point-in-time information about a hazard that is impacting or is expected to impact communities. It describes the impact and expected consequences for communities and includes advice on what people should do.

In this handbook, general advice about ever-present hazards, such as living in a fire or flood-prone area, road safety behaviour, or managing health risks, is not considered to be a warning, although such advice might be included in a warning. A 'total warning system' explains how warnings relate to general communication and education about risk.

Some organisations have a legislative responsibility to provide warnings. Legislation may include a definition of what this means or must include, and it should be followed.

See Part 1.6 *Who provides warnings?* for further information.

1.1.1 What is public information?

Information provided to the public immediately before, during and after an emergency to reduce the potential impact of an emergency or hazard.

Public information is a term used by emergency management organisations to describe the function and provision of information and warnings to the public during an emergency. Warnings are a specific form of public information.

In an approaching or current emergency, communities require a wide range of information including, but not limited to, official warnings. This might include, for example, general information about the nature of an approaching hazard, information on looking after your health during an emergency, forthcoming community meetings, local resources, relief and recovery services.

Warning messages are often presented separately to more detailed public information about an emergency to ensure they remain easily identifiable and understood.

The Australasian Inter-service Incident Management System (AIIMS) prescribes and outlines the function of public information as including the provision of all warnings and advice, media liaison and community liaison activity.

1.2 Warning principles

Ten principles guide the development and use of warnings in Australia. They outline why warnings are important and how warnings are provided most effectively (see Table 1).

The design and use of warnings should be guided by a total warning system, underpinned by clear governance arrangements, operate within an integrated incident management system, and be supported by delivery systems.

Table 1: Australia's warning principles

1	Life-saving: Warnings can save lives and protect people from harm. They prompt and encourage protective action to minimise the social and economic impacts of an emergency. Warnings are an essential element of effective emergency management.
2	Empowering: The provision of warnings enacts a national commitment to building shared responsibility for disaster resilience, by empowering people to make decisions about their own safety.
3	Trusted, authoritative and verifiable: For greatest effect, warnings must come from a trusted source and be verifiable through multiple channels. Warnings should therefore be easily and widely shared to recognise the diversity of potential trusted sources. The official authority issuing a warning should always be clearly stated.
4	Scaled based on risk: Scaled warning frameworks should guide the delivery of all warnings and support the consistent risk assessment of a hazard, its impact and its consequence.
5	Timely, targeted and tailored: Warnings should be timely, targeted to communities at risk and tailored to provide detail and relevance. Specific consideration should be given to harder to reach and vulnerable members of the community.
6	Conveying impact: Warnings should describe the expected impacts and consequences of an approaching or current hazard, to assist people to understand and be motivated to take protective action.
7	Including a call-to-action: Warnings should include practical calls-to-action using language tailored to the level of risk, ranging from advice and persuasive recommendations to authoritative direction.
8	Clearly communicated: Warnings should be easy to understand and use a consistent structure to provide information. Both written and visual information should be considered to assist with clearly conveying risk and encouraging protective action.
9	Readily accessible: Warnings should be disseminated via multiple channels, tailored to suit each channel, and consider accessibility for diverse audiences. Ease of sharing and rapid dissemination should be supported with use of nationally agreed technical standards, and dissemination strategies should be in place to adapt to failure of technology or other systems.
10	Part of a bigger picture: Warnings are one component within a systems-based approach to community safety. Community engagement, education and awareness programs better prepare communities to receive, understand and act upon warnings.

1.3 Why we warn

The provision of public information and warnings is a priority for any organisation with responsibility for community safety in an emergency.

Warnings save lives and minimise harm by facilitating protective action.

People's lives can be placed at risk during an emergency if they do not have the necessary information to take protective action, or lack specific guidance on what to do.

Warnings play a critical role in saving and protecting life and property. They serve and support broader risk management actions ranging from hazard reduction and traditional response, to ongoing community education and resilience building.

1.3.1 Warnings empower people and foster shared responsibility

The *National Strategy for Disaster Resilience* (COAG 2011) has a central focus on shared responsibility for resilience to disasters across governments, non-government organisations, businesses, communities and individuals. One of its key commitments is to empower individuals and communities to exercise choice and take responsibility before, during and after a disaster.

Having access to clear public information and warnings about imminent or current emergencies means communities can better understand their risk, consider their personal situation and take protective action. This can also assist people to consider the needs of others, building a shared responsibility for disaster resilience and safety.

1.3.2 A mandate and responsibility to warn

Authorities have moral and various legal obligations to protect life and property from the impacts of hazards and emergencies, including through the provision of knowledge and information.

International human rights law recognises a fundamental right to life and rights to information. In an emergency, the provision of public information and warnings serves to uphold these rights.

Many organisations also have specific legislative responsibilities and duties to provide warnings. For some, requirements are set out, defining when and how warnings are to be issued, and by whom.

See Part 1.8 *Who provides warnings?* for further information.

1.3.3 Public value

The social, economic and environmental cost of emergencies is significant. The economic cost of disasters to Australian communities in the 10 years to 2016 has averaged \$18.2 billion per year. This figure is expected to rise to an average of \$39 billion per year by 2050 (Australian Business Roundtable (ABR) 2017). It is noted that, at the time of this handbook's publication, this projected figure is being updated. The intangible costs of the impact on people's lives, their health and wellbeing, education, employment and community networks as well as environmental damage are at least equal to, if not greater than, tangible costs (ABR 2017).

The Insurance Council of Australia (ICA) has reported that the cost of insurance claims from four disasters over the summer of 2019-20 alone has passed \$5.19 billion, noting this does not include the impact of the COVID-19 pandemic (ICA 2020).

Effective warnings make a clear contribution to mitigating and minimising the lasting consequences disasters can have on households, businesses and communities.

1.3.4 Community expectation

Community expectations of government agencies and emergency services continue to grow in an era of rapidly evolving information sharing technologies.

Experience from previous disasters highlight challenging expectations that timely, targeted and tailored warnings will always be provided. Communities expect that near 'real time' information will be shared promptly and effectively.

Recent research into the 2019-20 bushfires found that catastrophic fire danger messages were largely seen as timely (90%), easy to understand (92%) and useful (88%) (Whittaker 2021).

1.4 A total warning system

A total warning system describes a means of collecting information about an impending emergency, understanding the nature of the threat, communicating that information to those likely to be affected by it, and facilitating protective action and timely response (Mileti & Sorensen 1990; Sorensen 2000).

Australia's Total Warning System (Figure 2) defines the essential elements of delivering warnings effectively, with a lifecycle of action before, during and after emergency. It is made possible with commitment to a partnership approach across agencies and with communities.

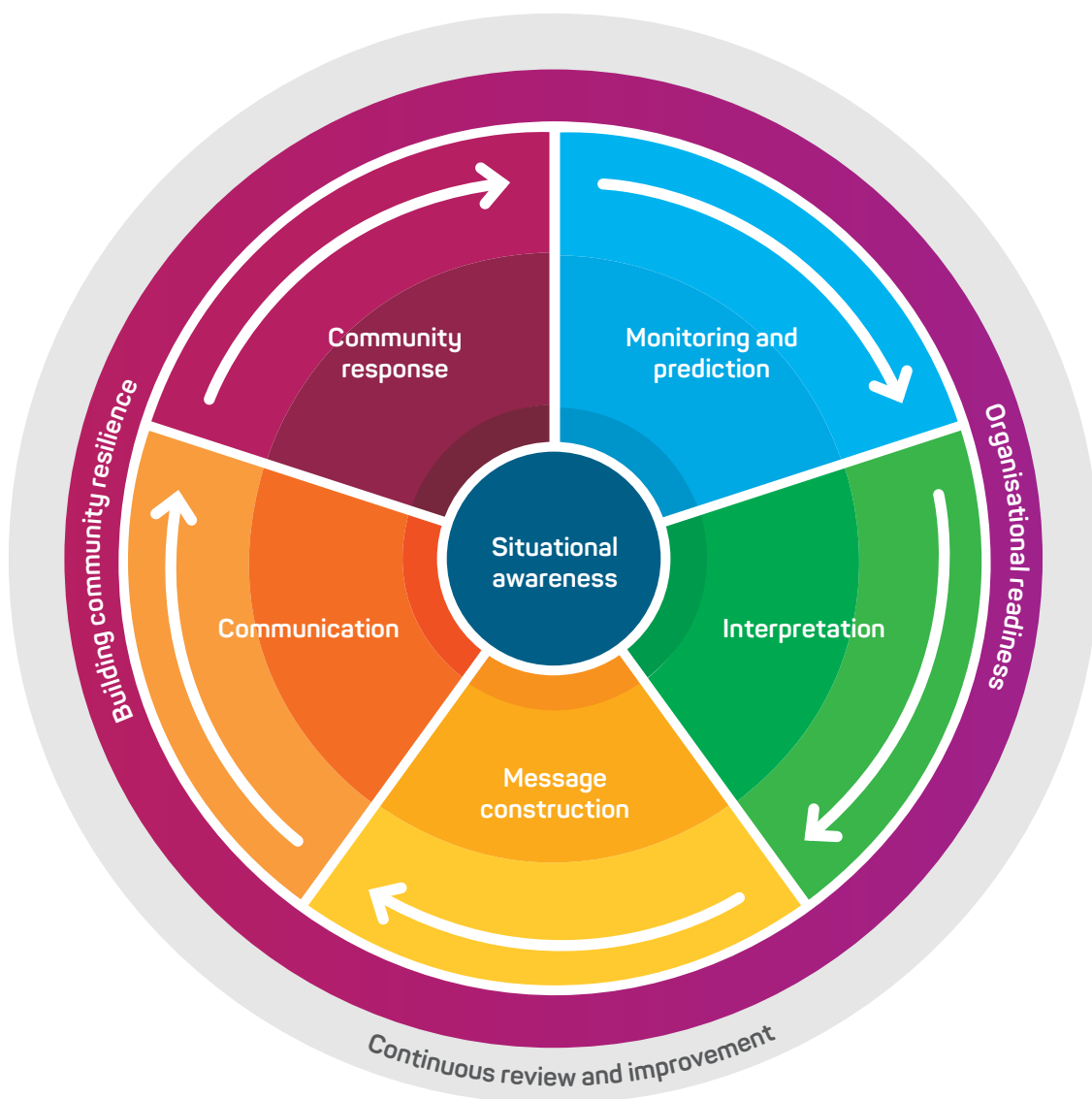


Figure 2: Australia's Total Warning System

This Total Warning System adapts Australia's Total Flood Warning System, originally presented in 1995 within *Manual 21: Flood Warnings* (AIDR 1995). It has been revised to encompass all-hazards and reflect contemporary practices.

1.4.1 Elements of the Total Warning System

Each element of the Total Warning System plays a critical role, and all elements interact. Table 2 provides further detail for each element within the system.

Table 2: Elements of Australia's Total Warning System

ELEMENTS OF AUSTRALIA'S TOTAL WARNING SYSTEM		
	ELEMENT	DESCRIPTION
ALWAYS	Situational awareness	Continuous attention to and connection with the past, current and emerging situation
	Warnings should be informed and regularly reviewed with the most up-to-date intelligence, a clear understanding of operational strategies and an understanding of the informational needs of the community. This connection, at all times, is central to the coordinated, informed and timely delivery of warnings.	
BEFORE	Building community resilience to disasters	Engagement and education with communities well prior to any emergency about their risk, shared responsibilities and options for protective action
	Warnings are more effective when engagement and education has occurred with communities about their risk, shared responsibilities, and options for protective action, well prior to any emergency (COAG 2011). This awareness of risk and confidence to act upon receiving a warning requires ongoing focus on: <ul style="list-style-type: none"> • Risk communication, awareness raising and education • Community engagement with communities at risk • Development of local strategies and networks to mitigate local risk, including participatory planning processes • Fostering empowerment and shared responsibility for risk. 	
	Organisational readiness to warn	Setting organisational capability, systems and arrangements in place to warn effectively
Essential capabilities and arrangements to put in place include: <ul style="list-style-type: none"> • Warning systems and protocols, with capable teams ready to respond • Training, exercising and testing of systems, including with communities • Forecasting, prediction and impact modelling to inform warning systems • Knowledge of at-risk communities to target and tailor warnings during an emergency, including strategies to reach diverse or vulnerable groups. 		
DURING	Monitoring and prediction	Detecting conditions that can lead to threat to life and property and predicting the likelihood, timing, level and nature of impact
	Diverse inputs such as weather and current incident activity need to be continuously monitored. Hazard modelling and relevant information inputs allow for the dynamic prediction and analysis of risk. The likelihood, timing, level and nature of impact on communities will continually adjust and should inform the creation and ongoing review of all warnings.	
	Interpretation	Understanding the impact as predicted and deciding whether and how to warn
The need for, level of, and location of warnings to be issued should be determined considering consequence and drawing on further inputs such as local history of similar events, community characteristics, and seasonal or concurrent events. Use of a warning framework supports consistent interpretation.		

Table 2: Elements of Australia’s Total Warning System cont.

ELEMENTS OF AUSTRALIA'S TOTAL WARNING SYSTEM		
	ELEMENT	DESCRIPTION
DURING	Message construction	Devising the content of a message to inform and warn people of their risk, including recommended or required action
	Warnings should be well-constructed, targeted and include pertinent information about the hazard, its expected impact, consequences for communities, a clear call-to-action and tailored advice to those affected.	
	Communication	Disseminating timely, targeted and tailored warnings through multiple channels to all who may be affected
	Messages should be made available through a wide range of channels appropriate for each hazard and targeted to impacted communities. Sharing of messages by other parties can be facilitated and encouraged. This can also encompass two-way discussion with warning recipients, e.g. via telephone, face-to-face meetings, radio and digital media channels. Messages should address any conflicting information causing confusion in community response. Communication should continue throughout an event and include announcement or advice when a threat has reduced or passed.	
	Community response	Seeking assurance communities have received, understood and are acting upon warnings
Insight should be sought on whether warnings have reached their intended audience and how communities are responding with protective action. Community response should then inform the issue of any subsequent warnings and response strategies.		
AFTER	Continuous review and improvement	Examining all aspects of the Total Warning System through evaluation, research and engagement
	All activities across the Total Warning System should be evaluated to continuously improve the delivery and effectiveness of warnings. Ongoing improvement requires: <ul style="list-style-type: none"> · real-time and post-incident review pre-event exercises to test message construction and community interpretation and action research and evaluation of policy, systems, processes and outcomes community involvement in review and evaluation activities. 	

1.5 How do people react to warnings?

Understanding how people respond to warnings is an area of great study through research, post-incident evaluation, and community engagement. Complex factors drive the decision-making and behaviour of people, particularly during an emergency where their safety is at risk (Box: Predictive Action Decision Making Model).

It is important to remember a principle of shared responsibility applies. Warnings should facilitate and encourage people to be responsible for decisions about their own safety. While everything possible should be done to warn, and warn effectively, warnings cannot be relied upon to guarantee safe and appropriate action.

For further information see Lindell, M., Perry, R., 2012, 'The Protective Action Decision Model: Theoretical Modifications and Additional Evidence', *Risk Analysis*, Vol. 32, No. 4 pp. 616-632.

This chapter explores some of the psychological and practical responses people have when receiving, assessing and acting upon warnings.

1.5.1 Trust and personal verification of warnings

People are more likely to act on a warning when the source of that warning is someone they trust (Heilbrun et al. 2010; Terpstra et al. 2014). For some individuals and communities, the trusted source may be an official authority or emergency service, and for others it may be a family member, local community leader, media outlet, or a public figure they recognise (Liu & Mehta 2020).

Almost always, people will want to verify a warning by seeking additional information or investigating how others in the area are responding. Confirmation is an important step in the process of warning response (Mileti & Sorensen 1990). They might, for example, connect with personal networks online, talk with neighbours, seek direct visual confirmation (Whittaker & Taylor 2018), or review warning information on additional channels (Mehta et al. 2017). This step takes time, delaying immediate action, but is known to be a key determinant of whether and how people will respond.

This means it is important to promote and support the sharing of official warnings across diverse channels. Consistent, up-to-date information across multiple sources, and with sufficient detail, is important to build confidence in the message and encourage action without further delay.

The role of leaders, influencers, friends and family here should not be understated. Their own response to warnings, including sharing warnings, proactively contacting others, tagging people online, or posting to local community groups, can positively influence others.

Protective Action Decision Model (PADM)

Complex psychological processes occur in the receipt, acknowledgement and interpretation of warnings. The Protective Action Decision Model (PADM) (Liddell & Perry 2012)* describes the elements and processes that typically inform an individual's decision to take protective action when at risk.

The PADM sets out pre-requisite elements to protective action as:

- exposure to or receipt of information (including warnings and other social or environmental cues);
- attention to this information;
- comprehension and interpretation;
- perception of risk and feasibility to act; and,
- consideration of protective action options (including no action).

Following these steps, protective action can be facilitated or impeded by a range of additional situational, physical or emotional, and information factors.

Lindell and Perry note while the stages are sequential, few people are likely to follow every step in detail and in an exact sequence. For example, a directive to evacuate immediately from an extremely credible or powerful source might result in compliance, even if there was no explanation about why evacuation was necessary or what alternative protective actions were feasible.

* Several psychosocial models of risk perception and action exist.

1.5.2 Interpretation of risk and decision to act

Once a warning has been acknowledged as credible and relevant, interpretation of personal risk can occur.

Sometimes referred to as optimism bias, research argues 'individuals routinely try to maintain their definition of the environment as 'normal' in the face of evidence that it is not' (Lindell & Perry 2012). Warnings can respond to this phenomenon in several ways.

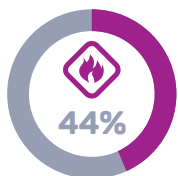
Past experience

Many people draw upon local knowledge or personal experience to inform their interpretation of risk. This is supported by recent research that has shown people's

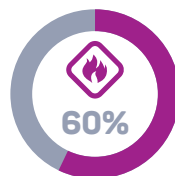
ability to recognise risk and their behaviour towards risk is strongly influenced by the type and location of their home (Metrix 2019). This can impact positively or negatively on their likelihood to follow recommended actions within a warning. For example, in a community with a history of flood, people may have their own informal markers of dangerous water levels and these markers may not align with official warnings. Thus, it is essential warnings describe why the current situation is different to previous events.

In a high bushfire risk community, some may have a lived experience of bushfire and understand how quickly conditions can escalate. Others without that experience may not appreciate the risk so clearly, and warnings can help by describing, for example, the danger of erratic fire behaviour, using plain language.

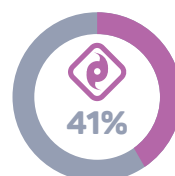
Research results:



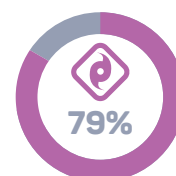
Bushfire warnings prompted awareness 44%.



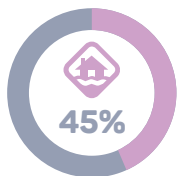
Increases to 60% for those who have had a personal experience with a bushfire.



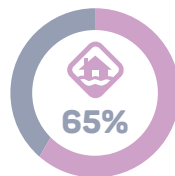
Cyclone warnings prompted awareness 41%.



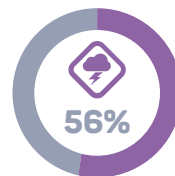
Increases to 79% for participants who have had a personal experience with a cyclone.



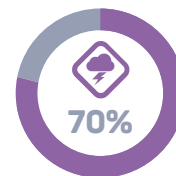
Flood warnings prompted awareness 45%.



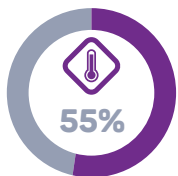
Increases to 65% for those who have had a personal experience with a flood.



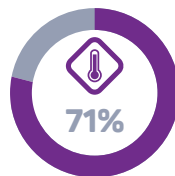
Extreme weather warning prompted awareness 56%.



Increases to 70% for those who have had a personal experience with an extreme weather event.



Extreme heat warning prompted awareness 55%.



Increases to 71% for those who have had a personal experience of extreme heat.

Metrix (2019)

Complacency or 'warning fatigue'

People with previous lived experience of receiving warnings, or those living through multi-day events may develop what appears to be complacency. This may be expressed along the lines of, 'we've been warned like this before and nothing happened', or 'nothing has changed for days'. To combat this reaction the following advice is offered:

- Include information about specific contributing factors to this event that differentiate it from past events.
- Where warnings are re-issued, emphasising even minor updates to information or altering phases (e.g. changing 'monitor information' to 'stay informed') can be helpful to retain attention. Unchanging warnings are likely to become increasingly less effective at attracting people's attention (Mayhorn & McLaughlin 2014).
- Research into complacency or 'warning fatigue' has identified that a lack of action can sometimes be due to a perceived inability or lack of confidence on how to act (Mackie 2013). Consider this in designing clear, achievable calls-to-action.
- Remember a total warning system reinforces the value of ongoing engagement, education and review. This might include communication following an event where warnings were issued, discussing how a pending emergency was effectively mitigated, or why there were perceived 'false alarms'. Every warning contributes to people's overall understanding and assessment of future warnings.

The importance of specific, persuasive information

Lindell and Perry (2012) note 'Ambiguity is likely to cause warning recipients to spend more time in seeking and processing information rather than preparing for and implementing protective action'. To combat this, warnings should contain concise information, removing uncertainty where possible. Warning providers should target and tailor warnings so they are unmistakably about particular communities or locations and use persuasive language suited to the situation, particularly in high-risk scenarios.

Warning providers should keep in mind, recipients may be processing information and making decisions while stressed or under duress, and our capacity to make decisions alters while under stress (McLennan & Elliott 2011).

The art of effective warning is less about instruction and more about clear, persuasive information that builds motivation and confidence to act.

Recent research also indicates this with individuals stating that words used in warnings need to be short, simple, action-oriented and consistent.

See handbook companion document *Warning Message Construction: Choosing your words* (AIDR 2021) for more information on language and techniques to encourage action.

1.5.3 Taking protective action

Numerous factors affect how people take protective action. Even with a personal realisation that there is a threat to safety and a need to act, some people will not act or react as predicted. Life is more complex than a single yes or no decision. People may lack access to transport or a vehicle to leave the area, perhaps the desire to stay and protect animals or assets will override the threat to personal safety for now, perhaps people will wait to gather other family members before leaving an area or will not feel they have somewhere safe to go.

Inhibitors to action should be considered when constructing a warning. If calls-to-action are to be followed, they should be practical and perceived as achievable. Sometimes the inclusion of additional public information or warning detail tailored to build confidence and remove doubt will assist. In the above examples, offering advice on what to do for pets and livestock, how local schools or sporting clubs are responding, or where relief or evacuation centres are located may be valued. Strong advice to prioritise life over property can be persuasive.

In summary, it is important to remember inaction is not necessarily ignorance or complacency to a warning.

Many factors contribute to each person's receipt, validation, interpretation and decision to act.

1.6 Who provides warnings?

The issue of official warnings is primarily the responsibility of various Commonwealth, state, territory and local government authorities. However, partnerships are crucial between all levels of government, emergency services organisations, the community, industry and business, and the media, to ensure communities receive, share and act upon warnings in an emergency.

Authorities should work with a wide range of warning dissemination groups who are trusted by individuals and communities. Some key groups are outlined here.

1.6.1 Statutory providers of warnings

In Australia, each state and territory has legislation governing its emergency management arrangements, including requirements or provisions to warn. The Commonwealth also holds warning responsibilities, particularly through the work of the Bureau of Meteorology. Table 3 outlines each jurisdiction's specific statutory roles and responsibilities for the issue of warnings.

A coordinated approach

It is important to highlight a need for multi-agency coordination. Warnings often include information and advice sourced from various agencies and experts. For example, a fire agency might issue public information about a fire and incorporate tailored advice from health, environment management and local government authorities.

A single, well-prepared message, rather than several separate messages from different agencies, is more likely to be effective, garner trust and be widely shared.

Arrangements to coordinate this approach should be outlined in relevant incident management systems and policies.

1.6.2 Established emergency broadcasters

Radio, television and online media broadcasters are important to the reach and success of warnings.

All broadcast media can play a role in the dissemination of warnings. Due to the importance of their role in an emergency, many outlets have established partnerships with local emergency service organisations to act as an emergency broadcaster under a Memorandum of Understanding. These partnerships establish agreed protocols and help to ensure warnings are issued in a consistent, timely, and complete fashion.

Some media outlets also have obligations under their Codes of Conduct or editorial policies for the delivery of emergency information to the community.

Emergency broadcasting of warnings is a specific activity and is different to general news journalism. Media outlets will frequently deliver concurrent news reporting of emergencies and events, in addition to providing services as an emergency broadcaster.

1.6.3 Individuals and community members

Prior to any emergency, community engagement will often identify local community groups or leaders who can act as dissemination channels during an emergency. Community radio stations, Facebook groups, local emergency service units and brigades, or local clubs, are just a few examples.

During an emergency, it is not uncommon for individuals to emerge as key dissemination points for warnings.

They typically have a personal connection to the impacted areas, and a limited background in warnings policy and practice.

Sometimes referred to as 'influencers', they can play an important role in amplifying the reach and impact of official messages (see Case Study 1).

Table 3: Jurisdictional statutory roles and responsibilities for warnings

JURISDICTION	
COMMONWEALTH GOVERNMENT	<p>Australian Emergency Management Arrangements knowledge.aidr.org.au/resources/handbook-australian-emergency-management-arrangements</p> <p>Emergency Management Australia www.homeaffairs.gov.au/about-us/our-portfolios/emergency-management</p> <p>Bureau of Meteorology www.bom.gov.au</p> <p>Geoscience Australia www.ga.gov.au/scientific-topics/community-safety</p>
AUSTRALIAN CAPITAL TERRITORY	<p>ACT Emergency Arrangements esa.act.gov.au/emergency-management/emergency-arrangements</p>
NEW SOUTH WALES	<p>NSW Emergency Management Arrangements www.nsw.gov.au/rescue-and-emergency-management</p>
NORTHERN TERRITORY	<p>Northern Territory Emergency Management www.pfes.nt.gov.au/emergency-service/emergency-management</p>
QUEENSLAND	<p>Local Government Disaster Management Plans www.disaster.qld.gov.au/cdmp/Pages/default.aspx</p> <p>State Disaster Management Plan www.disaster.qld.gov.au/cdmp/Documents/Queensland-State-Disaster-Management-Plan.pdf</p> <p>State Disaster Management Guideline www.disaster.qld.gov.au/dmg/Pages/DM-Guideline.aspx</p>
SOUTH AUSTRALIA	<p>State Emergency Management Plan www.dpc.sa.gov.au/responsibilities/security-and-emergency-management/state-emergency-management-plan</p>
TASMANIA	<p>Tasmanian Emergency Management Plan www.ses.tas.gov.au/emergency-management-2/tasmanian-emergency-management-arrangements-tema</p>
VICTORIA	<p>Emergency Management Manual Victoria www.emv.vic.gov.au/publications/emergency-management-manual-victoria</p>
WESTERN AUSTRALIA	<p>State Emergency Management Framework semc.wa.gov.au/emergency-management</p>

Case Study 1: Cyclone Yasi and community managed information

Cyclone Yasi and the community-managed, purpose-built Facebook page 'Cyclone Yasi Update'

Severe Tropical Cyclone Yasi began forming near Fiji on 29 January 2011 and was confirmed as a Category 5 system on 2 February. With uncertainty over where it would make landfall, a large coastal section of northern Queensland was on alert. The Queensland Premier urged people to evacuate; and tens of thousands of people left the region. Residents in areas likely to be impacted were told by the State Emergency Coordinator they would be on their own for up to 24 hours due to the dangerous conditions. Media heralded Yasi as a cyclone that could be the worst in Queensland's history; one that could 'annihilate' the entire Queensland coast.

Against this backdrop, Queensland community member Garrett Wells launched a 'Cyclone Yasi Update' Facebook page on 31 January, building on experience and insight administering a similar page for a previous flood event. The rationale was simple: 'helping people to help themselves'.

Garrett recruited 11 additional 'admins' (administrators and content managers) to the Cyclone Yasi Update team. They were geographically dispersed – from northern NSW to northern Queensland – and brought a range of complementary skills, networks and knowledge.

Cyclone Yasi Update was coordinated as a disaster management 'hub'; bringing together official information from many sources in a timely manner and combining that with two-way communication with people in the affected areas. This mix enabled the team to listen and correct inaccurate information, orientate people to the most helpful

and relevant sources of official advice, 'de-bunk' rumours, and personalise information, if necessary, through direct contact. In doing so, they were able to provide a single initial trusted point of contact for people who needed to prioritise their activities to protect themselves, rather than spend time searching for information.

In addition to the provision of timely information, the Cyclone Yasi Update team provided psychological and emotional support to frightened and anxious people, and those doubting their ability to take effective action to protect themselves or their loved ones.

The success of this community-owned-and-led Cyclone Yasi Update page is reflected in its usage statistics. The member base reached 15,000 in the first 24 hours and grew to 92,299 at its peak on 2 February. On that day there were 509,743 direct page views, 3576 wall posts and almost 22.5 million 'impressions' (posts viewed across Facebook feeds).

In 2012, Mel Taylor, Garrett Wells, Gwyneth Howell, and Beverley Raphael conducted a survey with 1146 respondents who had used social media in relation to a recent natural disaster. When asked the extent to which they would rely on social media or official sources of information, e.g. response agencies, 56 per cent of respondents reported they would rely equally on both, 38 per cent would rely more on official sources and only 6 per cent indicated they would rely more on social media sources of information.

Edited extract from: Taylor, M., Wells, G., Howell, G., Raphael, B., (2012) The role of social media as psychological first aid as a support to community resilience building: a Facebook study from 'Cyclone Yasi Update', Australian Journal of Emergency Management, Vol 27, Issue 1 2012.

1.6.4 Private warning publishers or disseminators

Some individuals and organisations have an ongoing interest in emergency warnings and have developed their own channels or warning platforms to create, disseminate and communicate warnings.

They include global digital service providers (e.g. Google and Facebook offer dedicated crisis response services), insurers, businesses with experience or deep interest in emergency management, and individuals or groups with a passion for communication about emergencies.

While some groups focus on sharing or disseminating official warnings, others create and deliver their own information and warnings, or augment and tailor official warnings with additional detail.

Handbook companion document *Guideline 2: Warnings Republishers* (AIDR 2021) contains further information about warnings republishers and their roles.

1.6.5 Working with warnings republishers

Wherever possible, agencies with authority and responsibility to warn proactively should engage with ongoing or emerging groups, to optimise the effective and responsible dissemination of warnings. A companion document to this handbook, *Guideline 2: Warning Republishers* (AIDR 2021) provides further detail and guidance for warnings republishers.

Key advice to provide to anyone republishing or disseminating warnings includes:

- Always link to official warning providers for the latest updates
- Verify authenticity and provenance of visual media (e.g. images and videos) being circulated to avoid amplifying inaccurate representations of the situation
- Advise listeners and followers that information can change quickly, and official sources should be monitored and relied upon
- Take care not to imply all warnings will be provided in a timely form on unofficial channels. Sustained 24/7 events can be fatiguing or overwhelming, technology can stall or fail, and a high level of group conversation can sometimes distract from release of official warnings and critical updates
- Inform yourself of any personal liability or risk in acting as a source for warnings.

Where timeframes allow for deeper engagement, there may also be opportunity to share and discuss how research informs good practice, explain or respond to any questions about how warnings are determined, and support providers to understand the benefits and impacts they can have in their community.



Part 2: Delivering effective warnings

2.1 The decision to warn

Not every event requires a warning. Determining when a warning is required, and the nature of that warning requires a guiding structure and process.

2.1.1 A scaled approach

Using a consistent scale or categorised system to determine a level of warning is broadly acknowledged as good practice. A defined system assists officials and the community by offering a consistent way to assess and describe the level of risk and need for action.

The Australian Warning System was adopted by ANZEMC in March 2021 and aims to provide consistent warnings to Australian communities so that people know what to do when they see a warning level.

It was designed based on feedback and research across the country through the National Fire Danger Ratings System and Multi Hazard Warning System Social Research and aims to deliver a more consistent approach to emergency warnings throughout Australia.

The Australian Warning System is a three-level scaled warning system. It includes a nationally consistent set of icons to show incidents on websites and apps, supported by calls to action.

There are three warning levels:

1. **Advice:** An incident has started. There is no immediate danger. Stay up to date in case the situation changes.
2. **Watch and Act:** There is a heightened level of threat. Conditions are changing and you need to start taking action now to protect you and your family.
3. **Emergency Warning:** An Emergency Warning is the highest level of warning. You may be in danger and need to take action immediately. Any delay now puts your life at risk.

Learn more:

- National Fire Danger Ratings System and Multi Hazard Warning System Social Research: knowledge.aidr.org.au/resources/multi-hazard-warning-system-social-research
- Australian Warning System: knowledge.aidr.org.au/resources/australian-warning-system

2.1.2 Factors informing a decision to warn

The widely used discipline of risk management underpins decisions to warn. An impact-based risk assessment ensures the likelihood and consequence of a hazard, not simply its magnitude, informs decision-making.

Assessment should consider the nature of a hazard, exposure to the hazard, vulnerability to this exposure, and the overall level of certainty (see Figure 3).

In Australia, the shift to impact-based risk assessment and warning is ongoing. Some warning frameworks are designed for this, while others will better reflect this approach with future development.

To assess for hazard, exposure and vulnerability, a broad range of information inputs are required. Table 4 offers example inputs and is not exhaustive. Each hazard brings specific features, and each warning framework will further define necessary detail.

For a more detailed outline of this approach, see the *WMO Guidelines on Multi-hazard Impact-based Forecast and Warning Services* (World Meteorological Organization 2015): library.wmo.int/doc_num.php?explnum_id=7901



Figure 3: The decision to warn is based on risk

This requires assessment of the hazard; exposure to that hazard; and, vulnerability of those exposed. Source: Adapted from Hedwig Van Delden et al. 2016 presentation: *A Spatial Decision Support System (SDSS) for Understanding and Reducing Long-Term Disaster Risk*.

Table 4: An example of data and questions used to inform assessment of the need to warn

JURISDICTION	
HAZARD, COMMUNITY AND ENVIRONMENTAL DATA	<p>Insight might include:</p> <ul style="list-style-type: none"> • actual and predicted weather • instrument or gauge readings (e.g. river levels, dam heights) • calculations or prior modelling • local pre-planning • historical activity of similar events • critical and community infrastructure • community profile • road networks in the area • available imagery and observations.
CONTEXT	<p>What else is occurring or relevant to this situation? For example, are there high numbers of tourists or major events in this area? Are emergency services positioned to mitigate the impact of this hazard? Are road closures and conditions known?</p>
SITUATIONAL AWARENESS	<p>What intelligence can frontline resources offer about current community response to the hazard? Does social media offer any further intelligence on community awareness or sentiment to this hazard?</p>
CONSEQUENCE	<p>What will happen when this hazard impacts upon communities?</p>
LIKELIHOOD / CERTAINTY	<p>How likely is it this hazard will impact communities? How certain are we of the nature of impact expected?</p>
TARGETED COMMUNITIES (BY LOCATION OR PROFILE)	<p>Do we have the necessary information to target this warning? Are there multiple areas or groups of people who will be impacted in different ways?</p>
TIMING	<p>Will this warning be most effective if it is released now? Is there a critical window where community action is required? Does issuing this warning require corresponding action?</p>

2.1.3 Managing uncertainty in dynamic events

The uncertainty of predicted and current events will often mean a decision to warn is complex. Importantly, uncertainty should not result in the delay or lack of warning. Rather, this uncertainty should be conveyed in simple terms and revised regularly.

Any decision to warn (or not warn) should also be regularly re-evaluated. Emergencies are dynamic, and risks can escalate rapidly. New information about the hazard, level of exposure or vulnerabilities should prompt review of the warning required.

Significant emergencies will sometimes see cascading events and consequences emerge. For example, the risk of landslide can follow fire or flooding, new health risks can emerge, community infrastructure can be potentially unsafe, hospitals might be overwhelmed, or physical safety and security needs can arise.

Warnings too, become more complex in these scenarios. The coordination of official communication and collation of expertise is essential. Generally, coordinated warnings are more effective than several different warnings spanning different subjects. While incident management systems will support the coordination and delivery of multi-agency activity, public information and warnings practitioners should, as a priority, consider the information needs necessary to prompt protective action.

2.1.4 Public information: complementing official warnings

Before, during and after a specific event, it can be helpful to provide information to complement official warnings. For example, a general notification can be offered where an incident poses no current threat and a warning is not required. While warnings are focused on succinctly and persuasively encouraging protective action, further public information can elaborate on relevant detail that people may be seeking.

Some examples of common information needed during different phases of a disaster include: a general update for the broader community on visible smoke in the area; information on road conditions due to operational activity or weather; public health information; animal welfare guidance; updates on any school closures in the area; detail on operational activity such as aircraft and crews attending; and, relief and recovery information.

It is also important to acknowledge many people who are not at risk will seek out information about an event. While warnings should be designed for and delivered to those at risk, it can be necessary to keep the broader community informed. Rather than amend a warning, a separate message with more generalised information can be helpful.

See Part 2.3 *Getting the message out* for further information.

2.1.5 De-escalation messages

Just as it is important to warn, it is equally important to advise community members when a threat has passed. Warning frameworks and operational protocols generally provide expectations on when a reduced threat message or an all clear message should be provided. This information can be critical for community members and should be treated as a priority. When determining the need to provide this messaging, keep in mind that while a particular risk may have subsided, new or residual risks may remain, and these should be clearly communicated.

2.2 Essentials of message construction

The key elements that should feature in the construction of every warning are outlined below. The handbook companion document *Guideline 1: Warning Message Construction: Choosing your words* (AIDR 2021) provides

further detail and advice to practitioners. Many of the essentials outlined below apply equally to other forms of public information and are not exclusive to warnings.

2.2.1 The issuing authority

Each warning should clearly state the official source and authority (or authorities) behind its issue. This is important to the credibility of a message and may improve the likelihood that it is acted upon.

Clear language

Warnings should be written using plain, clear language. Reading and comprehension levels vary widely across communities and warnings should be written to be understood by as many people as possible. Under stress, information comprehension and processing are further reduced.

Operational terms and scientific concepts that are familiar to emergency services or meteorological specialists are not easily understood by others. Some incidents also require technical information to be relayed in simple terms.

Use of Easy English guidelines may be helpful in the design of templates, training and construction of messages.

44% of Australians aged 15-65 have some difficulty reading or writing in English. Source: *ABS report 4228.0 (ABS 2013)*

2.2.2 Call-to-action

Emerging research highlights that upon receiving a warning, community members want to understand the specific action officials are asking them to take. A call-to-action offers a clear instruction of the protective action people should take and should be targeted and tailored to the at-risk community. Examples are provided in the handbook companion document *Guideline 1: Warning message construction: Choosing your words*. (AIDR 2021)

The Australian Warning System has a set of action statements to give the community clearer advice about what to do. Calls-to-action can be used flexibly across all three warning levels, and contextualised for each hazard within each state or territory. For further information refer to the handbook companion document *Australian Warning System* (AIDR 2021).

2.2.3 Structure

In the past, warnings typically began with detail about the hazard followed by information about how emergency services were responding. Advice on what the community should do would then be offered. More recent experience, research and input from communities has revealed improved structures which prioritise simple, essential information. This responds to insight on people's ability to scan for and comprehend information while under duress or stress. The Australian Warning System utilises a nested model that includes the warning level + hazard / location + action statements.

Good practice warnings should include:

- the title of the warning
- the issuer of the warning and date/time of issue
- a clear call-to-action
- the type of threat and how likely it is to occur, with a short description
- an explanation of the expected impacts and consequences, including detail on the specific communities at risk and expected time of impact.
- where to get more information
- when to expect the next update (as appropriate)
- further advice on action people should take, described as specifically and succinctly as possible
- general information if relevant, including how emergency services are responding
- the above written structure can be supported by the inclusion of a spatial or graphical representation (e.g. a map or diagram) of the warning area with detail about the current or expected impacts and consequences.

The order outlined here is not definitive and all agencies continue to evaluate and learn more about the most effective structures and formats. Handbook companion document *Guideline 2: Warning message construction: Choosing your words* (AIDR 2021) provides further advice on effective wording and construction of content.

2.2.4 Consistency

The consistency of structure, language and warning levels can assist with recognition or comprehension of a message, particularly in dynamic emergencies where multiple warnings are issued.

Most warning systems and frameworks prescribe and support a consistent approach. Pre-configured templates for different event types and warning levels, and automated publishing of basic incident information also drive consistency.

Wherever possible and appropriate, consistent approaches should be shared by agencies providing warnings, minimising the need for warning recipients to get to know each agency's terms and approach to warnings.

However, a word of caution: A 'cut and paste' familiarity for warnings might erode the credibility and effectiveness of a message. It is essential consistent structure and use of language does not translate to a lack of tailored, targeted information for specific communities and about a specific event.

2.2.5 Timing and frequency of issue

Determining how often to update or issue subsequent warnings about an incident requires consideration of several factors, including:

- any change to the situation or risk for community members
- new or changed advice or call-to-action information (e.g. public health advice is released, or relief services are in place)
- whether a warning might be queried or dismissed due to its age (release date and time)
- if there is an agreed cadence or time period set for provision of updates (e.g. tropical cyclone updates are provided by the Bureau of Meteorology at regular intervals).

Remember, people will seek to verify and confirm warnings before taking further action. A sustained or repeated message can assist in building confidence in a warning and motivation to take subsequent protective action. The frequency of warnings issued can also indicate the dynamism or severity of a situation.

Conversely, the release of repetitive warnings that do not appear to change can be frustrating and there is a risk people will 'tune out'. One way to combat this is to provide advice at the beginning of a message summarising any changes and explaining the warning is being renewed and the situation remains largely unchanged.

Finally, every incident is different. Too many warnings, too frequently, may result in confusion for some communities, but be called for to provide timely and targeted advice in others. Listen to community sentiment and response to warnings, gather feedback from social media, broadcast media and frontline resources, and use this insight to adjust the timing and frequency of warnings appropriately.

2.2.6 Maps and visuals

Use of visuals

Visuals (e.g. videos and images) are a critical part of risk communication. Visuals help by documenting the event; communicating the possible risk, impact and severity of the event; and, showcasing the desired action(s) and action(s) of others (Dootson et al. 2021; Liu et al. 2020; Morss et al. 2018). Often paired with text-based content, visuals help anchor text meaning and make the relevant information more salient, credible, and easier to interpret and remember (Mortensen, Hull & Boling 2017; Zhao, Zhan & Liu 2018).

Visual information should be purposeful and focused on assisting people to understand essential information and persuading them to take protective action.

Visuals might assist when the hazard is unobservable (e.g. blue sky flooding) to illustrate to the community the forthcoming potential threat and encourage protective action.

Use of maps

The inclusion of maps with warnings can assist with comprehension and interpretation of a warning (Fisher et al. 2017). Research continues to explore how best to design and utilise maps as public information but suggests it can complement text, provide visual detail on the location of the hazard to assist understanding, outline safe travel routes or road closures, and add information on the location of relief centres or evacuation points. Maps might also show, where applicable, the direction a hazard is travelling. Care should be taken in defining at-risk communities via map, as those beyond areas identified may disengage with warnings. A legend should be included, and consistent colours and symbols used wherever possible. The construction of a map should not delay the issue of a text-based warning.

Similar to the language used in text-based warnings and public information, maps should avoid including operational or technical terms or icons not easily understood by the community, to aid in comprehension of the information being portrayed.

Recent research has found that fire spread prediction maps were effective in communicating risk and motivating people to take protective action (Whittaker 2021).

Verify visual media

Issues arise when the visuals being circulated at scale and speed about an event are manipulated, fake, or originate from an unrelated event or location. The sharing of problematic visuals by news outlets, citizens, politicians or organisations subsequently increases the reach of problematic visuals, amplifying an inaccurate representation of an event. In natural hazard emergencies, amplification of problematic visuals could mean spreading an interpretation of an event that may be in direct conflict with what emergency services agencies are asking the public to do (Dootson et al. 2021).

The *Verification Handbook* (Silverman 2014) and the *Verification Handbook for disinformation and media manipulation* (Silverman 2020) provide information, tips, and tools for journalists and aid-responders to use to verify user-generated content, including disinformation and media manipulated content during emergency coverage.

- *Verification Handbook* (Silverman 2014): s3.eu-central-1.amazonaws.com/datajournalismcom/handbooks/Verification-Handbook-3.pdf
- *Verification Handbook for disinformation and media manipulation* (Silverman 2020): verificationhandbook.com/downloads/verification.handbook.pdf

2.2.7 Easily shared

Warnings are more effective when they are widely shared. This requires that the construction and publishing of a warning allows for easy sharing and retains its integrity. People can, and frequently do, edit or paraphrase official warnings using their own language and voice, to tailor the message to their own audiences. Warning providers should aim for key messages and essential links to be easily retained, shared and used by others.

The technical construction of a warning should follow the Australian Common Alerting Protocol (CAP-AU-STD) so it is readily shareable through automated feeds and compatible warning systems.

Australian Common Alerting Protocol (CAP-AU-STD): www.bom.gov.au/metadata/CAP-AU/About.shtml

2.2.8 Accessible

Warnings should be constructed to be accessible to diverse audiences. In addition to the use of clear language, there are various tools and services that can be utilised.

Web-based content should be compliant with web accessibility standards. For example, all visual content should offer alternative-text, and speech readers should be able to follow the content in a logical order. Use of colour should account for common colour-blindness conditions and support those with low vision.

Translation and interpretation services should be considered, both as automated or prior-built services, or as live services made available during emergencies. For example, AUSLAN interpreters and closed caption technology during live media briefings and reports are highly valued. Telephone interpretation services can also be well connected and utilised. Some warning systems can publish to multiple languages.

Providing accessible warnings is not an option. It is a necessity, and one all agencies should seek to continuously improve upon. People with physical, cognitive or mental disabilities can be particularly vulnerable during emergencies.

Peak bodies and community groups can offer advice and support, and there are numerous tools available to test compliance with online accessibility standards.

2.2.9 Targeted to specific locations

Broad, generalised warnings are less effective than warnings targeted to specific locations that provide specific advice. In a widespread event such as flooding for example, it can be more effective to issue multiple warnings concurrently, targeted and tailored to different locations, rather than one broad warning.

When describing locations, consider the particular area and the community impacted. Where possible, use place names and markers that will be familiar to people. Include, for example, the common name for a local road, rather than just its official name or a locally known place of interest and avoid reliance on names that sound technical or unfamiliar, such as forecast districts or catchment areas. This can help your message be perceived as relevant, add clarity and improve trust in the content.

Where a warning relates to locations beyond the immediate area of an incident, be sure to explain why these localities are being included (e.g. flooding extent, expected wind change upon a bushfire, or toxic smoke travelling from a hazardous materials event).

2.2.10 Tailored for local communities and diverse audiences

Understanding the characteristics of communities being warned is critical to delivering an effective warning. Ideally, this involves drawing upon prior planning and local knowledge to understand a wide range of factors, set out in Table 5.

It can also be useful to consider the information needs of specific groups and audiences within communities (see inset).

Table 5: Different factors about each community should inform the tailoring of warnings

FACTOR	QUESTIONS TO CONSIDER
LANGUAGES SPOKEN, CULTURAL DIVERSITY	<p>Do you need to provide warnings in languages other than English?</p> <p>Are there cultural customs that mean your warnings should be directed to particular people or leaders within the community, or that your suggested actions will be difficult to enact?</p>
HISTORY AND STABILITY WITHIN THE COMMUNITY	<p>Has this community experienced a similar incident in the past? Will this affect their behaviour or response to your warning?</p> <p>Are people within this community familiar with local risks or landmarks or are they predominantly new to the area, or perhaps tourists?</p>
SOCIAL OR ECONOMIC DISADVANTAGE	<p>If this area has known social or economic disadvantage, how might your dissemination of warnings, or the language used within your warnings be most effective? Is your suggested action achievable?</p>
POPULATION AGE	<p>Is this a community with a high proportion of older or younger people? How might this impact the language you use, dissemination channels and advice provided?</p>
SPECIFIC AT-RISK OR VULNERABLE COMMUNITIES	<p>How might people with disabilities be affected in this incident? Do they need additional information or advice? Which channels and communication methods will best assist these groups?</p> <p>Is this an area with a high population of tourists who may be unfamiliar with their surroundings or unaware of their risk? Can messages include easy to identify landmarks for tourists lacking local knowledge? Where might tourists travel to if early departure or evacuation is recommended?</p> <p>Research has indicated that Tourist Leave Zone messages were effective during the 2019–20 Black Summer bushfires in communicating risk and motivating people to take protective action (Whittaker 2021).</p>
TELECOMMUNICATION COVERAGE	<p>Many areas have limited telecommunication access, and in an emergency, access can be put at further risk if usage is higher, or power or infrastructure is damaged. What kind of coverage exists for the areas you are warning? What alternative channels might you utilise or prioritise?</p>
ROAD ACCESS AND CONDITIONS	<p>Many areas have limited telecommunication access, and in an emergency, access can be put at further risk if usage is higher, or power or infrastructure is damaged. What kind of coverage exists for the areas you are warning? What alternative channels might you utilise or prioritise?</p> <p>What are road networks and conditions like in this area? Should this inform specific advice in your warnings – from driving safely, to the importance of early departure, use of key roads by emergency services or ability to leave/return to an area?</p>

Considering diverse audiences and places at risk

The following list is not exhaustive, and it is provided to illustrate the diversity of different groups and audiences within the community. Consider this diversity across communities at risk when developing and tailoring public information and warnings. Some groups and places may have specific information needs which can be supported or met.

Groups and audiences:

- Aboriginal and Torres Strait Islander communities
- members of culturally and linguistically diverse (CALD) communities
- people with disabilities
- remote communities
- people who are homeless or socially isolated
- people attending mass gatherings and major events
- pregnant women and parents of young children
- those with livestock, assistance animals, pets or responsibility for animal welfare
- tourists, including hikers, campers and caravanners
- people with specific health care needs
- business owners, commercial and industrial precincts
- people in boats and ships, in bays/marinas or at sea.

People responsible for or within:

- hospitals, aged care and supported accommodation facilities
- schools, childcare centres, and education precincts
- school camps
- correctional and secure facilities
- recreational and sporting facilities
- critical infrastructure operations (e.g. electricity generating plants, fuel depots)
- transport precincts.

See the handbook companion document *Guideline 1: Warning Message Construction: Choosing your words* (AIDR 2021) for more information about diverse audiences and places at risk.

2.2.11 Managing a wealth of information

Many incidents have widespread and cascading impacts, and a corresponding complexity in communication is typical. In these scenarios a strategic approach to coordinating the preparation and dissemination of public information is necessary.

In addition to the initial hazard, diverse secondary impacts can emerge, including public health, power outages or utility shortages, road conditions and closures, availability of key supplies, school closures, availability of relief centres, care for livestock and animals, and dangerous conditions as a result of the initial event.

Collating and presenting information across impacted areas and presenting it efficiently is resource intensive and time-consuming work. Clarity about which information should be presented as a critical warning, and which is best provided as general public information is also important. Decisions should be based on impact and consequence for communities.

2.3 Getting the message out

A multi-channel approach to issuing public information and warnings is widely acknowledged as good practice. No single warning mechanism is guaranteed to reach everyone who may be impacted by an emergency at any given point in time, and some groups (e.g. younger people, older people, or those from non-English speaking backgrounds) may have preferred or popular channels. Common channels of communication are outlined in Table 6.

Table 6: Common channels of communication when disseminating public information and warnings

CHANNEL	DESCRIPTION
WEBSITES AND APPS	<p>Most statutory agencies responsible for warning communities provide incident information and current warnings on their official websites.</p> <p>Many also provide an application (app) for use on digital devices. Each app offers different functionality however, all allow users to see where warnings have been issued and to view those warnings. Some apps allow users to save watch zones for areas where they want to receive an immediate warning notification.</p>
BROADCAST MEDIA	<p>Radio and television broadcasters play a key role in the dissemination of warnings. From official emergency broadcasting of warnings to news bulletins and break-in messaging, and to provision of news ticker updates, broadcasters are a key partner in effective communication.</p> <p>Trained media liaison officers play an important role here, as they provide a two-way conduit for the media to connect with and can anticipate and assist with specific requests media outlets might have (e.g. coordination of interviews, capture of vision, or deadline-driven news).</p>
DIGITAL AND SOCIAL MEDIA	<p>The use of digital and social media, for example Facebook, Twitter, YouTube and various news feeds, continues to diversify and grow. These channels provide an easy way for community members to share public information and warnings with others in their network. Some social media platforms have also incorporated warning notification features. Most emergency services now utilise multiple social media channels to disseminate public information.</p> <p>These channels can also be used to monitor community response to warnings, gather local intelligence and situational awareness, and respond in a timely way to incoming questions or requests to clarify or elaborate upon information.</p> <p>Many broadcast and print media outlets also manage dynamic online media websites where public information and warnings can be shared in a timely fashion.</p> <p>Use of these channels for this purpose does not replace in any way the role of Triple 000 or any other call-taking and dispatch services.</p>
TELEPHONE AND SHORT MESSAGE SERVICES (SMS)	<p>Australia’s national telephony alert system is known as Emergency Alert. It enables authorised emergency services to send an essential warning to landlines and mobile phones within a specific geographic area. This is sometimes referred to as a ‘push’ or ‘intrusive’ alert and no subscription or opt-in action is required of the public. This form of communication is generally reserved for highest-risk situations.</p> <p>Prior community education should encourage people to proactively seek information and not rely on receiving a text message or telephone warning. It is important to counteract unsafe assumptions that it is okay to wait to receive a personalised warning.</p> <p>Emergency Alert does have some limitations including: the length of text messages; limits to the number of concurrent campaigns; selection of phones to be contacted*; potential for delays in delivery; and reliance upon telecommunications infrastructure.</p> <p>Many agencies also offer telephone hotlines, so people can call and listen to the latest warnings or speak with a live operator for assistance. Private operators also host subscription-based telephone alert systems.</p> <p><small>* Landlines to be contacted are currently defined via billing address, which may differ to the location of the service. Similarly, mobiles are contacted if they are currently roaming within the warning area.</small></p>

Table 6: Common channels of communication when disseminating public information and warnings cont.

CHANNEL	DESCRIPTION
FACE-TO-FACE	<p>Face-to-face advice through community meetings or door-knocking can be highly effective, and in some scenarios, will be a necessity.</p> <p>Community meetings can be helpful to convey complex information and answer questions. Door-knocking can be useful in events where the hazard is difficult to see or comprehend (e.g. air pollution), where community engagement may be low, or where particular groups within the community are at higher risk. In areas with poor telephone and internet reception, door-knocking may be an essential communication channel.</p> <p>Direct liaison with community leaders can also offer a format to effectively disseminate information through locally trusted networks.</p> <p>Trained community liaison officers play an important role in face-to-face engagement and dissemination.</p>
SIRENS AND PUBLIC-ADDRESS SYSTEMS	<p>A traditional form of alerting the public, sirens can play a role in alerting people to an incident and serve as a prompt to seek further information. Prior community education to encourage information-seeking behaviour when sirens sound is important. People should also be made aware they may not hear a siren and should not rely on this as their only trigger.</p> <p>Public address systems are an additional channel that may be available, particularly in cities or specific activity centres. They can be used to broadcast warnings to people in an immediate area.</p> <p>Many emergency service vehicles include both sirens and a capacity for amplified public-address. They should be noted as a further channel for communicating warnings.</p>
PRINT MEDIA	<p>In longer running incidents, print media can play an important role in raising awareness, providing detail and summarising the current situation. While less suitable for the issue of timely warnings in a fast-running event, this channel of communication should remain part of overall planning.</p>
DISTRIBUTION LISTS	<p>Establishing and using distribution lists (typically email lists) can be a targeted way to deliver warnings to specific organisations or people. Lists offer a way for agencies to communicate directly with target groups (e.g. media outlets, community service organisations, or real estate agents) who opt in to receive messages. They can be particularly useful where organisations might assist in the further dissemination of messages.</p>
COMMUNITY NOTICEBOARDS	<p>Community noticeboards can provide an important location to post regular updates or news bulletins about an incident. They can be particularly useful in longer running events, smaller communities or areas with limited access to technology and telecommunication.</p>
ROADSIDE AND VARIABLE MESSAGE SIGNS	<p>In some areas, and on many major roads, variable message signs (VMS) provide an option for communicating essential information. For example, a short message to turn on radios might enable motorists to be advised of an emergency or incident ahead. In rural areas or where other communication channels are limited or have been lost, roadside signs can play a key role and advise of any road closures.</p>

2.3.1 Tailoring warnings for different channels

Each communication channel has its strengths and limitations and to be most effective, warnings should be tailored to suit the channel they are being provided on. For example, Twitter includes a short character limit, so links to further information are important. Hashtags can assist people to monitor for updates.

The power of the #hashtag

Research and exploration about the use of social media has identified a range of good practice.

The United Nations Office for the Coordination of Humanitarian Affairs (OCHA) has suggested standards for the use of hashtags to assist effective communication during disasters. See the *Hashtag Standards for Emergencies* (OCHA 2014) for details: www.unocha.org/sites/unocha/files/Hashtag%20Standards%20for%20Emergencies.pdf

In their research, Lin, Spence, Sellnow and Lachlan (2016) argue authorities should 'own the hashtag', fully integrate social media, actively engage in dialogue online and cooperate with the public and peers to share and promote information online.

Dissemination via radio removes the ability to include a map or visual information so written location-based information should be clear.

2.3.2 Standard Emergency Warning Signal

The Standard Emergency Warning Signal (SEWS) is Australia's distinctive siren sound reserved exclusively for use to alert the public to an urgent message posing an imminent threat to life and safety.

SEWS is not intended for use as an alert when issuing minor warnings or general information. It is vital the impact of SEWS be preserved by ensuring it is used only for emergencies of major community significance and for a limited time period.

Only authorised government agencies may approve of the use of SEWS in an emergency.

See Part 1.6 *Who provides warnings?* for further information on authorised agencies.

2.3.3 Communicating with hard-to-reach communities

Some groups within communities are harder to reach during an emergency. They include, for example, isolated communities or individuals, people with limited or no access to commonly used technologies and telecommunication, those from culturally and linguistically diverse backgrounds, people with low literacy, and people with a disability requiring specific modes of communication. It is critical these groups are well catered for in the design and issue of public information and warnings.

Pre-planning and community engagement is particularly valuable for hard-to-reach communities. Prior engagement might identify important networks, clubs, supporting organisations and communication channels used by different groups, that can be called upon or utilised in the event of an emergency. Relationships or partnerships can be established e.g. with AUSLAN interpreters for the deaf, local churches or community radio stations.

Proactive, personalised contact might be possible in some scenarios. For example, in a heatwave, authorities could call upon services such as meals on wheels to share public information with the elderly or vulnerable.

See Part 2.2 *Essentials of message construction and Community Engagement for Disaster Resilience* (AIDR 2020) for more information.

2.3.4 Reaching people beyond the geographic warning area

Warnings are written for those who are at risk of being directly impacted by a hazard. It is important to appreciate people beyond this geographic area may also have a genuine need to consider and act upon warnings.

Some examples include:

People who are not at home when a hazard may be approaching or impacting their home area. These people may need tailored advice on what to do, e.g. 'do not return home at this time', or information about time until impact of a disaster event, safe road access, or what authorities can do for livestock on properties.

People who are assisting others located in the geographic warning area. For example, friends and family might monitor warnings for someone in the warning area, to relay information, to translate warnings in a preferred

language, or to make an assessment about isolated or at-risk loved ones. In this scenario, people may be unfamiliar with the area and be supported by additional detail such as a map, or description of main roads or terrain.

People who are interested in or concerned about an event. This might include people planning to travel through or visit an area, organisations assessing risks for their employees or wanting to understand the potential for service interruption or impact to their business, local or international family members, and media outlets.

It is important critical warnings for those most at-risk are not diluted. Support for some of the above groups might be better provided through additional public information. Other considerations include the use of particular channels to best assist different groups. For example, if hotlines are promoted, are they accessible by interstate or international callers? If not, are alternatives needed? If people want to locate or check on the safety of someone in the area, what information or advice should be included in messages? In a major event, how might appropriate information be prepared for an international audience?

Public information will be sought out and expected for diverse groups, well beyond those directly impacted. While warnings are critical, the effective creation and dissemination of public information is also important.

2.3.5 Working with changing technology and user expectations

Technology and user trends evolve continuously and can change quickly. Warning systems and protocols should also continuously adjust in response. Changes can present both opportunity and risk. For example, the rise in use of streaming media for music, radio or television requires agencies to seek new arrangements to break-in to or share warnings with people using these channels. In addition, the significant role of algorithms in defining the content presented to social media users requires agencies to understand and design for this, to maximise the possibility the latest warnings will appear for targeted audiences.

For social media channels, getting the message out is only part of the work. Social media channels inherently promote comment and conversation, and the degree to which agencies encourage and respond to commentary will depend on various factors. Responding to individual questions or comments can be time-consuming and resource intensive.

People will contribute their own comments or insight, self-managing so questions are often not put to 'authorities', but to a wider group. Monitoring of sentiment and review of comments can highlight an

information gap, misinformation, or dis-information to be addressed in subsequent updates.

Triple Zero (000)

The use of social media channels to communicate does not extend to the reporting of new emergencies. Authorities should continue to promote all new emergencies be reported via telephone to Triple Zero (000).

2.3.6 Warning publishing systems

Many organisations responsible for issuing warnings utilise purpose-built information systems to create, disseminate and manage public information and warnings. These systems typically integrate with incident management systems, draw upon current incident information, offer the ability to include a map or imagery, have templates available, provide a publishing mechanism that can tailor and deliver messages to multiple communication channels instantly, and keep a record of publishing actions.

Such systems improve the timeliness of warnings, assist incident management teams, and minimise the risk of missing warnings, poorly constructed warnings or warnings falling out of date. They are also particularly valuable when coordinating post-incident analysis activities.

2.4 Planning for system failures and unexpected challenges

It is essential organisations responsible for the provision of warnings plan for a variety of system failures and catastrophic events. It is not unforeseeable that critical public infrastructure or key warning systems will fail or be unavailable for critical periods of time, or that an event will overwhelm or confound usual processes.

Communication and the sharing of information are fundamental requirements to maintaining community safety and should be a priority in any business continuity and capability planning or training.

Experience providing warnings during complex events continues to grow, and there is much to learn. Planning for genuinely unexpected events requires imagination and innovation. How can warning systems rapidly adapt to different circumstances? What are the most likely cascading impacts if public information and warnings cannot be provided as planned? How do communities respond when expected supports fail?

The following insight is provided to support agency planning and exercising and is not exhaustive. It draws upon lessons learned in post-incident reviews both locally and internationally. All organisations should undertake detailed contingency and business continuity planning.

2.4.1 The importance of consistent education: do not expect a warning

Preparation for and resilience to catastrophic events begins in early engagement and education with communities. Community safety campaigns should stress that community members should not expect or wait for a warning in an emergency. This point is pertinent when considering the impact of system failures and the loss of typical communication channels.

Further information on community engagement can be found in *Community Engagement for Disaster Resilience* (AIDR 2020).

2.4.2 Loss of power and telecommunications networks

The loss of power in localised or widespread areas during an emergency is not uncommon. For public information and warnings, the consequences of this risk are critical.

Many communication channels rely upon power, including much of Australia's telecommunication and internet connectivity for homes and business. Loss of these channels can also place subsequent stress on mobile communication channels as use increases dramatically. Without key channels, timely dissemination of critical information is curtailed, and alternative communication strategies are necessary. Pre-prepared protocols, training and exercising for this scenario are valuable.

The importance of providing public information and warnings should be factored into strategic pre-planning, response activity and the restoration of any lost services. Agencies can work with local utility providers to articulate this priority and to assist in defining vulnerable communities (e.g. where mobile coverage is limited, or where particular communities might rely more heavily on information and advice).

Australia's National Broadband Network (nbn™) provides advice about:

- What to expect in a power outage: www.nbnco.com.au/learn-about-the-nbn/what-happens-in-a-power-blackout.html
- How to prepare for an emergency: www.nbnco.com.au/learn-about-the-nbn/what-happens-in-a-power-blackout/emergencies-and-outages.html

2.4.3 The importance of local networks and resources

Where principal communication channels are lost or limited, local information sharing channels will play an important role. These may be known prior or may emerge during an event, e.g. at relief centres or evacuation points. Tap into both official and spontaneous community hubs as important dissemination points.

Community meetings, street corner briefings, newsletters and local noticeboards can all play a more significant role where power or telecommunication outages are ongoing.

Consideration of how to connect with, resource, deploy and support resources on the ground to take up a role in disseminating public information and warnings should form part of continuity strategies.

While frontline personnel are usually charged with response to the hazard rather than communication of warnings, the loss of standard channels may call for their increased involvement in dissemination of essential information.

Notably, efforts to gather information and understand community response may also be more challenging when typical channels are lost. Maintaining a connection with local networks and resources is equally important here.

Communicating uncertainty

Large scale events and disruptions can introduce higher levels of uncertainty in information. It is important to be transparent about this, to enable people to plan and respond accordingly. For example, information about the expected duration of power outages might include a best and worst case scenario to assist decision-making by those affected.

2.4.4 Capacity of public information resources

Small teams of public information and warning professionals can quickly be overwhelmed in a large-scale event or major disruption. Rapid recruitment of additional resources to assist with crafting and issuing public information and warnings requires prior planning. Procedures and guidance will need to be well documented, and alternative team structures providing greater supervision and support may also be required.

2.4.5 Failure of publishing and dissemination systems

Business continuity planning and ICT strategies should provide plans for loss of systems, including loss of critical data or loss of power to publishing systems and infrastructure. Even a temporary loss of these systems could be life threatening for communities seeking information during an emergency.

In addition to any local redundancy and disaster recovery arrangements, agencies should consider establishing reciprocal arrangements with partner agencies or interstate colleagues to act as publishers on their behalf in some format. Establishing basic publishing capacity in lieu of formal systems might also be worthwhile.

Protocols to promptly advise all stakeholders, including the community, of loss of warning capability should be in place. For example, notification to emergency broadcasters may be one avenue of advising the public that warnings may be delayed or limited at this time.

To build system resilience and preparedness, the loss of publishing and dissemination systems should be considered as a training and exercise scenario.

2.4.6 Increased use of social media

In a major event, the volume of social media activity has a potential to overwhelm officials. In a 24-hour period during the 2012 Queensland floods, Queensland Police Service Facebook 'likes' grew from 17,000 to 100,000, generating 39 million post impressions (equating to 450 impressions per second) (QPS 2011). In New Zealand, shortly after the 2011 Christchurch earthquake, 7,500 tweets per hour (just over two tweets per second) were being posted using the dedicated hashtag #nzeq (OCHA 2013).

Strategies to rapidly resource and escalate social media monitoring, message production and response are needed. Analytic software that can discern which discussions are occurring within or beyond impacted communities, and rapidly distil conversations and sentiment can be highly valuable in high-traffic events.

Without this analysis, the sheer volume of activity can be distracting, and potentially unhelpful if it is dominated by the conversation of people who are not in or near impacted areas.

Case Study 2: South Australia's state-wide power outage

Public information and warnings during a state-wide loss of power

On 28 September 2016, South Australia was impacted by an extreme weather event which included widespread thunderstorms, destructive winds, hail, heavy rain and tornadoes. Twenty-three power transmission towers were damaged, triggering a state-wide power outage.

As a consequence of the power outage and storm damage, significant disruption and loss was experienced by communities and businesses. Power was able to be restored to Adelaide and most metropolitan areas within several hours. However large areas of the state, including major regional centres, remained without power for several days.

In the days leading up to this forecast weather event, the State Emergency Service (SES) Public Information Team provided tailored early messaging across diverse channels. Public information and warnings were also issued during and post-impact with a coordinated multi-agency approach, drawing upon interstate agency support.

An independent review was subsequently commissioned by the South Australian government. Key lessons identified included:

Loss or impact on key communication channels

Extensive loss of power quickly impacted communication infrastructure and diminished capacity to disseminate and receive warnings. A loss of power meant many businesses and households lost telecommunications and internet connectivity. As a result, mobile networks were also quickly congested or overwhelmed in some areas. Loss of power supply also affected some radio broadcasters for a period.

Alternative communication channels

Battery-operated radios were able to be utilised by community members, and the review found some communities were able to utilise VHF/UHF radio networks. Informal information points also emerged. One such example included the Port Lincoln Hotel. With sustained power outages in the community, the hotel became an active hub, providing showers, meals and accommodation for

many. The review identified emergent points such as the hotel could have been better utilised to share public information and warnings and recommended effective community liaison activities be better outlined.

Nature and scope of public information needs

The diverse and cascading impacts of this event required preparation and provision of broad public information in a coordinated fashion. Information spanned, for example, access to and storage of food; water and sewerage; medical services, medication and life support or other medical technology; updates on utility outages; information, communication and technology; home safety and essential home appliances; accessing fuel; managing credit card and cash transactions; and mental and physical health impacts.

Despite efforts, there were criticisms information lacked detailed local information to allow people to make better, more informed decisions and plan for their situation. As an example, more detailed information on estimated timeframes to restore power (and the level of confidence in these estimates), would have been beneficial.


Business continuity planning

The review identified many business continuity plans were inadequate across both the public and private sectors. Many lacked contingencies for loss of power and other planned contingencies failed. The loss of landline and mobile telecommunication capacity was also highlighted as an issue requiring greater attention in future plans.

Distracting commentary

Editorial and political commentary quickly emerged during response to and recovery from this event. The review highlighted the deleterious damaging effects this can have on the reach and effectiveness of important public information and warnings. Distracting commentary is not an uncommon challenge, and prior relationships, codes of conduct or their equivalent, and education on the impact of this kind of distraction can help to prevent or address it.

Developed with reference to: Burns, G., Adams, L., Buckley, G. (2017) Independent Review of the Extreme Weather Event South Australia 28 September – 5 October 2016: Report presented to the Premier of South Australia.



Part 3: Evaluating public information and warnings

3.1 Evaluating public information and warnings

The discipline of public information as a core component of emergency management is constantly evolving. It is richly complex, spanning technical and operational systems, decision-making, and community behaviour in response to warnings.

A range of post-incident evaluation and research has been conducted in Australia and overseas to better design, deliver and understand the impact of warnings during emergencies. It spans predictive modelling, risk communication, behavioural science and psychology, decision-making, legal considerations and more.

The need for an evidence-based approach is highly valued. Best endeavours and assumptions about what works have been challenged over time by research outcomes, and more can be achieved as the research matures.

Accessing research

A range of research related to public information and warnings can be explored at the Bushfire and Natural Hazards Cooperative Research Centre (www.bnhcrc.com.au) and at the AIDR Knowledge Hub (www.knowledge.aidr.org.au).

3.1.1 A lessons management approach

Importantly, the distinction between lessons identified and lessons learned (i.e. embedded as the new normal) is made. The latter takes time and applied effort at all levels.

Identifying lessons and the review of warnings practice and effectiveness is part of contemporary emergency management. A 2017 review of 55 post-incident reviews and inquiries held in Australia since 2009 found recommendations related to community warnings and communication to be the third most common theme (Cole et al. 2017).

Recurrent themes across these relevant recommendations include:

- the prioritisation of warnings
- prior engagement and planning to better tailor and disseminate warnings
- the importance of warning systems and procedures
- use of clear language and structure to assist interpretation
- use of diverse channels for dissemination
- timeliness of issue as a priority.

In addition, independent reviews are regularly commissioned by organisations to conduct post-incident research with communities or targeted reviews that aim to evaluate, understand or improve particular areas of public information and warnings practice.

A small sample of these reviews can be found on the Bushfire and Natural Hazards Cooperative Research Centre website at: www.bnhcrc.com.au/research/cluster/communications-warnings

For further details on models and approaches to lessons management see *Lessons Management* (AIDR 2019)

3.1.2 An outcomes focus

Much of the learning about this area of emergency management is deeply connected with understanding community response. Post-incident analysis in emergency management typically focuses on review of operational systems, strategy and effectiveness (what worked well, what requires change etc.). Early evaluation of warnings also focused on operational effectiveness and the reach of warnings to targeted audiences.

However, the impact of a warning cannot truly be evaluated without gathering insight into community understanding, sentiment and response to that warning.

While each jurisdiction and agency is responsible for their assurance, lessons management and evaluation of services, public information practitioners can advocate for the importance of working closely with communities to continuously improve practices and outcomes.

Australia's warning principles, as outlined in Part 1 of this handbook, offer a foundation for evaluation focused on warning effectiveness, impact and outcomes.

Research and evaluation as a priority

Recommendation 8 of the *2014 National Review of Warnings and Information* (ANZEMC 2015) calls for a stronger evidence-base to inform warnings policy and practice.

Recommendation 9 of the same review calls for the advancement of performance indicators and post-incident evaluation processes.

3.1.3 Readiness to review

Being ready and able to undertake post-incident evaluation activities requires proper preparation.

Designing evaluation

Social research is a discipline. Whether evaluation is planned or occurring in response to an event, clear consideration for and ideally, consultation with, the community is required. It is essential all evaluation is conducted ethically and appropriately. Agencies can be guided by experienced researchers, Human Research Ethics Committees and official guidance from, e.g. the National Health and Medical Research Council.

Working with communities who may have been impacted by an emergency requires care, respect and expertise.

Methods of data collection, understanding of issues such as trauma, accuracy of recall or bias, careful phrasing of questions, and consideration of sample sizes are all example factors for consideration. Even use of the word 'warning' should be carefully considered. Research highlights that people define or recognise official warnings in different ways and will include a range of informal information and detail, related and (seemingly) unrelated to their responses.

Evaluation of systems and capability to deliver warnings is also important, and possibly more easily aligned with broader operational reviews. Consideration of policies and processes; suitability of systems; training and resourcing; and availability of data and intelligence to make decisions and inform warnings can all provide insight and improve practice.

Pre-planning for activation

Rapid activation of real-time and post-incident evaluation teams is important. Monitoring of community response can begin as soon as resources are in place if evaluation rationale, design, data capture and necessary pre-approvals are in place.

Having systems that capture data for post-incident analysis and evaluation is valuable. They may include: a full and searchable archive of warnings created and published during an emergency; media monitoring; social media analytics; or logs, maps, and situation data available at particular points throughout an incident.

It may also be possible to connect with selected communities well prior to any event to establish valuable baseline information, collaborate on the design of evaluation, or proactively advance the development of warnings.

References

Anderson-Berry L, Achilles T, Panchuka S, Mackie B, Canterford S, Leck A, Bird D 2018 (in press), Sending a message: How significant events have influenced the warnings landscape in Australia, *International Journal of Disaster Risk Reduction* doi.org/10.1016/j.ijdr.2018.03.005

Attorney-General's Department 2013, Australia's Emergency Warning Arrangements, Commonwealth of Australia, Canberra. Attorney-General's Department 2013, Best practice guide for warning originators, Commonwealth of Australia, Canberra

Attorney-General's Department 2013, Code of practice for warning republishers, Commonwealth of Australia, Canberra

Australian Broadcasting Corporation 2018, Unofficial weather forecaster Higgins Storm Chasing criticised for alarmist social media flood post, accessed 16 March 2018, www.abc.net.au/news/2018-03-15/higgins-storm-chasing-criticised-by-farmers-for-flood-forecast//9549878

AFAC 2016, Strategic directions for fire and emergency services in Australia and New Zealand 2017-2021, www.afac.com.au/docs/default-source/publications/strategic-directions-plan-2017-2021.pdf?sfvrsn=38&download=false

AFAC 2009, A national systems approach to community warnings: AFAC Discussion Paper, Melbourne

Australian Bureau of Statistics 2013, 4228.0 Programme for the International Assessment of Adult Competencies, Australia, 2011-12, viewed 2 March 2018, www.abs.gov.au/ausstats/abs@.nsf/mf/4228.0

Australian Institute for Disaster Resilience 2009, Manual 21: Flood Warning knowledge.aidr.org.au/resources/manual-series

Baker-Jones M 2017, Social Media in Emergencies: An examination of government accountability for risk communication and warning, Queensland University of Technology, QLD

Bates J 2017, Cascading and complex network failures, *Australian Journal of Emergency Management*, Vol 32, No 3, pp 32-33

Burns G, Adams L, Buckley G 2017, Independent Review of the Extreme Weather Event, South Australia: Report presented to the Premier of South Australia, South Australia

Cole L, Dovers S & Eburn, M 2017, Major post-event inquiries and reviews: review of recommendations, Bushfire and Natural Hazards Cooperative Research Centre, Melbourne

Council of Australian Governments 2011, National Strategy for Disaster Resilience, knowledge.aidr.org.au/resources/national-strategy-for-disaster-resilience

Crosweller M 2015, Improving our capability to better plan for, respond to, and recover from severe-to-catastrophic level disasters, *Australian Journal of Emergency Management*, Vol 30, No 4, pp 41-45

Deloitte Access Economics 2017, Building resilience to natural disasters in our states and territories, Australian Business Roundtable for Disaster Resilience and Safer Communities

Dootson, P., Thomson, T. J., Angus, D., Miller, S., Hurcombe, E., & Smith, A. 2021, Managing problematic visual media in natural hazard emergencies. *International Journal of Disaster Risk Reduction*, 102249

Emergency Management Victoria 2014, National Review of Warnings and Information: Final report, Victorian Government, Melbourne

Fisher Liu B, Wood M, Egnoto M, Bean H, Sutton J, Mileti D, Madden S 2017, Is a picture worth a thousand words? The effects of maps and warning messages on how publics respond to disaster information, *Public Relations Review*, vol. 43, issue 3, pp. 493-506

Heilbrun K, Wolbransky M, Shah S & Kelly R 2010, Risk communication of terrorist acts, natural disasters, and criminal violence: Comparing the processes of understanding and responding, *Behavioral Sciences & the Law*, Vol 28, Issue 6, pp 717-729

LeClerc J & Joslyn S 2015, The Cry Wolf Effect and Weather-Related Decision Making, *Risk Analysis*, vol. 35, no. 3, pp. 385-395

Lin X, Spence PR, Sellnow TL & Lachlan KA 2016, Crisis communication, learning and responding: Best practices in social media, *Computers in Human Behavior*, vol. 65, issue c, pp. 601-605

Lindell MK & Perry RW 2012, The protective action decision model: theoretical modifications and additional evidence, *Risk Analysis*, vol. 32, no. 4, pp. 616-632

Liu, B. F., Seate, A. A., Iles, I., & Herovic, E. 2020, Tornado warning: Understanding the National Weather Service's communication strategies. *Public Relations Review*, 101879

Mackie B 2013, Warning Fatigue: Insights from the Australian Bushfire Context, University of Canterbury, New Zealand ir.canterbury.ac.nz/bitstream/handle/10092/9029/Thesis_fulltext.pdf?sequence

Mayhorn CB, & McLaughlin AC 2014, Warning the world of extreme events: A global perspective on risk communication for natural and technological disaster, *Safety science*, vol. 61, pp 43-50

McLennan J 2014, Capturing community members' bushfire experiences: interviews with residents following the 12 January 2014 Parkerville (WA) fire, Bushfire & Natural Hazards Cooperative Research Centre, Australia

McLennan J & Elliott G 2011, Community Members' Decision Making Under the Stress of Imminent Bushfire Threat - Murrindindi Fire, Bushfire CRC, Australia

Metrix 2019, Multi Hazard Warnings Social Research: Research Report - Stages 1 to 3, knowledge.aidr.org.au/media/7791/2337-sa-cfs-warnings-full-report.pdf

Mileti DS & Sorensen JH 1990, Communication of emergency public warnings: A social science perspective and state-of-the-art assessment (No. ORNL-6609), Oak Ridge National Lab., Tennessee, USA

Moore R & Verity A 2014, Hashtags standards for emergencies, United Nations Office for the Coordination of Humanitarian Affairs www.unocha.org/sites/unocha/files/Hashtag%20Standards%20for%20Emergencies.pdf

Morss, R. E., Cuite, C. L., Demuth, J. L., Hallman, W. K., & Shwom, R. L. 2018, Is storm surge scary? The influence of hazard, impact, and fear-based messages and individual differences on responses to hurricane risks in the USA. *International Journal of Disaster Risk Reduction*, 30, 44-58

Mortensen, T. M., Hull, K., & Boling, K. S. 2017, Really social disaster: An examination of photo sharing on twitter during the # SCFlood. *Visual Communication Quarterly*, 24(4), 219-229

National Academies of Sciences, Engineering, and Medicine 2017, Emergency Alert and Warning Systems: Current Knowledge and Future Research Directions, The National Academies Press, Washington, DC. doi: doi.org/10.17226/24935

Queensland Police Service 2011, Queensland Police Service Disaster Management and Social Media - a case study www.police.qld.gov.au/corporatedocs/reportsPublications/other/Documents/QPSSocialMediaCaseStudy.pdf

Ryan B 2011, 'What is the significance of communication in emergency management? An empirical analysis', *Australian Journal of Emergency Management*, vol. 25, issue 1, pp. 54-57

- Ryan B 2018, A model to explain information seeking behaviour by individuals in the response phase of a disaster, *Library and Information Science Research*, Vol 40, Issue 2, pp. 73-85
- Skinner & Skinner Consultants 2014, A Synthesis of Bushfire CRC Community Safety Research (2003-2013) Including Post-fire Contact Surveys, Bushfire Cooperative Research Centre, Melbourne
- Sorensen J 2000, Hazard Warning Systems: Review of 20 years of progress, *Natural Hazards Review*, vol. 1, issue 2, pp. 119-125
- Sutton J & Woods C 2016, Tsunami warning message interpretation and sense making: Focus group insights. *Weather, Climate, and Society*, Vol 8, Issue 4, pp.389-398
- Taylor M, Wells G, Howell G, Raphael B 2012, The role of social media as psychological first aid as a support to community resilience building. A Facebook study from 'Cyclone Yasi Update', *The Australian Journal of Emergency Management* Volume 27, No. 1, pp. 20- 26
- Terpstra T, Zaalberg R, Boer JD & Botzen WJW 2014, You have been framed! How antecedents of information need mediate the effects of risk communication messages, *Risk analysis*, Vol 34, Issue 8, pp 1506-1520
- Tippett V, Greer DA, Mehta A, Christensen S, Duncan W, Stickley AM, & Dootson P 2016, Emergency warning message comprehension: Community focus groups, Bushfire and Natural Hazards Cooperative Research Centre, Melbourne
- United Nations Office for Disaster Risk Reduction, Sendai Framework for Disaster Risk Reduction 2015-2030
- United Nations Environment Programme 2015, Early Warning as a Human Right: Building Resilience to Climate-related Hazards, Nairobi, Kenya, wedocs.unep.org/handle/20.500.11822/7429
- United Nations Office for the Coordination of Humanitarian Affairs 2013, Humanitarianism in the network age including world humanitarian data and trends 2012, United Nations www.unocha.org/sites/unocha/files/HINA_0.pdf
- United Nations International Strategy for Disaster Risk Reduction 2005, Hyogo Framework for Action 2005-2015: Building the Resilience of Nations and Communities to Disasters, Hyogo, Japan
- Van Delden H, Riddell G, Vanhout R, Maier H, Zecchin A, Newman J, Daniell J, Dandy G 2016, A Spatial Decision Support System (SDSS) for Understanding and Reducing Long-Term Disaster Risk, paper presented at the 6th International Disaster and Risk Conference IDRC 2016 Integrative Risk Management - Towards Resilient Cities. 28 August - 01 September, Davos, Switzerland viewed 21 April, 2018 www.slideshare.net/GRFDavos/a-spatial-decision-support-system-sdss-for-understanding-and-reducing-longterm-disaster-risk-hedwig-van-delden
- Webber D, Gissing A, Dufty N, Bird D 2017, Community participation in emergency planning: NSW State Emergency Service case study, *Australian Journal of Emergency Management* vol. 32, issue 2, pp. 28-34
- Whittaker J & Taylor M 2018, Community preparedness and responses to the 2017 New South Wales bushfires: Research for the New South Wales Rural Fire Service, Bushfire and Natural Hazards Cooperative Research Centre, Melbourne
- Whittaker, J, Haynes, K, Wilkinson, C, Tofa, M Dilworth, T, Collins, J, Tait, L & Samson, S 2021, Black Summer - how the NSW community responded to the 2019-20 bushfire season, Bushfire and Natural Hazards Research Centre, Melbourne
- World Meteorological Organization 2015, WMO Guidelines on Multi-hazard Impact-based Forecast and Warning Services, Geneva, Switzerland
- Zhao, X., Zhan, M., & Liu, B. F. 2018, Disentangling social media influence in crises: Testing a four-factor model of social media influence with large data. *Public Relations Review*, 44(4), 549-561



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