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Recognising and measuring competency in natural hazard preparation: a Preparedness Competency Index

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Abstract:	With weather-related natural hazards increasing in number and severity, it is more important than ever for communities to prepare for all types of hazards. However, the literature does not reveal what such preparedness looks like – how much preparation is enough and, conversely, how low levels of preparation can be easily recognised by emergency agencies. This study maps Australian emergency agency understanding of competencies that are needed by individuals and communities for effective preparation. Using in-depth semi-structured interviews of 30 emergency agency, local council and not-for-profit organisation staff from all Australian states, participants identified a range of community and individual features that they had seen in un-prepared and well-prepared communities and which they believed were key competencies for protective action. These competencies were then mapped against participants' perceptions of five different levels of preparation, resulting in a Preparedness Competency Index that allows agencies to benchmark preparation in communities, as well as to recognise when lack of preparation competency leaves groups vulnerable.

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Abstract

With weather-related natural hazards increasing in number and severity, it is more important than ever for communities to prepare for all types of hazards. However, the literature does not reveal what such preparedness looks like – how much preparation is enough and, conversely, how low levels of preparation can be easily recognised by emergency agencies. This study maps Australian emergency agency understanding of competencies that are needed by individuals and communities for effective preparation. Using in-depth semi-structured interviews of 30 emergency agency, local council and not-for-profit organisation staff from all Australian states, participants identified a range of community and individual features that they had seen in un-prepared and well-prepared communities and which they believed were key competencies for protective action. These competencies were then mapped against participants' perceptions of five different levels of preparation, resulting in a Preparedness Competency Index that allows agencies to benchmark preparation in communities, as well as to recognise when lack of preparation competency leaves groups vulnerable.

Keywords: natural hazards, competency, preparedness, protective action,

1 Introduction

The United Nations reports that recorded weather disasters such as wildfires, storms and flooding have increased significantly since 1980. Large flood events have doubled in number, the number of damaging storms has risen by 28% and the number of large scale wildfires increased from 163 from 1980-1999 to 238 from 2000 to 2019 (Centre for Research on the Epidemiology of Disasters, 2020). In Australia, the cost of natural hazards in 2020 was $AU9bn, with the 2019-20 bushfires estimated to have caused $2bn of insured losses and around $3.6bn in economic impact to tourism, hospitality, agriculture and forestry (Royal Commission into Natural Disaster Arrangements, 2020). The health effects of persistent smoke across Australia may have cost a further $2bn (Royal Commission into Natural Disaster Arrangements, 2020).

Since natural hazard risk is increasing, preparing for these events has become a priority around the world. A central aim of the 2015 United Nations Office of Disaster Risk Reduction Sendai framework 2015-2030 (United Nations, 2015) is to see improvement in the ability and prevalence of communities and householders to plan and prepare for unpredictable hazards, and in their resilience to the impact of disasters. Empirical research has shown that for every $US1 spent on mitigation, society saves $US4 in disaster losses (Godschalk et al., 2009), and saves $13 in rebuilding to the existing code (National Institute of Building Sciences, 2019). Higher levels of flood preparation have been shown to result in fewer physical health problems and adverse experiences, lower PTS, and faster recovery (Grineski et al., 2020), thereby reducing costs to health networks.

These findings drive the imperative of many emergency agencies and local governments to build community capacity and capability in preparation for natural hazards, and encourage

communities to take over this role through community-led approaches (Johnston, Ryan & Taylor, 2019). To do this, agencies and local governments use a range of community engagement techniques, many of which should be used in certain circumstances and matched to communities of certain features, background and capability in emergency management (see Ryan, Johnston, Taylor & McAndrew, 2020), health (Tangseefa et al., 2018) and online community participation in local government (Afzalan, Sanchez & Evans-Cowley, 2017). Therefore, selecting the right technique requires a knowledge of the current capacity of the community, and where that community currently sits in terms of its competency in natural hazard preparation, attitudes and receptivity. It also requires a knowledge of the range of competencies specific to well-prepared communities.

This article advances a natural hazard preparedness competency Index that can provide emergency managers with a guide to identifying where a community sits in terms of its level of preparedness. Such an index will help emergency community engagement practitioners more effectively motivate and support individual and community capacity-building, and encourage their communities to ultimately take responsibility for their own safety before, during and after a natural hazard.

The article begins by defining and explaining capacity, capability and competencies. Drawing upon and extending Paton et al.'s work (such as 2006), we consider the role and nature of preparedness competencies in supporting natural hazard protective actions by communities. The next section of the article conceptualises and operationalizes competencies within the natural hazard preparedness capability. The third section introduces the two stages of developing and drafting an Australian competency index.

The final section considers the theoretical and practical implications of the index for improved natural hazard preparedness.

2 Understanding capacity, capability and competencies

Increasing the capacity of the community to withstand and recover from a natural hazard is a key focus of community engagement by Australian emergency management agencies (Council of Australian Governments, 2011). Capacity-building is a term that describes the aims of both emergency and non-emergency community engagement (see, for instance, Australian Institute for Disaster Resilience, 2020, p. 4). The Australian Institute for Disaster Resilience glossary (n.d.) defines it as capacity development, specifically, as:

> *…the process by which people, organisations and society systematically stimulate and develop their capacities over time to achieve social and economic goals. It is a concept that extends the term of capacity -building to encompass all aspects of creating and sustaining capacity growth over time. It involves learning and various types of training, but also continuous efforts to develop institutions, political awareness, financial resources, technology systems and the wider enabling environment.*

The National Strategy for Disaster Resilience (Council of Australian Governments, 2011, p.2) uses the synonyms 'capacity' and 'capability' . At least two Australian emergency management agencies employ staff responsible for developing "community capability" via community engagement (Australian Institute for Disaster Resilience, 2020). Scholars in the field of disaster preparedness also describe their work in terms of investigating community

capacity-building (Bromley et al., 2017; Paton, 2006; Paton & McClure, 2013; Sandanam et al., 2018) and community and adaptive capability (Dufty, 2008; Elsworth et al., 2010).

Capability is a concept that emerged in the mid-1980s in an organisational context in response to rapid changes in the nature of work and learning (Phelps, Hase & Ellis, 2005). Capable people are learning-focused, creative and apply competencies in a range of familiar and unfamiliar situations (Hase & Kenyon, 2000). These 'competencies' are interlinked clusters of knowledge of concepts and processes; skills, abilities, behaviours and strategies; and attitudes, beliefs, values, dispositions, personal characteristics, self-perceptions and motivations (Epstein & Hundert, 2002), whereas 'capability' is the integration of knowledge skills and personal characteristics that are used appropriate to a situation and which contribute to an all-round human quality (Cairns, 2000, p.2).

In a natural hazards context, Paton, McClure and Burgelt (2006) described community competency as facilitating an increase in the likelihood of sustained action, but were not explicit on what a comptency looked like, apart from identifying self-efficacy, action coping, sense of community and a problem-focused approach. Outside the natural hazards field, Kaslow et al. (2018) summarised competencies for development of professionalism in psychology into the clusters of knowledge, skills and attitudes. Competency is more specifically defined and limited than capability (Phelps, Hase & Kenyon, 2005) and there is no definitive line where a person is competent or capable – rather, they have competencies and capabilities, which may make them competent in one field within one of their area/s of capability. Competencies relate to performance and can be improved through education (Kaslow et al., 2018) and engagement (Dufty, 2011) .

Kaslow, et al. (2018), guided by Epstein and Hundert (2002), summarised the dimensions of competence to be:

- knowledge (of concepts and processes);
- skills (abilities, behaviours and strategies)
- attitudes (including beliefs, values, self-perceptions and dispositions)
- personal characteristics; and
- motivations

However, their focus was on the first three competencies in this framework, and their research did not further examine personal characteristics and motivations. When reviewing the natural hazard preparedness literature, these aspects of an individual's persona emerged as influences on both material and psychological preparation, and they were included in the foundation framework for this study.

This study examines Australian emergency agency community engagement practitioners' perceptions of individual and community competencies within the preparedness capability of individuals and communities. The study adapts the Kaslow, Finklea and Chan (2008) competency framework, with additions suggested by Epstein and Hundert (2002), and applies these frameworks to a community setting. The next section examines the different competencies considered essential within natural hazard preparedness capability.

3 Competencies within the natural hazard preparedness capability

The lack of discussion around competencies for natural hazard preparedness forces us to turn to other fields for guidance. Drawing on the work of Kaslow et al. (2018) relating to employment in the field of psychology, the five dimensions of competence provide a

competency framework considering each of the influences to clarify the competencies required for effective natural hazard preparation at household and community level. These dimensions include: (1) Knowledge of concepts and processes; (2) Skills, abilities, behaviours and strategies; (3) Attitudes, beliefs, values, self-perceptions and dispositions; (4) Personal and demographic characteristics and situational factors; and (5) Motivations. Each of these will now be discussed.

3.1 Knowledge of concepts and processes

How much and what people know matters. Knowledge of how a natural hazard will act, and its potential effect on householders had some impact on preparation levels, but, a range of other factors that contribute to competence also influence whether the effect was positive or negative. Experience is not always a motivator for preparation, but that those who have experience in more than one hurricane tend to prepare more, probably because their knowledge of the hazard is more complete (Kleier, Krause and Ogilby, 2018). Traumatic cyclone experience with trait anxiety and avoidant coping styles can lead to low preparation levels (Morrissey & Reser, 2013), but on the other hand, increased damage in a previous hazard increases preparation levels for the next one (Onumo et al, 2017). In North Queensland, cyclone experience supports intermediate and advanced preparation (Office of the Government Statistician, 2012, 2013). For bushfire, increased knowledge and/or experience was a factor in high levels of psychological preparedness (Boylan, 2016; Every et al., 2019), but gender could be a factor affecting knowledge and confidence in preparation (Tyler et al., 2012). Experience in the process of emergency agencies is also a factor in increased preparation (Every et al, 2019). Experience seems to usually contribute to knowledge of the hazard and therefore increase the likelihood that people will undertake

preparation. Knowledge of the hazard, and information seeking to gain that knowledge, is an important natural hazard preparedness competency that is generally increased by experience, and this becomes the first competency to emerge from this discussion.

3.2 Skills, abilities, behaviours and strategies

The second cluster of the competence framework is the range of skills, abilities, behaviours and strategies that people use day to day that could motivate them to prepare for a natural hazard. Hazard survival plans, and the form they come in, are prominent in emergency agency preparedness information (such as Federal Emergency Management Agency, 2004; NSW Rural Fire Service n.d.; NZ Department of Civil Defence, 2018; and Queensland Rural Fire Service, 2015) that provide guidance on preparation strategies. Physical ability and disability/mobility emerged as important (Every et al., 2015; Kleier et al., 2017; Martins et al., 2019), as did being able to visualise what good preparation looks like (Sturtevant & McCafferty, 2006).

Agencies and some researchers articulate differences in terms of effect between no plan, a mental plan, a written plan and a plan shared with the rest of the household. Most literature has found connections between levels of preparation and the level of commitment to a plan – for instance, having a plan increased the likelihood of residents in the path of a tornado taking protective action (Cong et al., 2012), with written plans producing better outcomes than mental plans, which are better than no plan at all (Boylan et al., 2013; Mulilis, 1999; McLennan, 2014; Whittaker et al., 2013). However, the more complex the plan, the lower the number of people with one: Eriksen et al. (2016) found that 12% of their New South Wales sample had a written plan, 26% in South Australia and 11% in

Tasmania, while mental plans were held by 64% of households. However, there seem to be pitfalls in a mental plan – once householders have made the decision that they will leave (rather than stay and defend), they were not likely to invest time or money in preparing their property (Prior, 2010; Prior & Eriksen, 2012; McLennan, 2014).

In this instance, the level of purposeful planning, such as having a written or mental plan with preparedness outcomes that is shared with all of the other members of the household, has emerged as a necessary competency for effective natural hazard preparedness (especially bushfire). The second competency to emerge from this discussion is physical ability, which affects the time people need to get ready, and their ability to undertake the tasks required. A third competency is being familiar with what preparation should look like.

3.3 Attitudes, beliefs, values, self-perceptions and dispositions

The tendency for an individual to recognise risk and then undertake preparation for a natural hazard is influenced by a range of cognitive factors (Paton, 2019). Researchers have investigated these cognitive factors since the early 2000s (especially Paton and colleagues), and have discovered interplay between a range of complex cognitive factors. Many of these cognitive factors are important in psychological preparation for a natural hazard and influence material preparation (Every et al., 2019).

Paton (2003) described natural hazard preparation as a process that includes factors that motivate people (precursor variables), followed by variables that link this motivation to intention, and finally, the variables that link this intention to preparation activity (Paton, 2003). Key among the precursor variables was the individual's realisation of risk, and then personalisation of that risk to their household (Paton, 2003), which does not always reliably follow the initial recognition of risk. McLennan et al.'s (2017) theory on this was that a small

number of people will deny the risk, and this was supported by Strahan and colleagues' work on evacuation archetypes, with between 9.8% and 13.6% of their samples making up the 'threat denier' archetype (Singh et al., 2021; Strahan et al., 2019; Strahan, 2020). A perception of low self-efficacy (Paton, 2019; Xu et al., 2018) and the pointlessness of getting ready (Koksal et al., 2020; McNeill et al., 2014; Prior, 2010; Prior & Eriksen, 2012) can be an underlying factor in this threat denial.

Other studies have shown that individuals will employ optimism bias to justify taking no action (Mackie et al., 2013; Becker et al., 2017) or they will be too busy to undertake mitigation or preparation activity (McNeill et al., 2015; Paton et al., 2006). Failure to prioritise action against the risk, to let everyday life get in the way is a finding across hazards, but mainly bushfire (McLennan et al. 2015; Paton et al., 2006). Recognition of risk, personalisation of risk and prioritisation of risk are distinct steps in the preparation process and will be recognised in this study as three separate competencies.

Another well-researched aspect of preparation is that individuals who are strongly networked within their community and have strong social connections locally will be more likely to undertake material preparation, and will be more psychologically prepared (Kim & Kang, 2010; Mackie et al., 2013; McLennan et al., 2012; Prior 2010). In fact, Paton (2020) identifies social systems as critical to the interpretive and transformative process involved in preparation, and how this supports people's ability to adapt and cope with a possible environmental challenge. The importance of social connections and strong local community capital points to the conclusion that connection to community is a third important competency in this cluster.

The cognitive processes that lead to action or inaction are well represented in the literature – fear of what other people think, optimism bias, outcome expectancy and risk compensation bias are all negative framing factors that present obstacles to preparation. On the other hand, McNeill et al.'s (2015) identification of 'the need for cognition' and self-efficacy show how a positive view of the thinking process that accompanies hazard risk recognition can manifest, and it is supported by Boylan and Lawrence (2020) and Every et al. (2019). This indicates that the ability to think about and collect information on the risk, and an individual's confidence in their own abilities and mastery of a situation will enable people to positively frame hazard preparation and its outcomes. Positive framing, according to McNeill and her colleagues (2015), and a self-sufficient coping style (Every et al., 2019) are features of well-prepared individuals – and each form a valuable competency for people at risk of natural hazards.

Mental health indicators, such as depression, anxiety and stress, and strategies to reduce their effects (such as mindfulness) are considered critical indicators of psychological preparedness for a natural hazard (Every et al., 2019; Boylan & Lawrence 2020). People who score lower on the health indicators are less likely to prepare (McLennan et al., 2019), while people who score highly on mindfulness are more likely to get ready for a natural hazard (Every et al., 2019). These findings lead us to suggest that strong mental health and proactive strategies for mental health are competencies for natural hazard preparation.

In summary, eight competencies emerge from this aspect of the literature: recognition of personal/household risk; personalisation of that risk; prioritisation of the risk; strong connection to community and place; positive situational framing; self-sufficient coping styles/self-efficacy; strong mental health; and a proactive approach to mental health.

3.4 Personal and demographic characteristics and situational factors

Personal and situational factors such as age, gender, physical ability, location, or economic circumstances are traditionally measured as potential influences on the ability of the individual to undertake preparation and the level of that preparation (such as Heath et al. 2011; Sattler, Kaiser & Hittner, 2000). However, this is not always the case (Lindell et al., 2005) and it is difficult to find a study that can say that demographic factors have an effect on preparation. One exception is cost – for example, more advanced fire or storm preparation activity might include installing shutters over windows and independent power. Several studies have confirmed the negative effect of cost (Eriksen & Gill, 2010; Heath et al., 2011; Prior 2010), and wealth is associated with more protective actions, although not if property owners are older than 65 years (Zamboni et al., 2020).

A feature of this section is that there is considerable cross-over between the characteristics identified here and those reviewed in the previous clusters. In addition, individuals of certain demographics can be influenced by all of the clusters reviewed in the previous sections. For instance, longevity within a community cannot be separated from community connectedness, and personalisation of risk leads to protection of livelihood for some residents. In addition, older people, considered in some studies as more vulnerable (Kleier et al. 2018; McGee & Russell, 2003) can also be highly connected to their community and better resourced (McGee & Russell, 2003).

This category featured two groups of characteristics: demographic features and situational factors. Demographic features, for instance, covered age, race and ethnicity, gender, and marital status, and could not be classified as competencies that could be developed with education, engagement and support. Situational factors relating to household income and

resources (including insurance), the local environment and specific weather behaviour, living in an area subject to government vegetation regulation, living in an agricultural community, and longevity in the community were also difficult to build into competencies. One factor that could emerge directly from this section as a competency was education , which could be viewed as formal education as well as education by agencies and local government about the risk and preparation for the natural hazard.

3.5 Motivations

Motivations for getting ready for a natural hazard are a powerful trigger once risk is personalised. As a competency, motivation relates to how an individual "can discern that their self-interest will be served" (Rothschild, 1999, p. 31). As such, motivation, combined with opportunity and ability offers a framework of motivation, opportunity and ability (MOA). The MOA framework was first used within information processing (MacInnis & Jaworski, 1989), then later applied within a social marketing context (Rothschild, 1999). So while **motivation** relates to personalised risk, **opportunity** is the circumstances optimising preparedness involvement and **ability** relates to "individual skill or proficiency at solving problems" (Rothchild, 1999, p. 32). These underpin motivation as a competency in preparedness.

Five key motivations were identified in the literature for preparation and protective action: the composition of households; caring roles for pets and animals; protection of livelihoods; not being the owner of the property; and personalisation of risk.

The composition of a household will increase the likelihood of evacuation as a preparation tool. Households with children (Singh et al., 2021), disabled members (Van Willigen et al., 2002; Spence et al., 2007) and elderly (Kleier et al., 2017) differed in their levels and

strategies of preparation. More likely to be prepared are farmers (high levels of preparation) (Smith et al., 2015), women with pets (Every et al, 2019) and pet owners experienced with a natural hazard, in this case bushfire (Trigg et al., 2015; Taylor et al., 2015). The preparation of farmers in relation to the care of animals was linked to protection of livelihood (McLennan et al., 2015; Smith et al., 2015).

People who rent their home are less likely to clean gutters, read preparation literature, or discuss a plan with their household (Beringer, 2000), and people who realise that they or their property are at risk are more motivated to get ready for a natural hazard (Mileti & Darlington, 1997; Paton, 2003).

While none can be classified as competencies, they are interconnected with competencies such as knowledge, experience, resources and recognition and personalisation of risk. For instance, renters seem to be less motivated to develop competencies in risk recognition, risk personalisation, information seeking and knowledge development, and planning. Farmers often have equipment, experience and knowledge that could well be the result of motivation to protect their livelihood. Motivation itself emerges as a driver of competency development here.

3.6 Summary of emergent preparedness competencies

The review of the literature provides a collection of competencies that can influence hazard preparation by individuals. These are: recognition of risk; personalisation of risk; prioritisation of risk; knowledge of the hazard; having a mental plan; having a written plan; sharing the plan with others in the household; practicing the plan; strong connections in

their local community; personal and community resources; positive approach to situational framing; self-sufficient coping styles; strong mental health; proactive approach to mental health; and longer term membership of a community. Underlying all of this was a range of motivations for getting ready for a natural hazard, the most important of which were recognition and personalisation of risk.

It is clear that general competencies have emerged from international researchers. The question that needs to be asked is how do these competencies occur (or not) in unique national contexts? Now that these competencies are understood in a general context, we now seek to analyse them in a more narrow national context: Australia. By selecting a nation that experiences a myriad of natural hazards, we can compare Australia's competencies to the boarder research outcomes looking for similarities and differences. The findings will provide a national heuristic for natural hazard agencies and practitioners in Australia. The next section provides a summary of a research study that probed the competencies that Australian emergency agency practitioners believe are needed in natural hazard response. The methodology for this study is described below.

4 Research questions

There is value of listening to the voices of the people who work on the front lines of natural hazard preparedness. This study listened to emergency agency practitioners who work with Australian communities in getting ready for a range of natural hazards. Based on the preceding literature review, two research questions guided our study:

RQ1 : What are the key competencies for preparedness that support individuals and communities to be better prepared?

RQ2: How could these competencies be articulated so they could guide knowledge of local community preparedness capability?

The next section details the methods to address these research questions.

5 Method

A qualitative two-stage research design underpinned the study. The first stage was in-depth semi-structured interviews with community engagement practitioners involved in motivating and guiding natural hazard preparedness from which a draft competency index was developed. The second stage was to present this version of the index to practitioners to get feedback on how they felt the index reflected their experience in the field.

Interviews were conducted with 30 community engagement and operational staff with an interest in community engagement from all but two Australian emergency management agencies concerned with natural hazard preparation and mitigation. Also included were community engagement staff from local government, a nationwide hazard relief agency and a not-for-profit community centre. Every Australian state was represented in the sample, and the hazards they dealt with were weather-related and mostly bushfire, flooding, cyclone and severe storm. Criteria for sampling of participants were applied at three levels: natural hazard type, type of agency, and location. Table 1 summarises the sample against these criteria.

1	Disaster type	Slow flood Flash flood Cyclone Bushfire (southern Australia) Bushfire (northern Australia) Storms
2	Type of agency	State Local government Community
3	Location	All Australian states and territories

Table 1: Profile of the sample of respondents

Table 2 below summarises the agency types represented in the sample:

EM agencies*	25
LGA	3
Not-for-profit/others	2
Total	30

* Includes oversight agencies

Table 2: Sample representation by type of agency

The interviews were conducted from October 2018 to January 2019, by telephone and online using the meeting software, Zoom. Ethics approval was granted by the university ethics committee of one of the researcher, and all participants received full disclosure for consent prior to participating. Each session was recorded and professionally transcribed (verbatim), with interviews taking between 40 - 80 minutes. Empirical and grey literature was used to build an open-ended question interview guide and participants were asked questions about their role, the community engagement approach they employ, what they have found works and doesn't work, their ideas on what preparedness looks like, and competencies they thought people needed for effective preparedness.

The analysis followed Braun and Clarke's (2006) reflexive process of familiarisation, coding, generating initial themes, reviewing the themes, and defining and naming the themes. Inductive thematic analysis centred on competencies practitioners had seen in the field.

6 Findings and discussion

The findings are organised to respond to the two key research questions. The first research question asked*: What are the key competencies for preparedness that support individuals and communities to be better prepared*?

6.1 Key competencies

Based on Woodruffe (1993), competencies were viewed as a set of values and behaviour patterns that a community needs in order to perform its tasks and functions effectively. Two sets of competencies emerged from the data – those held by individuals, and those held by a group represented as a community. Table 3 summarises the frequency of the competencies from the data. All of the competencies except two new competencies – 'Have an emergency kit' and 'See getting ready as their own responsibility' - were already established in the literature.

Competency	**Frequency**
Personalisation of personal and family risk levels	21
Connections to their local community – they care/social norms	19
Base level of information and know where to access it	14
Own resources/resourcefulness; high level of knowledge; physical ability	13
Motivated/activated – 'make time for this stuff' (knowledge to action)	12

Realistic expectations of how they will cope and faith in own ability (self-efficacy)	12
Recognition of the need for a plan/capacity to develop a plan	11
Connection to an agency/agencies	9
See getting ready as their own responsibility	9
Connection to place; longevity in place	5
Sound economically; ability to be outward looking as a result	4
Have an emergency kit	2

Table 3: Practitioner-generated individual competencies for natural hazard preparedness

The data found that personal capability was supported by both cognitive processes and physical activity and that personalisation of risk was an important consideration for natural hazard preparation. There was evidence, however, of dissonance between personal risk and community hazard risk. One interviewee noted:

> *Well, obviously, understanding risk (is important); understanding community and personalising that risk; which sometimes I think rationalising risk is tricky for people, sometimes. They tend to…so they get the broader risk at the community level, but then in terms of rationalising that and personalising it, there's a slight disconnect there (Z339).*

Some participants were realistic about their potential to bring the whole community on board with their community engagement efforts, ideas that are backed up by research (such as Strahan (2020), who found that 'threat deniers made up 13.6% of his sample):

> *And there are some people who we always talk about the '10 per cent' who don't get it, because they are not interested. You know, there's always a group of people, that it doesn't matter what they do, they are not going to listen to you (DS300217).*

Practitioners were also keenly aware that community social networks and social connectedness of individuals provided a solid foundation for preparation activities by individuals. One participant was deeply involved in the recovery of her community from a fatal flash flood, and found herself in the centre of the community's realisation of the

importance of preparation for any hazard. She said that central to this was increased connections between residents of the affected town, so much so that the community adopted a preparation slogan 'Being prepared is being connected':

> *…when disaster strikes, we need each other. So the time to build those connections is now… And we sort of delve into, 'The more people that know what you plan to do, the more people can help you...' (DS300227)*

Two participants talked about the necessity of connections between community and their local council and emergency agencies. For instance:

> *My belief is that a lot of it comes back to community connectedness. (The) my 'community vibe' is that when we see a connected community, they are more likely to be a prepared/resilient community. I think 'connectedness' is a big part of it; and that is connectedness with themselves but, also, connectedness with agencies like us and a whole heap of others. You know, it isn't just about fire and emergency services; it is definitely about connectedness with council and other government departments and a whole heap of different players (DS300232).*

The participants, being concerned with making sure communities know where to get hazard preparation information and how to develop and practice a plan, unsurprisingly suggested that the ability to look for and use information, as well as the ability and motivation for developing a plan, writing the plan down, and practicing the plan as competencies for preparation. One respondent encapsulated their urgings to community on access to information this way:

> *That is the absolute basic level of preparedness. (We tell them) "You need to know how to ensure that you are getting the warning messages; you need to know how to confirm data that you get," because we know people will do that once they get a warning message. So, "How do you - you have got to have a battery powered radio that you can get that information...going onto the computer, you need know which websites are the responsible websites..." (DS300219)*

Resources and resourcefulness were other competencies that featured highly in the analysis, with several participants identifying self-efficacy and individuals' means to equip

themselves as important to preparation. Some also talked about economic situation, as well as its contribution to allowing people the capacity to consider a wider circle than their own family when thinking about hazard risk:

> *First of all, people have to be pretty financially and emotionally sound and okay. So people that are struggling to feed themselves every day, have very limited capacity to think about, you know, their disaster is now and today. Be it flood or the fire, it's so far removed from their personal crisis, that they are not in a head space or in a financial capacity it even look at how they would prepare for something even bigger/catastrophic than not being able to feed their kids tonight when they pick them up from school (DS300227).*

The need for a planning in some form, the sharing of the plan and practicing the plan were ideas that almost all of the participants raised. While there is little research to support the idea that different levels of planning indicate different levels of preparation effect, participants had faith in the effect of this hierarchy (from a mental plan through to practicing the plan) on preparation:

> *In terms of competencies at an individual level, being organised is one of those; that you need to be you know, in order to be a planner or to have a plan, you need to have some kind of organisation that sits around that. You need, I think, some clarity around the decisions that you have to make; so being able to make decisions under pressure, is certainly part of it. But I think that is certainly planning in a response phase, as such (Z341).*

Overall, 12 competencies were suggested by the participants, and in Table 4, these are compared with the 15 that emerged from the literature. Three of the practitioner-suggested competencies had not been identified from previous research. One competency suggested from the interviews, 'possession of an emergency kit', was classified as an action prompted by competency, and was discarded. From this, a total of 17 competencies emerged.

Table 4 - Comparison of practitioner-suggested competencies and those emerging from the literature

Interview competencies	Literature competencies

Personalisation of personal and family risk levels	Recognition of risk; personalisation of risk
Connections to their local community – they care/social norms	Strong connections in the local community
Base level of information and know where to access it	
Own resources/resourcefulness; high level of knowledge; physical ability	Personal and community resources; strong mental health; proactive approach to mental health
Motivated/activated – 'make time for this stuff' (knowledge to action)	Prioritisation of risk protective action
Realistic expectations of how they will cope and faith in own ability (self-efficacy)	Self-sufficient coping styles
Recognition of the need for a plan/capacity to develop a plan	Having a mental plan; having a written plan; sharing the plan with others in the household; practicing the plan
Connection to an agency/agencies	
See getting ready as their own responsibility	Positive approach to situational framing
Connection to place; longevity in place	Longer term connections to the community
Sound economically; ability to be outward looking as a result	Personal and community resources
	Knowledge of the hazard

Table 4 - Comparison of practitioner-suggested competencies and those emerging from the literature

These 17 competencies suggest a globally foundational approach to hazard preparedness is possible. What is clear from the interviews is that the contexts and levels of preparedness relate to the risk and hazard perception in a specific community. A strong theme shared by many participants was that some communities live within a high hazard setting/context and require a high level of preparedness. The next section takes this knowledge and develops a more useable structure for practical application in the form of a preparedness competency index. The first step is to use the interviews to guide the position of competencies on the

index, and then to present the resulting model to practitioners to test the relevance of such an index.

7 An Australian competency index for preparedness

From the interviews findings and literature reviewed, 17 competencies were formally supported. Based on these competencies, a draft index was developed by overlaying these competencies onto a continuum of preparedness where '1' was least prepared and '5' was as prepared as possible. The next challenge was to enable practitioners to easily understand how the competencies could be used in a practical setting, leading to the second stage of the research to answer RQ2, which was: *How could these competencies be articulated so they could guide knowledge of local community preparedness capability?*

To do this, a draft competency index was compiled and critiqued at two workshops attended by emergency communication and community engagement practitioners to firstly develop an index, and then make refinements and ensure the model was applicable to practice. The method to develop the index is described below.

7.1 Developing the index: method

The first workshop, attended by seven practitioners was held in Melbourne, Australia (workshop 1). The second workshop, attended by 13 practitioners, was held in Brisbane, Australia (workshop 2). The list of competencies identified from the literature and interviews was presented to workshop 1 participants. The researchers worked through each competency with participants using a technique similar to QSort method (Block, 1961) asking participants individually and then as a group, where each competency should sit on a

five point scale for preparation. On this scale, 1 was least prepared through to 5 at most prepared (see Figure 1). A baseline was also developed for each level. Where participants disagreed, there was a facilitated discussion to achieve an agreed position to produce the first version of the index. This process was repeated in workshop 2.

During workshop 2, participants identified two key data points that were missing in the index – specifically, a starting point and the transformation junctures. A starting point represents pre-risk recognition, which was identified as 'oblivious to risk'. The transformation juncture represents the transition from receiving and understanding a base level of information to, at the most competent, becoming a source of information. At the conclusion of workshop 2, these data informed how the competencies were positioned on the continuum diagram of preparedness levels, which is presented in Figure 1.

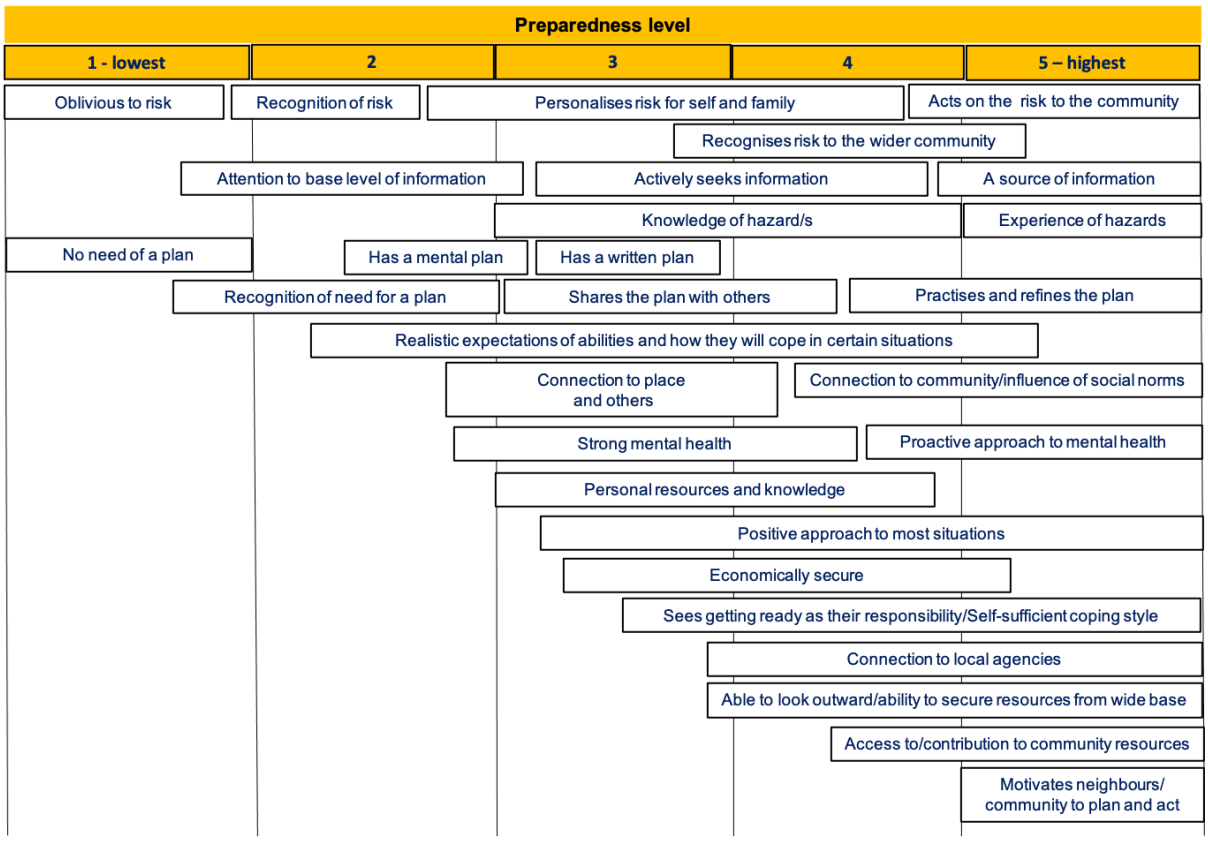

Figure 1 - A Preparedness Competency Index

The Preparedness Competency Index (Figure 1) locates attitudes and behaviours on a scale from 'no preparation' to the highest level of possible preparation. It provides a visual map for community engagement practitioners in the preparation phase to recognise key manifestations of preparedness, and to use these to guide their activity to build on milestones that each target (community) group reaches in terms of preparation. Key points in this index are recognition and personalisation of risk, formal planning at all levels, and personal characteristics of individuals in target communities. All of the competencies can be measured and located on the index using survey, interview and existing archival data at local community level, much of which is already secured by agencies in regular measurement and evaluation.

8 Implications and future research

The competency index developed in this study provides an evidence-based diagnostic tool for competencies for preparedness that can be used by community engagement practitioners and community members. Theoretically, the index empirically supports and formalizes competencies for preparedness and offers future researchers a framework to further differentiate the competency descriptors and refine the positioning aligned to preparedness level. Future research to identify influences from contexts, national cultures, and economic conditions on the index provides further insight.

Practically, the index, informed by community-specific research, provides engagement practitioners with a storytelling tool that visually depicts the preparation journey and what good preparation looks like; something that has been missing to this point. In addition, the index provides experienced practitioners with evidence-based

guidance for preparedness activities that are aligned to where a community sits on the index. Being able to select appropriate community engagement techniques enhances practitioner efforts and success in moving a community to a more prepared state.

The index also facilitates a framework for learning by community members, as a self-diagnostic tool to identify what are the knowledge, skills and values needed in that community to increase a commitment to valuing preparedness and keeping their community safe. The index can facilitate formative tasks around each competency.

There are several limitations recognised in this study. While the index was piloted with practitioners to determine its useability, it has not yet been tested in the field, something that will be a natural next step to build on this research. The index may not be generalisable outside of Australia – so the terminology and adjectives used to describe competencies may be culturally contextually or contextually limited to the area of study.

9 Statement of competing interests

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Recognising and measuring competency in natural hazard preparation: a Preparedness Competency Index

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Declaration of interests

☒The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

☐The authors declare the following financial interests/personal relationships which may be considered as potential competing interests: