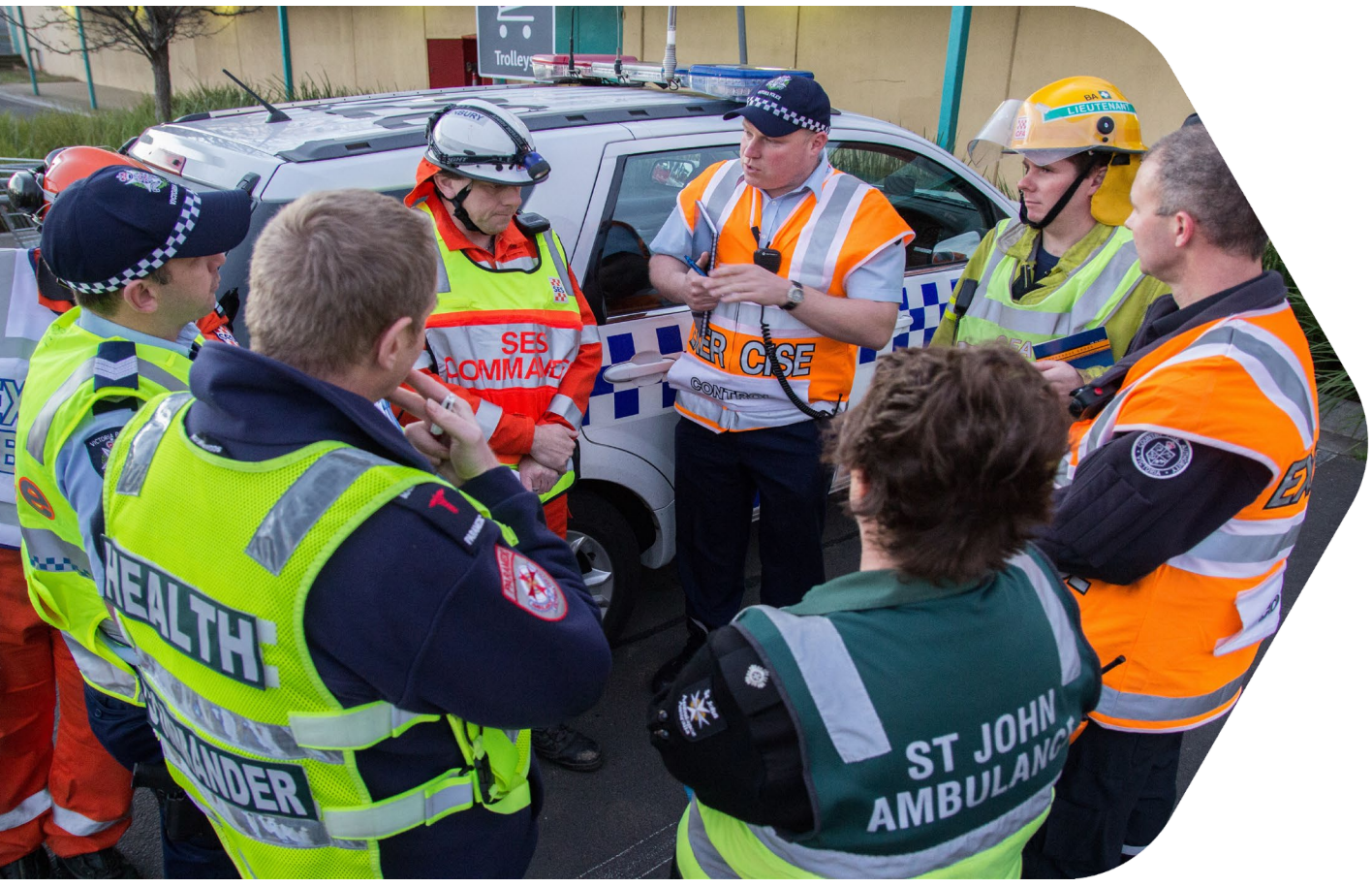
Natural Hazards Research Australia

Principles of best practice strategic crisis management arrangements for catastrophic disasters

Dr Michael Eburn[1] & Andrew Gissing[2]

1. Independent consultant 2. Natural Hazards Research Australia



Australian Government
National Emergency Management Agency

Version	Release history	Date
1.0	Initial release of document	18/11/2024

Australian Government

Natural Hazards Research Australia receives grant funding from the Australian Government.

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We acknowledge the Traditional Custodians across all the lands on which we live and work, and we pay our respects to Elders both past, present and emerging. We recognise that these lands and waters have always been places of teaching, research and learning.

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Publisher:
Natural Hazards Research Australia

ISBN: 978-1-923057-07-4

Report number: 29.2024

November 2024

Cover: Country Fire Authority (Victoria)

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Introduction

Australia is continually challenged by the threat of natural hazards. Leaders are constantly required to maintain public confidence in the context of uncertain crises. Whilst the impact of natural hazards is generally well managed there is always the potential – if not inevitability – that the impacts will at some time exceed current capacity and thinking with the result that the outcome will be catastrophic. It is essential that crisis management arrangements adopt best practices as established by evidence and that this evidence is widely recognised and understood by practitioners and policymakers.

This report has been commissioned by the National Emergency Management Agency (NEMA) to identify key principles for best practice strategic crisis management arrangements for catastrophic disasters. The report, based on the research evidence, will assist in building the knowledge and understanding of practitioners and policymakers.

End-user statement

Joe Buffone PSM, Deputy Coordinator General Emergency Management and Response Group National Emergency Management Agency

The National Emergency Management Agency (NEMA) partnered with Natural Hazards Research Australia to develop evidenced based crisis management principles to support national coordination arrangements for catastrophic disasters. The outputs of the project are already being used by NEMA and Natural Hazards Research Australia in the design of national crisis management policies, plans and operating models. They are also being shared broadly at national forums such as the AFAC24 Conference, National Space Weather Exercise and Higher Risk Weather Season Summit with strong interest from stakeholders.

NEMA looks forward to launching the principles alongside Natural Hazards Research Australia and raising awareness of the research to further enable its utilisation. These principles represent global best practice and are drawn from research that is either contemporary or has stood the test of time. These principles and supporting evidence are invaluable as we tackle more frequent more intense disasters and crisis, and in particular, for Australian context as we continue to build our national crisis management arrangements to deal with consecutive, concurrent and compounding natural and human induced disasters that could result in catastrophic consequences.

Context

This report is written in the context of the Australian Federation. Primary responsibility for managing the preparation for, response to and recovery from most disasters is said to lie with the states and territories. The Commonwealth of Australia (the Commonwealth) provides support to those efforts through funding and the use of non-financial resources, often the Australian Defence Force, during the response phase.

Disasters are not, however, limited to the states or to expected events of floods, fires and storms. The Commonwealth can expect to take a leadership role in disasters that impact areas of commonwealth responsibility e.g. disasters in the Australian exclusive economic zone (extending up to 200 nautical miles from the coast) (Parliament of Australia, 2012), Australia's 53 million square kilometre search and rescue region (AMSA, 2022), disasters on Commonwealth managed land e.g. the Kakadu National Park (Parliament of Australia, 1999) or disasters that uniquely impact areas of Commonwealth responsibility e.g. cyber-attacks that affect 'postal, telegraphic, telephonic, and other like services' (Australian Constitution s 51(v)). Economic disasters, such as the global financial crisis are also matters particularly within the Commonwealth's ability to manage (High Court of Australia, 2009).

Australia has emergency plans where the states and territories manage the response to and recovery from most disasters and certainly familiar (even if extreme) bushfires, floods and storms. Equally the Commonwealth, its agencies and departments have, or should have, emergency management plans to apply to emergencies within their areas of portfolio responsibility (Department of Prime Minister and Cabinet, 2023). These plans involve industry and state and territory governments, but they are led by the Commonwealth. This report is not about management arrangements in these areas of either state or commonwealth responsibility where arrangements are reasonably well practised and understood for routine emergencies.

The context of this report is on crisis management when the event is truly unforeseen, unexpected, or overwhelming and where the Commonwealth is expected to take a national leadership role. In truly catastrophic disasters managing the response and recovery may be "peculiarly within the capacity and resources of the Commonwealth Government" (High Court of Australia, 2009; Eburn, 2011; Eburn et al., 2019). Exactly what form that disaster will take is yet to be experienced or imagined. The closest example may be Cyclone Tracy. On Christmas day 1974, Cyclone Tracy devastated Darwin, rendered local administration ineffective and required the interstate evacuation of the affected population. The Commonwealth was able to intercede and manage the response to that event even without legislated authority (Gissing, 2022; Eburn, 2009). The Commonwealth's authority in that event was clear as the Northern Territory did not yet have self-government so was governed directly by the Commonwealth but if a similar event were to occur today, in a state or territory, it may still be incumbent upon the Commonwealth to exercise national leadership. It would be an unwise optimist who assumed that there are now in place plans and procedures to deal with any event that may come our way. A cyclone like Cyclone Tracy demonstrates that disasters can and almost inevitably will arise, that will overwhelm current planning and which will require active leadership by the Commonwealth.

The Australian Disaster Preparedness Framework (Department of Home Affairs, 2018, p. 5) defines a catastrophic disaster as:

> *… what is beyond our current arrangements, thinking, experience and imagination (i.e. that has overwhelmed our technical, non-technical and social systems and resources, and has degraded or disabled governance structures and strategic and operational decision-making functions).*
>
> *It should be noted that severe to catastrophic disasters differ from emergencies in that they exceed business as usual emergency management systems and capability design parameters.*

Quarantelli (2006) defines six criteria to distinguish catastrophes from disasters:

1. *Most or all of the community-built structure is heavily impacted.*
2. *Local officials are unable to undertake their usual work role, and this often extends into the recovery period.*
3. *Help from nearby communities cannot be provided.*
4. *Most, if not all, of everyday community functions are sharply and concurrently interrupted.*
5. *The mass media system…. socially constructs catastrophes even more so than they do disasters.*
6. *… the political arena becomes even more important.*

What is common to these definitions – what makes an emergency a catastrophe – is that current planning, resources or imagination are inadequate for controlling the hazard or dealing with the consequences. Planning for catastrophe therefore must include preparing for plans to fail and resources to be inadequate.

Such circumstances become more likely as natural hazard risks worsen and disasters become more complex. Cascading disaster consequences occur where the loss of one system triggers the failure of another (Comfort, 2005). This recognises the interdependence of many risks and makes prediction of consequences difficult (Cavallo and Ireland, 2014). As society continues to modernise and increase in complexity, unexpected risks will likely grow (Boin and ‘t Hart, 2010).

Methods

This report was commissioned by the National Emergency Management Agency and considers the literature to identify best practice strategic crisis management arrangements for catastrophic disasters, as defined by the Australian Disaster Preparedness Framework. How do governments, non-government organisations, businesses and citizens best prepare for and manage the response to events that are "beyond our current arrangements, thinking, experience and imagination"?

The literature analysis was completed based on a search of global literature conducted from October to December 2023 using Google Scholar, and Google and Bing internet search engines for grey literature as well as literature suggested by the National Emergency Management Agency. The report builds upon previous Bushfire and Natural Hazards Cooperative Research Centre research on the topic of planning and capability requirements for catastrophic disasters.

Catastrophes require different approaches to emergencies

Australia's emergency management arrangements are largely based on a command-and-control model (Zurita et al., 2015). This is evident in state and territory emergency management legislation and supporting doctrine in particular the Australian Inter-Agency Incident Management System (AIIMS) (adopted by Australia's fire, rescue and emergency services) and the related Incident Command-and-Control System Plus (ICCS Plus) (adopted by Australia's police services) (O'Rourke and Leonard, 2018).

The underlying doctrine is that for any particular hazard event, there will be a nominated lead (or combat, or control) agency that will take control of the response. Other agencies that can support the response will report to the Incident Controller who will identify the desired outcomes and allocate tasks to the support agencies. This is seen in AIIMS which anticipates that for any event there will be one, and only one identified incident controller. The Incident Controller will exercise control, that is:

> *… the overall direction of emergency management activities in an emergency situation. Authority for control is established in legislation or in an emergency plan and carries with it the responsibility for tasking other organisations in accordance with the needs of the situation. Control relates to situations and operates horizontally across organisations (AFAC, 2017, definition of 'control').*

This is a top-down style of management where the Incident Controller is to set the objectives and participating organisations will work to achieve those objectives within the scope of tasks allocated to them. This approach is fundamentally reflected in the Australian Government Crisis Management Arrangements that assumes there will be a lead minister responsible for the strategic coordination of the Australian Government's near-term crisis preparation, immediate crisis response and early recovery from crisis. However, the differentiation of this approach is that it does not reflect a command or control model. In the absence of a clearly defined lead minister, responsibility falls to the Minister for Home Affairs unless the Prime Minister elects to take on that role. Government agencies and senior officials support and inform the Ministers (Department of Prime Minister and Cabinet, 2023).

AIIMS aims to establish model incident management structures to foster interoperability between agencies. The 2009 Victorian Bushfires Royal Commission (Teague et al., 2010, pp. 87) said that AIIMS:

> *Offers a consistent approach to incident management throughout Australia, as well as allowing for effective interoperability with fire management personnel from New Zealand, the United States and Canada.*

Arguments have been made that an incident control system (ICS) (i.e. from which AIIMS is based) is only a partial solution better suited to routine, smaller scale events (Harrald, 2006; Lagadec, 2004; Buck et al., 2006). The application of ICS in catastrophic events is limited as activities of emergent groups cannot be structured beforehand (Wachtendorf and Kendra, 2017). In this context, Wachtendorf and Kendra (2017) state that the concept is essentially "a tool for agencies to manage themselves". Buck et al. (2006, p. 2) state:

> *It works best (i.e. ICS) when those utilizing it are part of a community, when the demands being responded to are routine to them, and when social and cultural emergence is at a minimum.*

Suggestions for the use of ICS in coordinating recovery operations have been criticised in that ICS models ignore that recovery is an intensely social process (Buck et al., 2006).

The limitation of AIIMS is further evident in the definition of an incident (AFAC 2017, definition of incident) that is:

> *an event, occurrence or set of circumstances that:*
> - *has a definite spatial extent*
> - *has a definite duration*
> - *calls for human intervention*
> - *has a set of concluding conditions that can be defined*
> - *is or will be under the control of an individual who has the authority to make decisions about the means by which it will be brought to an end.*

A catastrophic event may be none of these things (Gissing et al., 2020). It may extend across a large area, and multiple jurisdictions to include all of Australia and beyond. In a complex event there may be no set of concluding conditions that can be defined i.e. it cannot be ascertained, in advance, what the mission success (Eburn and Dovers, 2014) will look like and because of its diverse nature aspects of the response may be under the control of many different people whilst the hazard itself will, by definition, be uncontrolled.

What distinguishes incidents from catastrophes is the degree of novelty and challenges presented (O'Rourke and Leonard, 2018). It is when plans fail that an event becomes a catastrophe (Boin et al., 2019; Tierney 1993). If the plan worked, and everyone and everything behaved as expected, or at least anticipated, it could be a big event, but it is not a catastrophe.

Discussion of ICS systems in the context of catastrophes is provided in more detail, below under the heading *Arrangements must allow for flexibility, improvisation and scalability*.

Principles of best practice strategic crisis management arrangements for catastrophic disasters

Having identified what is a catastrophe, what makes a catastrophe different from emergencies and why traditional command-and-control models are unlikely to be effective in the management of the hazard or its consequences we now identify, from the literature, key principles of best practice strategic crisis management arrangements for catastrophic disasters.

Arrangements must allow for a nationwide approach

There is a need to conceptualise catastrophes from a national perspective, given that they will require responses across Australian jurisdictions (including across borders), commonwealth and most likely, international organisations.

Scenario analyses usually consider potential disasters in isolation, but Australia is susceptible to a series of damaging events whose compounding impacts could lead to a much larger impact. While Australia is well protected by having well-separated major concentrations of population in our capital cities, the possibility of a series of disasters across the country that collectively exhaust the response capacity of emergency responders cannot be dismissed (Gissing et al., 2020).

As catastrophes exceed the operating capacity of any single jurisdiction, a collaborative, national approach should be used to plan and prepare for such events (United States Department of Homeland Security, 2007). Compound disasters occurring concurrently, or in sequence mean that national coordination entities must be prepared to support multiple disaster responses concurrently (Gissing et al., 2022).

Case study: compound disasters

2017 US compound disaster

In 2017 the United States was impacted by multiple hurricanes and wildfires nationally. These events presented challenges at a national level on an unprecedented scale including shortages in the availability of debris removal contractors and delays in removing debris. In addition, Federal Emergency Management Agency's (FEMA) workforce was overwhelmed, leading to the deployment of a large number of unqualified and inexperienced staff which further complicated response efforts (US Government Accountability Office, 2018).

2019/20 compound disaster

In Australia, the summer of 2019/20 is illustrative of a compound disaster with bushfires causing multiple severe events combined with subsequent flooding, storms and the COVID-19 pandemic. When measured in terms of normalised insured losses, however, 1967 ranks as Australia’s most significant compound disaster since the collation of insurance losses commenced.

1967 compound disaster

The 1967 Australian compound disaster commenced in January 1967, when Tropical Cyclone Elsie struck Western Australia. The event incurred a normalised damage of nearly $200M as roads, railways and airfields were damaged by floodwaters. Later that same month, Queensland was struck by Tropical Cyclone Dinah which brought highly damaging winds and rainfalls across the state coastline with a normalised insurance loss of just over $4.5B. A week later, the Black Tuesday bushfires ravaged the states of Victoria and Tasmania on 7 February 1967. The fires claimed 62 lives, alongside more than $2B normalised damage to houses, cars, buildings and bridges across the south-eastern states.

Then in the middle of February, Cyclone Barbara brought extensive coastal erosion, localised flooding and a half-billion-dollar damage bill to New South Wales. Although Cyclone Barbara caused less damage than Cyclone Dinah, it came at a time when other states were still grappling with recovery efforts for recent disasters (Gissing et al., 2020).

Arrangements must allow for a collaborative and coordinated approach

Collaboration

A catastrophe implies a loss of control. Traditional command-and-control models do not cope with increasingly novel and complex situations (O'Rourke and Leonard, 2018) and are inconsistent with the principle of shared responsibility (Waugh and Streib, 2006). Command-and-control models may also fail because they assume that all responding organisations and individuals will submit to the control authority, but many responding organisations are autonomous without hierarchical (Boin and Bynander, 2015) or pre-existing relationships between them. Many are created out of a need identified by local communities in response to the disaster. In these circumstances coordination is not imposed but develops organically. "There is no plan and no coordinator. It materializes seemingly without any prompting from above'' arising from responder's good will and desire to work together to meet the challenges created by the event (Boin et al., 2019, p. 11-12). Buffone and Cameron (2023) say "A key challenge in emergency management … includes managing people and organisations with different protocols, priorities, cultures and locations".

Collaboration is described as a dynamic and flexible network model of emergency management that facilitates multi-organisational, intergovernmental, and intersectoral cooperation (Waugh and Streib, 2006). Conceptually it is characterised by people and organisations working collectively together towards common objectives (Boin and Bynander, 2014).

Collaborative networks are widely utilised in emergency management (Kapucu and Garayev, 2013) with the recognition that a collaborative model of interacting organisations (government, non-government, business and others) may be able to adapt more appropriately to complex events than individual organisations acting alone (Comfort and Kapucu, 2006). Collaborative networks are described as promoting innovative practice due to different perspectives, ideas and practices brought together for a unified purpose (Sorensen, 2011). On a practical level they enable the sharing of information, finances, human resources and resilience (Kapucu and Garayev, 2013).

Collaboration means decision makers adopting a leadership style where they spend more time asking than telling; requesting as opposed to ordering; and delegating and decentralising rather than centralising (Quarantelli, 1998). Similarly, Bakatsaki and Zampetakis (2020) describe effective leadership of collaboration as being persuasive rather than directive.

McChrystal (2011 & 2015) describes the advantages of a network style approach in military conflict where networks of different actors including unconventional actors are formed to suit a situation, evolving as the problems evolves and empowered by common purpose, shared situational awareness (shared consciousness), adaptability, decentralised decision making (empowered execution) and a cooperative culture. Such networks include different organisations, personalities and cultures and the approach enables faster and more effective response to agile threats than traditional command and control methods. Such an approach also recognises the value of individuals who Carayannopoulos (2018) describes as "boundary spanners" to broker relationships between different networks illustrating the strengths of interpersonal relationships.

Emergency management networks can be formally defined or be emergent in their nature, typified by informal arrangements to solve complex problems (Kapucu and Garayev, 2013). O'Rourke and Leonard (2018) talk of the "sudden team" – a collection of individuals that bring different capabilities but, because the challenges presented and the response to each catastrophe is unique the team cannot have been predetermined but arises and changes in response to the needs. Buffone and Cameron (2023) talk about the network model adopted in Australia's National Coordination Mechanism, discussed in more detail below.

Quarantelli (1998) emphasised the role of coordination over control, believing that coordination was key. Buffone and Cameron (2023) argue that in large-scale, complex crises, cooperation and collaboration are just as important as coordination. Dynes (1990) further supports a collaborative approach, reinforcing existing strengths of social units by respecting the continuity of community capacity and existing social structures; promotion of coordination and common decision-making in a decentralised context rather than authority relationships and centralised decision-making; and recognition of emergent behaviours to support response and recovery efforts and the need for cooperation with emergent groups and volunteers and to promote their mobilisation. The need to allow for the integration of emergent organisations and spontaneous volunteers is discussed in more detail under the heading *Arrangements must allow for the integration of civilian and emergent capability*, below.

Kapucu et al. (2010) argues that effective collaboration is built through trust, consensus, team spirit and effective communication. This requires leaders to demonstrate strong networking and communication skills, team building, agility, flexibility, urgency, decision making and planning (Boin et al., 2016). Effort to sustain networks is required before and after disasters (Kapucu and Garayev, 2013).

However, efficient collaboration between organisations is not a certainty. The Australian experience during the Spanish Flu outbreak saw jurisdictions attempt to cooperate on border security and quarantine, however, after disputes occurred, cooperation was abandoned with each state imposing its own policies (Curson and McCracken, 2006). Similar experiences occurred during the COVID-19 pandemic. Boin et al. (2021) note that during the COVID pandemic there was initial cooperation, but governments worldwide faced pushback both from state and local authorities, and citizens, and within governments where agencies sought to reassert their own priorities and shift the focus from public health to issues such as economic and social policy. During the response to the Christchurch earthquake a pre-existing

dysfunctional relationship between Christchurch City Council and the Civil Defence Emergency Management Group was blamed for a lack of regional coordination (Mamula-Seadon and McLean, 2015).

Coordination

No one organisation alone can respond to all aspects of a catastrophe (Benini, 1999). In the case of Hurricane Katrina some 535 organisations were involved ranging from government to non-government and private sectors (Comfort and Haase, 2006). There is a need to integrate and coordinate operations of large numbers of disparate organisations (Boin and Bynander, 2015).

Coordination is defined as:

> *The bringing together of organisations and other resources to support an Emergency Management response. It involves the systematic acquisition and application of resources (organizational, human and equipment) in an emergency situation (AFAC, 2017)*

Coordination and collaboration assist to aid each other but differ in that coordination is described as a directive action to bring about collaboration (Boin and Bynander, 2015). In this sense collaboration in part is the gel that brings organisations together to work collectively, whilst coordination is focused on the practical organisation of resources.

Coordination occurs at all levels but differs in its focus in a vertical context that is at strategic versus tactical levels. At a strategic level coordination is focused on long-term objectives, planning and overall direction of disaster management efforts and coordination of resources across potentially large geographies. Decisions can involve large numbers of people and interactions with a wide number and variety of stakeholders including elected representatives. Strategic coordination is of particular importance given the need to coordinate resources or the management of consequences that may extend well outside the impacted area requiring strategy and prioritisation to support local decision makers (Counter Terrorism Preparedness Network, 2019). Where impacts are specific to a single locality or region there may be opportunities to support tactical coordination through deployment of specialist expertise from strategic levels.

Tactical coordination is focused on on-ground implementation, ensuring that resources are organised and applied to meet strategic objectives, involving the coordination of traditional and emergent organisations (Counter Terrorism Preparedness Network, 2019).

Both levels of coordination need to be integrated to enable strategic levels to set objectives and for them to be implemented at tactical levels and for feedback to be provided to strategic levels to inform strategic planning.

Boin et al. (2019) argue that coordination can happen organically with people working together to address identified needs. Emergent coordination can arise with no plan and no coordinator.

Strategic crisis leadership is essential to effective coordination. This includes:

- *sense making* that is collecting, analysing and disseminating of information to allow decision makers to have "a shared understanding of the evolving threat and its consequences"

- *critical decision making* that is making strategic but not operational decisions
- *coordinating* that is motivating actors to work together
- *mean making,* "that is explaining to all involved, both responders and communities what is going on, what is being done to remedy the situation and limit the consequences and offering actionable advice to move forward'' (Ansell and Boin, 2019, p. 1082).

Lack of coordination and communication between agencies was well illustrated by the experiences of emergency first responders to the World Trade Centre 9/11 terrorist attacks. Command posts were in different locations and information that was critical to inform decision-making was not shared between responding agencies. The 9/11 Commission Report concluded that for New York and other major cities to be prepared for future terrorist attacks, different responding agencies must be fully coordinated (9/11 Commission, 2004).

Where capability gaps exist or there is a need to support coordination and collaboration temporary crisis response organisations are often established. Australian examples include the Northern Rivers Reconstruction Corporation and the Victorian Bushfire Reconstruction and Recovery Authority. In addition to such organisations elected officials may be appointed to specific Ministerial roles to lead and provide oversight of efforts. The establishment of such arrangements may be established through the passing of legislation responsive to the catastrophe for example the Canterbury Earthquake Recovery Act 2011, following the Christchurch earthquake.

International collaboration and coordination are also an increasing feature of catastrophe management (Breu and Samuel, 2016). There is growing pressure on states to offer and accept international assistance during an overwhelming crisis (ILC, 2016; IFRC, 2017). Macalister-Smith (1985, p. 143) notes that "the failure of coordination in the disaster affected country accounts for much of the confusion which may accompany relief operations...". But, says Minear (1993, p. 236), "everyone reveres coordination, but few wish to be coordinated…" Seeking to coordinate international actors, both amongst themselves and with domestic responders, remains an area of constant discussion and failure (Fisher, 2007). These problems were manifest in the response to the 2004 Boxing Day tsunami. There it was reported (Telford et al., 2006, p. 62) that:

> *The large number of actors both significantly increased the costs of coordination (as there were so many more agencies to coordinate with) and reduced the effectiveness of coordination (as there were large numbers of agencies falling outside any coordination mechanism). In general, large private funding permitted INGOs [International Non-Government Organisations] and the RC [Red Cross/Red Crescent] Movement an unusual degree of flexibility and independence from formal coordination structures. The need and (in some cases) the will for INGOs to coordinate was consequently reduced.*

Apart from coordination between themselves, international responders need to coordinate with local agencies and responders. The need to recognise, respect and work with local authorities is inherent in the principle that the primary responsibility for protecting an affected population lies with the government of the affected state. It is also expressly provided for in various statements of international non-government organisations and standards of good practice in humanitarian work (ILC, 2016; Eburn, 2009).

In events of less than catastrophic scale, Australia has developed well established procedures to cooperate with international partners. This is seen in the regular exchange of firefighters between Canada, the United States and Australia.

Case Study: National Coordination Mechanism

In the Australian context, Buffone and Cameron (2023) say that National Coordination Mechanism (NCM) has been developed to aid coordination and collaboration across government, NGOs and business. The NCM relies on a "domain approach" which they describe as a cooperative community that includes organisations with similar responsibilities and capabilities. The domain builds on pre-existing relationships between government, business, and the non-government sector. It allows groups to cooperate according to formal and informal ties with explicit and implicit commitments and authorities or commands. Each domain has a nominated lead which may be a senior government official or senior industry or non-government official. Each domain is connected to the NCM coordination hub, which is there to de-conflict and synchronise effort. It is not a command-and-control structure.

The NCM offers a governance structure and supported process to help participants identify and define problems and to stabilise a situation through common understanding and cooperation. Participants are invited because of their equity in defining problems and their role or expertise as required by the situation.

Arrangements must allow for decentralised decision making and distributed execution supported by centralised strategic coordination

Crisis management arrangements need to allow for decentralised decision making (Kapucu and Van Wart, 2006, Boin and McConnell, 2007). Such a model allows for flexible, improvised and networked responses that the centralisation of decision making inhibits (Boin and 't Hart, 2010, Tierney, 1993).

Decision making in circumstances of extreme uncertainty and where the consequences of the decision may themselves be catastrophic is the essence of decision making in a catastrophe (Maclean 2017, Boin et al., 2020). Maclean (2017, p. 7) argues:

> *it is surprisingly common for those decisions that carry the highest potential for catastrophic error to be made by relatively junior personnel, those with direct responsibility for conducting operations. While senior commanders or corporate executives will define the overall mission and set their immediate intent, it is when these are implemented that the risk of catastrophe is at its highest.*

Centralisation of decision making can lead to outcomes that are insufficient, ineffective or even counterproductive (Boin et al., 2016). Excessive reliance on rigid, centralised and top down decision making in response to catastrophes is liable to be fraught as centralised decision makers are unlikely to hold sufficient knowledge that may only be available at local levels, especially in the early phases of a catastrophe when information may be scarce or unreliable (Kapucu and Van Wart, 2006; Boin and 't Hart, 2010); leaders may be missing or unavailable (Comfort and Kapucu, 2006); and decision makers likely overwhelmed by competing priorities and complexity of the event.

What is required to deal with the uncertainty and inability to control either the response or the hazard that is inherent in a catastrophe is a model that is "capable of operating at speed and providing situation awareness in support of critical decisions. Fixed mindsets and models rooted

in historical precedent are unlikely to cope with future demands" (O'Rourke and Leonard, 2018, p. 28).

During Hurricane Katrina the hierarchical design of the Department of Homeland Security exercising top-down control was inconsistent with the needs of the rapidly changing environment (Comfort, 2005). Centralised decision-making processes and strict processes caused delays in providing assistance and complicated communication between local, state and federal officials, resulting in poor situational awareness (Waugh and Streib, 2006). The US Senate inquiring into the response to Hurricane Katrina argued that "officials at all levels seemed to be waiting for the disaster that fit their plans, rather than planning and building scalable capacities to meet whatever Mother Nature threw at them" (Boin et al., 2019, p. 2).

The centralisation of decision-making was criticised in the context of 2011 Japanese earthquake and tsunami. The Japanese Government appeared to lack the power that was expected of it with critical information not shared immediately after the disaster resulting in inefficient decision making (Norio et al., 2011).

Centralised decision making was found to delay the notification of residents following the false warning of an imminent ballistic missile attack on Hawaii in 2018. In this case local officials in Hawaii believed that they needed to gain approval from FEMA in Washington before issuing a cancellation text message (McAvoy and Jones, 2018).

Despite its popularity, decentralised decision making and process flexibility must be well thought out. Given the large number of resources involved in responding to a catastrophe, lack of control and process can result in resource wastage. In the context of Hurricane Katrina, it was found that adherence to strict business-as-usual processes delayed in some instances the ability to expedite the delivery of vital supplies and other assistance. However, in other cases it was identified that suspension or lack of controls resulted in waste or mismanagement. There is a key conflict between ensuring resources are deployed quickly, but also that internal controls are appropriate to avoid waste and mismanagement (US Government Accountability Office, 2006).

Leonard and Howitt (2010) also outline risks to decentralised decision making associated with inadequate training and experience of decision makers, emphasising the need to support and build capabilities of local leaders.

Decentralised decision making should be supported by centralised strategic coordination that provides for a flexible, adaptable and collaborative framework (Clarke, 2018; Leonard and Howitt, 2010). The role of centralised coordination is not to override local decision makers but to provide them with necessary support, resources and information sharing, respecting their knowledge of local context and needs (Leonard and Howitt, 2010). In the national context this allows for the effective prioritisation and sharing of resources across jurisdictions and consideration of national policy issues such as relaxing Commonwealth regulation. Such centralised strategic coordination does not replace organic coordination (i.e., strong working relationships and personal familiarity) that occurs between different organisations in a collaborative network and is supported and supplemented by coordination structures at all levels. As addressed elsewhere in this report not all organisations involved in a disaster response will be part of a coordinated network for example emergent organisations.

Arrangements must allow for flexibility, improvisation and scalability

Existing emergency management arrangements (AFAC, 2017) are intended to be scalable as the size of the event increases but they still envisage a single hazard so the event can scale from a small bushfire that is being attacked by local crews to a major conflagration, but they do not deal well with compounding and unique disasters. By the time a disaster has reached catastrophic scale, local arrangements are necessarily overwhelmed, and the matter has been escalated to the arrangements being considered here. Catastrophe arrangements must be flexible and scalable that is able to adjust in size, structure and aim as the circumstances change.

As discussed above, command-and-control approaches have been criticised (Quarantelli, 1998; Tierney, 1993), with Drabek and McEntire (2003, p. 106) describing it as being "based on inadequate theory, incomplete evidence and a weak methodology." Command-and-control approaches are based on false assumptions that society will be chaotic and helpless and responding agencies must take over management (Tierney, 1993; Dynes, 1990); that responses are best directed through centralised decision making (Tierney, 1993; Dynes, 1990); departures from standard operating procedures can be detrimental (Drabek and McEntire, 2003); that emergent groups are unhelpful (Drabek and McEntire, 2003); and that an effective response is achieved through a single individual being in charge and supporting organisations arranged hierarchically (Tierney, 1993).

Catastrophic disasters pose leaders with unique challenges requiring improvisation and flexibility to ensure effective communication and management of scarce resources. 't Hart (2014, p. 172) described the decision-making pressures:

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

Decision makers must adapt to changes in human behaviour, with strategies designed based upon how people are likely to act rather than assuming they can be controlled (der Heide, 2006; Teague et al., 2009). For example, behaviour at hospitals in Christchurch following the 2011 earthquake differed from what would normally be expected. Patients arrived by abnormal means without pre-hospital care, patients were reluctant to enter hospital buildings due to fear of aftershocks and there was spontaneous arrival of additional medical resources that had not be planned for (Ardagh et al., 2012).

Successful management of extreme events requires an ability to rapidly assess and adapt (Comfort and Kapucu, 2006), and use flexible decision making rather than relying on bureaucratic systems and procedures (Kapucu and Van Wart, 2006). Management must allow for local innovation, collaboration, trusting relationships and the suspension of rules where necessary (Kapucu and Van Wart, 2006). Often though emergency managers rely on previous experience and training and fail to adapt their methods of management (Comfort and Kapucu, 2006). O'Rourke and Leonard, (2018) argue that management structures and approaches must be tailored to suit different problems, noting that novel problems require different approaches, organisational structures, processes and capabilities to achieve resolution. In this sense it is

important to distinguish management methods that may be used for a routine emergency versus those needed for the management of a catastrophe.

Case study: the need for flexibility

The need for flexibility in planning is underscored by an example regarding the Christchurch earthquake in 2011. Prior to the earthquake, the national civil defence organisation had planned to control operations from its base in the New Zealand capital, Wellington. After the earthquake, however, politicians insisted that the response to the earthquake be controlled from Christchurch. This meant that the national civil defence organisation had to adapt its plans on the run to enable this direction to occur. As a result, the New Zealand Ministry for Civil Defence and Emergency Management was said to now adopt a more flexible approach to planning.

A further illustration is the relaxation of competition regulation during COVID-19. Competition regulators in Australia, New Zealand and the U.K. provided exemptions to competition regulations to promote collaboration between businesses for public benefit. In Australia this included supermarket, mining, health insurance, oil, medicine, telecommunications and banking companies (Australian Competition and Consumer Commission, 2020).

Arrangements must allow for the integration of civilian and emergent capability

Emergency management is typically the preserve of emergency management organisations utilising an all-hazards, all-agencies approach, which is predominately government centric. For catastrophic events, however, collaborative partnerships are unavoidable, as no single organisation can respond alone (Fugate, 2017; Benini, 1999; Waugh and Streib, 2006). Disaster management is a joint collaborative effort (Kapucu et al., 2010; Waugh and Streib, 2006) and it is necessary to adopt a whole-of-community approach. The whole-of-community approach has been described as:

> *… a means by which residents, emergency management practitioners, organisational and community leaders, and government officials can collectively understand and assess the needs of their respective communities and determine the best ways to organise and strengthen their assets, capacities, and interests. By doing so, a more effective path to societal security and resilience is built. In a sense, Whole Community is a philosophical approach on how to think about conducting emergency management (FEMA, 2011; p. 3).*

The whole-of-community approach encourages partnerships between government, community organisations and businesses. It recognises that emergency management is a shared responsibility (Teague et al. 2010). In times of disaster, collaboration assists all organisations to better serve the needs of communities (Kapucu and Garayev, 2011; Waugh and Streib, 2006).

In practice, whereas the roles of government organisations are embedded in legislation and regulation, the roles of community organisations and businesses are less so. The 2019-20 Australian bushfire season and the COVID-19 pandemic saw heavy involvement from community organisations and businesses. Government, though, is hindered by its lack of structure to support formal cooperation and capacity to engage (Australian Red Cross, 2014). Collaboration is not only dependent on structures but also on the culture of emergency managers (Kapucu et al., 2010). Emergency managers are burdened by rules of accountability

that force them to take charge and implement hierarchical approaches in the face of disaster events. This creates risk aversion and a reluctance to devolve control, creating incompatibilities to fully engage and collaborate with non-government organisations (Waugh and Streib, 2006; Australian Red Cross, 2014).

Government does not need to formally activate businesses and community organisations as they are already reactive in ensuring their own resilience and meeting the needs of staff and customers. Strong involvement and collaboration reduces the need for government services and resources and community organisations and businesses should be integrated into collective disaster plans (Waugh and Streib, 2006).

COVID-19 illustrated that governments rely on the business sector for the provision of critical infrastructure and supply chains, but that the private sector can equally be reliant on government for information, regulatory relaxation and financial support. This was illustrated by the role businesses played in the rapid manufacture of vaccines and the role of government in their funding and rapid approval (Boin et al., 2021).

There is international evidence that demonstrates that the business sector can act more efficiently than government in some cases. After Hurricane Sandy (2012) in the United States, the business sector was able to move eight times the amount of food into affected areas compared with the combined efforts of government and non-government organisations (Kaufman et al., 2015). Similarly, after Hurricane Katrina (2005), the retail store, Wal-Mart, frequently outpaced the United States FEMA by several days (Chandra et al., 2016). The business sector can also act with more flexibility than government, making faster decisions and acquiring, moving and disposing of resources rapidly taking advantage of their global networks and supply chains.

During the pandemic in Australia and when natural hazards impacted on critical supply chains, the private sector was pivotal in defining the problems and delivering timely solutions (Buffone and Cameron, 2023). During COVID -19 the NCM involving major businesses played a central role in the national coordination of non-medical consequences of the pandemic, including identifying issues, deconfliction, resolution, allocation of responsibility and providing whole-of-response advice—and options—to government. More than 100 meetings were held to ensure shared understanding and rapid stabilisation of problems as they emerged. This allowed a supply-chain taskforce to work with road transport companies and their peak bodies, shipping and freight companies, food and grocery suppliers, agricultural peak bodies and cooperatives, state and territory government agencies, and local governments.

Early in the pandemic, the major supermarkets advised that rules limiting contact and furloughing staff threatened the grocery supply chain, with a high likelihood of empty shelves if the settings weren't adjusted. The NCM supported all involved to quickly provide expert advice to the Australian Health Protection Principal Committee. The committee developed interim guidance that was endorsed by National Cabinet, and changes in state and territory policy were implemented in time to ensure availability of food and groceries.

In January 2022, more than 300 kilometres of rail line and major highways were severely damaged by flooding, effectively cutting north-south and east-west road and rail transport corridors. The NCM was convened with federal, state and territory authorities and the transport and logistics sector to identify consequences and potential solutions. Food and grocery supplies to Western Australia and supply of water purification chemicals to the eastern states were identified as critical issues. Solutions included establishing a land bridge between Adelaide and

Kalgoorlie, establishing a sea freight corridor, and using liners in shipping containers to allow for safe loading and transport of chemicals.

Emergent capability

During catastrophes community members become first responders and mass convergence of groups into the affected area occurs (Tierney, 1993; Whittaker et al., 2015). Often the success of the response is reliant upon the capacities already present in communities. Social research has shown that rather than panic or being shocked and dazed, that communities impacted by catastrophe typically act proactively and work to assist others. Often rather than working as individuals, community members form groups often based on pre-disaster ties (Tierney, 1993). Such groups typically arise in the aftermath of a catastrophe when the demands of the community are not being met; when existing traditional structures are inadequate; or when the community feels it is necessary to be involved (Drabek and McEntire, 2003).

These groups often have the advantage of real-time situational awareness, knowledge of vulnerable persons and can configure their responses to best meet local needs. Rather than embracing existing social structures and volunteering in the aftermath of events it is argued that disaster management systems often ignore this valuable capacity (Whittaker et al., 2015).

The role of emergency service first responders in responding to a catastrophe must adjust from one which typically undertakes direct taskings to one which would facilitate, lead, support and enable community-led actions (Gissing, 2017).

Case study: community capability

Numerous examples exist to illustrate the role of community groups and volunteers during catastrophes.

The response to the Christchurch earthquakes (2010 and 2011) saw organised and emergent volunteer groups (such as the Student and Farmy armies) perform vital roles in assisting the most affected communities. The Student Army was reported to have been some 10,000 people strong was coordinated via Facebook. The group has now formalised after the event as an organisation to promote volunteering in the community (https://sva.org.nz/).

In the Australian context, the Brisbane 2011 floods saw the emergence of the Mud Army. This group emerged after the Brisbane City Council issued a call for volunteers to assist with the clean-up. Some 25,000 people responded to the call and volunteered (Adams, 2016). The Mud Army is now an established part of Brisbane City Council's response arrangements (Brisbane City Council, 2022).

In the aftermath of the 2016 Louisiana floods and Hurricane Harvey in 2017 the volunteer-based Cajun Navy group consisting of citizens with their watercraft emerged to assist with the rescue of people stranded in floodwater. The group arose originally in the aftermath of Hurricane Katrina following a call for help by city officials. The group has reported responding to calls for help posted on social media, though the group has also established a website through which people can request rescue assistance or resupply (www.cajunnavy.com). During the Louisiana floods FEMA search and rescue teams provided just-in-time training to volunteers to assist with flood rescues and were overwhelmed by the response (Wachtendorf and Kenda, 2017).

It was the community response to the 2022 NSW floods that played critical roles in the response to and recovery from the flood event. Citizens used their own boats and other resources to

rescue and then provide shelter to people. "The many citizens who volunteered and self-organised profoundly benefitted the wellbeing, health, and safety of those who were flood-affected and displaced". In the absence of an effective government response communities organised and established community hubs that acted as a central location where community members and organisations could provide welfare services, respite and information. When government support services arrived, they linked up with community hubs as that was where people who needed assistance were going (Fuller and O'Kane 2022, p. 40).

Fuller and O'Kane (2022, p. 40) were critical of the government's response to the 2022 floods noting that communities responded in the "absence of expected assistance from government authorities and emergency services". That begs the question of whether those expectations were reasonable given the overwhelming nature of the event. Assisting resilient communities to manage their own response is consistent with the idea of resilient communities (COAG, 2011; Keelty, 2011)

A number of Australian disaster relief organisations have grown from groups that simply saw a need and responded – for example BlazeAid (https://www.blazeaid.com.au/), SurfAid (https://surfaid.org/surfaidstory) and Disaster Relief Australia (https://disasterreliefaus.org/).

Arrangements must promote and embrace foresight and sense making

Foresight and sense making are foundational to proactive planning and effective decision making. Foresight analyses current and future trends at regional, national and global scales and considers challenges and opportunities posed to future disaster risk (Lentini, 2015), whilst sense making focuses on understanding the current disaster situation. Effective foresight and sense making are critical to reducing the consequences of a disaster as evidenced by the many events that mitigation and early warning systems have enabled the saving of lives and avoidance of damages.

When considering future risk, leaders may struggle with threat recognition only identifying the signals of the impending disaster in hindsight following an event, or place to much faith in risk reduction measures assuming that they will eliminate risk. Often significant future risks are given less priority than squeaky wheel short term issues (Boin et al., 2016).

During disasters, decision makers are challenged by incomplete, contradictory and uncertain information, sometimes described as the fog of war. They need to decide how to make sense of an unfolding disaster to limit its consequences (Boin et al., 2016). "Making sense of a crisis is one of the hardest tasks in crisis management. Having to decide without knowing creates a terrible conundrum that weighs down on leaders" (Boin and Lodge, 2023). This task only becomes harder as despite the growth in available data disasters are becoming more complex.

Sense making is a critical precursor to decision making during disasters. Sense making is a continual process based on available information and intelligence whilst managing and understanding inherent uncertainty including regarding the nature of the threat and courses of action (Maclean, 2017). Uncertainties are often compounded by changes to an event including compounding and cascading impacts that may result in unforeseen consequences resulting in rapid escalation (Boin et al., 2016). Communication disruptions can also hamper the flow of critical information to inform the sense making of decision makers.

The information that is required for sense making differs by event (Penney et al., 2022) and the operational level at which it is being considered for example at local levels focus will be on the immediate minutes to hours whilst at strategic levels on longer timeframes of weeks to months (Department of the Prime Minister and Cabinet, 2019). Individuals and teams with different expertise and experience will also vary in their interpretation of information and organisational politics can inhibit information sharing making it difficult to establish a common understanding of an event (Boin et al., 2016; Penney, 2022). Open data exchange, scenario modelling, early warning systems and decision support tools are key enablers of effective foresight and sense making.

Ansell and Boin (2019) identify a pragmatic approach that recognises decisions are being made in the face of uncertainty. Strategic leaders should recognise that each decision or action is itself an experiment designed to not only resolve the crisis but to test their understanding of what is happening. They say:

> *… a "rational" model of decision making is not well suited to understanding, let alone guiding action under the crisis conditions of novelty, uncertainty, and instability. Under such conditions, decision makers simply cannot start with clear, well-defined strategic objectives (ends) and then optimize the means to achieve those ends by collecting the information necessary to fully evaluate them. In a crisis (and, we would argue, in many other situations), strategic objectives must be partially discovered through action using fallible knowledge. Decision makers must figure out what to do while figuring out what they can do (Ansell and Boin, 2019, p. 1100).*

Fugate (2011) argues that uncertainty should not limit action and that decisions will need to be made based on possible consequences to provide for a timely response rather than waiting for actual confirmation of impacts and missing the opportunity to influence the disaster's consequences. Major-General Stretton describes these considerations in his decision making in response to Cyclone Tracy:

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

To enhance sense making the National Emergency Management Agency has developed the Crisis Appreciation Strategic Planning (CASP) process.

CASP consists of processes and products that make the complex, simple. Simple – but not necessarily easy. The fundamental purpose for using CASP is to lower the risk of negative outcomes and increase the chances for positive outcomes. CASP accomplishes this through a structured, systematic methodology that uses strategic thinking and conceptualising the big picture in emergency planning.

The CASP process facilitates a diversity of thought, perspective and input so that informed decisions guide operations. It requires team input at critical steps during planning to create a common operating picture that informs decisions and generates meaning.

The process consists of the steps of:

1. Define the environment: establishment of initial common operating picture and situational awareness.
2. Mission analysis: establishment of the strategic intent and lines of effort to achieve desired end state.
3. Course of action to give effect to lines of effort: evaluation of options to accomplish lines of effort.
4. Execution: tasking and coordination (NEMA, 2023).

Other similar processes exist within other organisations for example the Australian Defence Force's use of the Joint Military Appreciation Process.

Case study: challenges in foresight and sense making

The 2004 Asian tsunami demonstrated the escalation of consequences because of insufficient foresight and sense making. Despite previous history of damaging tsunami (Rubin et al., 2017) no tsunami warning system existed across the Indian Ocean meaning that following the devastating 9.1 M earthquake tsunami waves arrived at low lying coastal communities across the Indian Ocean basin without warning resulting in at least 227000 fatalities (AIDR, 2023). In recognition of the importance of early warning capability a tsunami warning system has since been established for the Indian Ocean.

An Australian example of the challenges associated with foresight and sense making was the November 2016 Thunderstorm Asthma outbreak. This event saw a surge in demand for health response because of evening thunderstorms and high pollen levels. The event occurred rapidly with people seeking emergency medical treatment in record numbers, resulting in an additional 3270 hospital presentations over a two-day period and nine deaths. Initially the cause of the event was unknown and there was no understanding of the true scale of the consequences, creating challenges for decision makers as to how to respond. A review of the event concluded that if decision makers had been in possession of all available intelligence and the emergency response escalated appropriately that an improved response would have been possible via enhanced management structures, information sharing and warnings to the community (Inspector-General Emergency Management, 2017). Following the event, a warning system for thunderstorm asthma was developed to provide thunderstorm asthma risk forecasts.

Arrangements must be supported by capability

Planning activities are of little use unless resources are available to support required response and recovery activities (Sutton and Tierney, 2006) and there is capacity to mobilise them noting that in a catastrophe it will be true, almost by definition, that sufficient resources are unlikely to be available. The US Government Accountability Office (2006, p. 7) review of Hurricane Katrina stated:

> *… substantial resources and capabilities marshalled by state local and federal governments and non-government organisations were insufficient to meet the immediate challenges posed by the unprecedented degree of damage and resulting number of hurricane victims caused by Hurricane Katrina and Rita. Developing the*

> *capabilities needed for catastrophic disasters should be part of the overall national preparedness effort that is designed to integrate and define what needs to be done, where, based on what standards, how it should be done, and how well it should be done.*

Planning should identify the demands that a catastrophe might impose, and the resources needed by agencies to undertake their roles and responsibilities including possible timing (Tierney, 1993; Perry and Lindell, 2003; Alexander, 2005). This should then be compared with resources available such that gaps can be identified. This process should include the identification of atypical resources and service providers that might be able to assist (Ardagh et al., 2012).

Capability must be supported by exercising. Regular exercises assist to build awareness and knowledge; improve decision-making skills, enhance relationships between collaborative partners (Boin and 't Hart, 2010) and test plans (Perry, 2004). Short of actual events, these offer the best opportunity to test plans and to ensure they are understood. In the aftermath of Hurricane Katrina, the US Government Accountability Office (2006) concluded that inadequate exercising before the event had created a lack of understanding as to the types of assistance that would be necessary, the required timing for assistance and the contributions organisations might provide. Perry (2004) in evaluating an emergency exercise found that exercising enhanced participants teamwork and perceptions of response knowledge. In a similar evaluation, Alim et al. (2015) found that training and drills improved knowledge and ability regarding disaster preparedness. Fugate (2017b), however, challenged the way emergency managers exercise arguing that exercises are focused on scenarios in which emergency management agencies are capable of handling rather than considering truly catastrophic events. In other words, there is no stretch involved.

Arrangements must foster interoperability

Interoperability of personnel, equipment and systems is key to enabling effective collaboration and coordination between agencies (Binskin, M.D., et al , 2020). Interoperability is defined as the ability for resources from different agencies to work with each other (Kapucu et al., 2011). Put simply, those agencies involved in collaboration must achieve interoperability in order to achieve their objectives.

Interoperability is of particular importance given that any response to a catastrophe would require a nationwide and possibly an international response, however, interoperability would likely be limited due to the emergent nature of some responding agencies. Such a diversity of organisations requires a system of systems approach where individual agency systems consisting of personnel, equipment and technology connect with each other whilst maintaining their independence. Such approaches in theory can be enabled by common technology, governance structures, standard operating procedures and training and exercising (Barnes, 2015).

Emergency services in Australia have worked to improve interoperability through the adoption of common systems such as AIIMS by all jurisdictions. However, as highlighted by the Royal Commission into National Natural Disaster Arrangements (Binskin, M.D. et. al.,2020) there are ongoing challenges and opportunities for increased interoperability for example communications equipment and training and qualifications for emergency response personnel.

An international example of arrangements to enable interoperable capability is the International Search and Rescue Advisory Group (INSARAG). INSARAG guidelines state:

> *In order to ensure interoperability between the different levels of USAR response, it is vital that working practices, technical language and information are common and shared through all levels of the USAR response framework* (UNOCHA, 2015, pp. 13).

The group, among other initiatives to promote interoperability, has developed guidelines and methodologies to ensure standardised training and structures for international USAR teams and internationally accepted markings for use on buildings during USAR operations to improve communication between teams.

Case study: interoperability

The devastating 2009 Victorian Black Saturday Bushfires that claimed 173 lives exposed gaps in interoperability between Victoria's fire services. Regarding the use of systems by Victorian fire services (CFA and DSE) the Royal Commission (Teague et al., 2010, p. 121) found:

> *The CFA and DSE used different systems to do similar tasks. Access to the systems for all incident management team staff was not always possible. This made the use and transfer of information such as warnings, maps, and situation reports, difficult.*

The Commission subsequently recommended that Victorian fire services:

> *Standardise their operating systems and information and communications technologies with the aim of achieving greater efficiency and interoperability between agencies* (p. 124).

Internationally, a lack of interoperability between agencies was found to have contributed to the magnitude of the Hurricane Katrina disaster. Deficiencies in interoperability contributed to poor information flow which resulted in poor situational awareness and understanding of the needs of survivors. For example:

> *Furthermore, lacking an integrated search and rescue incident command, the various agencies were unable to effectively coordinate their operations. This meant that multiple rescue teams were sent to the same areas, while leaving others uncovered* (The White House, 2023).

Arrangements must be supported by planning processes

The basis for planning lies in the principle that effective response and recovery are based on a pre-designed plan that maps the various activities that will be necessary during an emergency (US Government Accountability Office, 2006). It seeks the most effective use of resources under extreme circumstances (Alexander, 2005). Emergency planning has been described as a systematic and ongoing process, preparing organisations for the response to, and recovery from, emergencies. It evolves as lessons are identified and addressed, and circumstances change (UK Cabinet Office, 2011). Key objectives of emergency plans should be to facilitate the protection of life; ensure resources are allocated effectively (Alexander, 2005); increase multi-agency and community resilience by ensuring that all those responsible for managing the emergency on behalf of the community know their role, are competent to carry out their roles and have access to available resources.

Often in frequent, small events, when uncertainty and time pressures are low, existing plans and procedures are sufficient to guide an adequate response (Boin and 't Hart, 2010). However, during catastrophic events additional challenges are presented: essential infrastructure and critical resources may not be available, for example, overwhelming plans and pre-existing approaches (Kapucu, 2008; 't Hart, 2013; Boin and 't Hart, 2010). Command-and-control structures may fail if they assume uninterrupted communications (Kapucu and Van Wart, 2006). Quarantelli (1998) argues that there is often a large gap between what is planned and what actually occurs in major disasters. Timothy Manning of FEMA in comments about disaster planning in the United States said that "FEMA had come to realise that its disaster planning worked well for 'average disasters' but beyond that, it failed catastrophically" (Lahey, 2013, p. 5). McConnell and Drennan (2006) make similar findings outlining four key challenges to planning including: catastrophes are low probability events that require large resources, whose provision will often compete with other policy issues for funding. Planning requires ordering and coherence of possible risks, yet catastrophes are unpredictable; planning requires the integration of networks, however, in reality networks are fragmented; and planning requires active preparation through training and exercising but given the cost of these often only symbolic preparedness is possible. These challenges were illustrated throughout the COVID-19 pandemic where despite preparation by governments world-wide, extreme challenges were experienced in controlling the virus and managing consequences (Boin et al., 2021).

Though researchers note its limitations the utility of planning is argued to be in building networks of collaboration, establishing a starting point (Boin and 't Hart, 2010) and building mental preparedness (Boin and Bynander, 2015).

Plans may be essential, but they are only one of the elements underlying preparedness (der Heide, 1989; Sutton and Tierney, 2006; Boin and 't Hart, 2010). Plans can be illusory, if other requirements are neglected, creating a false sense of security (Boin and 't Hart, 2010). This has been referred to as the 'paper' plan syndrome (der Heide, 1989) or the production of 'fantasy documents' (Boin and 't Hart, 2010). Heide (1989) argues that disaster planning is an illusion of preparedness unless based on valid assumptions about human behaviour, incorporates an inter-organisational perspective, is tied to resources, and is known and accepted by the participants. Focus should be on the process of planning rather than just the production of a written document (Quarantelli, 1998; Boin and 't Hart; 2010; Eriksson and McConnell, 2011).

Traditional methodologies argue that plans should be multi-hazard in their focus, whilst incorporating special considerations associated with individual hazards (Sutton and Tierney, 2006; Quarantelli, 1998). This is based on the principle that the same general tasks will largely need to be planned for regardless of hazard type (Tierney, 1993). Alexander (2005) argues that multiple plans can result in conflicts and ambiguities, while Quarantelli (1998) argues that since societal responses are similar across different hazards, the nature of the specific hazard should not matter.

Though traditional approaches to planning have utilised all-hazard methodologies, it has been suggested in the context of planning for catastrophic events that a specific scenario-based approach may be preferable (Ruback et al.). This approach is recommended due to the complexities and possible geographical size of a major emergency that would not be appropriately covered off by a generic all hazards plan. Scenario based planning uses a specific scenario to establish a framework for modelling the consequences of an event, modelling the possible resources required to respond and evaluate existing emergency management

capabilities (Ruback et al.). Boin and 't Hart (2010) suggest that good practice involves a mixed approach of combining generic all hazards planning with a suite of specific contingency plans.

Planning should anticipate the range of problems that might occur and the possible solutions to them (Quarantelli, 1998) including their timing. Many of these problems can be identified based upon lessons from previous events (der Heide, 2006), however, it is impossible to anticipate everything or accurately predict problems ahead of time (Quarantelli, 1998; Eriksson and McConnell, 2011). McConnell and Drennan (2006) identify a paradox in that the more elaborate and detailed a plan is, the less likely it will be used during an event. Plans should therefore be focused on general principles and not specific details, encouraging flexibility, adaptation and improvisation (Quarantelli, 1998; Perry and Lindell, 2003; Eriksson and McConnell, 2011). In this sense, plans should assume that informal responses will emerge rather than espouse management based upon prescriptive formal procedures that may be utilised for routine emergencies. As stated by Tierney (1993, p. 37) "if a situation could be handled through routine organisational operations and standard procedures, and if all its details could be planned out beforehand, it would not be a disaster".

Arrangements must be responsive and support elected officials decision making and crisis leadership

All catastrophes have a political dimension as political leaders undertake key roles either defined in legislation or not and respond to media interest and public demands for information and accountability. As highlighted during the COVID-19 pandemic political leaders are often key to coordinating and influencing the interests of citizens for the public good (Antonakis, 2021). Plans should support the effective implementation of accountabilities held by political leaders at all levels of government and must consider processes and procedures to maintain their situational awareness (Department of Homeland Security, 2008).

Conclusion

Australia is well prepared for the types of disasters that we are familiar with – bushfire, floods and storms – as well as disasters that we can foresee are likely to arise in areas of portfolio responsibility – public health, biosecurity, etc. Current plans assume an identified lead agency will coordinate with others who have agreed to be part of the response network, they will bring resources to bear to control the hazard and/or its consequences and bring relief to an affected population.

Catastrophic disasters will be different. They will be catastrophic *because* they are different. Plans will fail, resources will be inadequate, emergent groups will arise and take the lead and need to be supported. Disasters will compound leading to multiple events requiring different responses at the same time. Australia needs to plan for when the plan fails.

This report has identified, from the literature, ten principles that should be applied to develop best practice crisis management arrangements for catastrophic disasters. They are not principles to be applied in the face of a disaster but in putting together arrangements to manage the disaster that is as yet unidentified and 'is beyond our current arrangements, thinking, experience and imagination'. The ten principles are:

1. arrangements must allow for a nationwide approach
2. arrangements must allow for a collaborative and coordinated approach
3. arrangements must allow for decentralised decision making and distributed execution supported by centralised strategic coordination
4. arrangements must allow for flexibility, improvisation and scalability
5. arrangements must allow for the integration of civilian and emergent capability
6. arrangements must promote and embrace foresight and sense making
7. arrangements must be supported by capability
8. arrangements must foster interoperability
9. arrangements must be supported by planning processes
10. arrangements must be responsive and support elected officials' decision making and crisis leadership.

These are in addition to principles that promote post-disaster learning and improvement.

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