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Engaging communities to prepare for natural hazards: a conceptual model

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Abstract

Natural hazard preparation by communities reduces disaster-induced physical health problems and adverse experiences, lowers potential for post-traumatic stress disorders, and aids faster recovery. However, approaches to community engagement for preparedness vary widely leaving those responsible confused and often overwhelmed. This study builds on natural hazards behavior, community development, participatory, and codesign research to understand current community engagement approaches in an Australian context. Key principles for engaging communities were operationalized from document analysis and interviews with 30 community engagement practitioners from 25 Australian emergency management agencies. A thematic analysis of the agency documents and interviews led to a visualization of the pathway to community-led preparedness with the *iterative community-centered engagement model for preparedness.* The model reflects both current practice and aspirations. It contributes theoretically to a collaborative community-led engagement approach for risk personalization and protective action by highlighting the need to develop a deep understanding of the specific features of local communities. The model maps a pathway through different levels of community engagement toward the ultimate aim of a community-led approach to natural hazards preparation. It recognizes the changing circumstances and the situation of communities within their environment, and the barriers and enablers to support community-led preparedness. The model is significant in that it delivers a practical framework for engagement practitioners to build capacity in their communities and support their local communities to prepare for natural hazards and build relational capital for longer-term resilience.

Keywords Community engagement · Preparedness · Multi-hazard · Community-centered · Model · Risk mitigation

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1 Introduction

Natural hazard risk occurs in every community in every country. The quality and quantity of preparedness activities by individuals and households can be the difference between life and death. Previous disasters show a pervasive lack of community preparation (Martins et al. 2019; McLennan et al. 2011, 2014; Pincock 2007), even in communities with previous hazard experience (Karanci et al. 2005).

Community preparation for natural hazards is a key factor in saving lives during disasters (see, for example, Gibbs et al. 2015; Heath and Lee 2016). From 1967 to 2013, Australia experienced more than 310 natural hazard disasters with losses estimated at more than $171 billion (Handmer et al. 2018). Storms, floods, cyclones, and bushfires accounted for 93% of total number of disasters and 96% of total losses in Australia (Handmer et al. 2018). Deloitte (2021) reports an increasing trend of natural hazard disasters, with the current cost to the Australian economy more than $38 billion per year, and cumulative costs of natural hazards estimated to increase to more than $1.2 trillion over the next 40 years under a low emissions scenario (p. 16). The Australian Business Roundtable for Disaster Resilience and Safer Communities (see http://australianbusinessroundtable.com.au/) has called for more investment in disaster resilience approaches, particularly in community preparedness (Deloitte 2017). This type of investment has been shown to have tangible community-level effects in flood preparation (Grineski et al. 2020) and infrastructure preparation across a range of hazards (Multi-Hazard Mitigation Council 2019). However, increasing numbers and severity of disaster events has not resulted in an associated increase in community-led participation (Lindell and Perry 2012).

Approaches that build on collaborative community-based disaster preparedness call for self-reliance, awareness of risk, and capacity building (see Allen 2006). Collaborative and participatory approaches to community capacity building and development have been discussed within a community engagement framework (Carey et al. 2007; Johnston 2010). However, while community engagement appears widespread in emergency management practice, little is known about what informs these practices, what attributes of engagement practice are valued, and how engagement contributes to community preparedness. This study responds to this need through developing a deep understanding of how Australian emergency management agencies conceptualize and undertake community engagement to encourage communities to prepare for natural hazards. It identifies frameworks and practices that emergency management engagement and operational personnel viewed as effective in moving people into a more prepared state. The findings from this study are then used to build an evidence-based model for community engagement for preparedness that can be operationalized by agencies across the world. The model is prescriptive, easy to follow, and based on the shared reality of preparedness practitioners and their aspirations for better preparing their communities.

This paper is structured to first overview the engagement literature that spans diverse fields and frames the key research questions organizing the study. The methods and analysis used to investigate these questions are then discussed. The final section introduces a community-centered engagement model for preparedness to improve community preparation for natural hazards in Australia and potentially in other national contexts. The paper concludes with implications and future research into community engagement for natural hazard preparation across the world.

2 Literature review

A synthesis of the engagement in natural hazards empirical literature establishes that approaches to community engagement in disaster management generally fall into four tiers based on flow of communication (Rowe and Frewer 2005) and locus of power of community members to influence outcomes (see Ryan et al. 2020). These include (1) non-engagement orientation, (2) agency strategic approaches, (3) community–agency partnership approaches, and (4) community-led approaches. These tiers are discussed in the following sections.

2.1 Non-engagement orientation

A non-engagement orientation is the lowest tier of community engagement and features a reliance on linear (one-way) information and community compliance. This tier aligns with a command-and-control environment where "leaders give directives and set goals for a defined organizational mission; managers coordinate the resources required to carry out the mission" (Ntuen et al. 2006, p. 1416). The United Nations Centre for Regional Development in 2003 acknowledged the dominance of command-and-control as the dominant disaster management approach limiting community involvement. The 2009 L'Aquila Earthquake offers a clear case study on why command-and-control is no longer an ideal risk reduction and response facilitator as it has "…poor outcomes in the short, medium and long term" (Imperiale and Vanclay 2019, p. 12).

Scolobig et al. (2015) explored the challenges in transitioning from the command-and-control model including the following: an increased requirement for transparency in decision-making and communication; institutional capacity building to develop weak co-ordination and inter-agency collaboration capability, and to localize preparation, warnings, and response; and the requirement to trust communities to take responsibility (Scolobig et al. 2015). During emergency events, command-and-control may be necessary (see Johnston et al. 2020), but for many agencies, the ability to address the challenges is both resource and culturally bound.

2.2 Agency strategic engagement

The second tier of community engagement is a strategic engagement approach. A strategic approach views community engagement as an outcome tied to an agency-centric plan. Activities are undertaken for a range of organizationally driven outcomes rather than community outcomes. This engagement approach is associated with the traditional top-down approach where emergency management directs the community response. For example, in a public health context, Popay et al. (2015) studied four different strategies to community engagement and then measured health outcomes in each of the four treatment groups. One strategy exemplifies the "instrumental professional-led approach" (para 5) that reflected the agency's interests. Popay et al. (2015) noted that this strategy engaged residents in agency-centric agendas that were not community driven and that the overall well-being in this group deteriorated compared to the other engagement approaches. Indeed, the strategic approach produced the least positive outcomes with residents in this group reporting a deteriorated 'sense of control' over time.

This approach can be marred by a lack of sincerity indicated mostly by lack of investment in the community engagement process (Burnside-Lawry and Carvalho 2015). In the

Amadora region of Portugal, this was found to affect the community's trust in the agency's ability to prepare and respond to natural hazards. An agency-centric agenda also created tensions between agencies and community as agencies were introduced to a more collaborative way of working (Burnside-Lawry and Carvalho 2015). Agency-led engagement can also lead to communities and community organizations working in isolation and therefore having little impact on vulnerability, as was found across the Caribbean (Ferdinand et al. 2012; Pyles et al. 2018).

2.3 Community–agency partnerships

Community–agency partnerships represent a shared-power engagement relationship (see Johnston 2010) between emergency management agencies and communities. In this higher tier of engagement, emergency management agencies still manage the larger hazard preparation and response. However, over time, communities that have more mature relationships with agencies take on key preparation and response roles. In this way, community members understand the risk and requirements of their local area. A good example of this partnership tier is presented in the work of Haworth (2016) who studied volunteered geographic information (VGI). During a natural hazard, this tier of partnership involves citizens who share geographic information with the community and with emergency management agencies. People share images and data about flooded roads, fires, and images of what other people are doing to prepare. While these self-organizing groups can add support to emergency management, Haworth notes that "agencies need to be flexible and willing to adapt and support community initiatives, recognizing the strengths of VGI" and other partnerships (Haworth 2016, p. 197).

More holistic examples can be found in both developing and developed countries. For instance, a government initiated, community-run tsunami preparedness and resilience program in Aceh, Indonesia, was built around the local school (Oktari et al. 2018). This program, which also involved local and international NGOs, was successful in developing networks and strengthening relationships within those networks within the local community (Oktari et al. 2018), two factors identified as critical to resilience (Cretney 2016, 2018; Soetanto et al. 2017). Canadian research after events like flood, fuel spills, and wildfire (Waldman et al. 2018) showed a positive impact on local resilience after a multi-agency approach to capitalize on post-event spontaneous volunteers. Community involvement in New Zealand's annual Shakeout and The Great Shakeout in Los Angeles shows an equal partnership between agencies and community (Vinnell et al. 2020; Adams et al. 2017). This cooperative approach is not enough to keep communities safe but it provides the foundation for communities to lead natural hazard preparation, and for agencies to support their efforts.

2.4 Community-led approaches

Participatory and community-led approaches to disaster preparedness are widely acclaimed as an essential attribute to successful disaster risk management (see Hsahimoto et al. 2018). However, Samaddar et al. (2015) highlight that how this is done remains unresolved (see also Rowe and Frewer 2000). This current research and its presentation of a community engagement model seek to address this gap.

Community-led or community-based approaches to hazard preparedness are founded on community participation, capacity building, and a shared-responsibility mindset

(Maskrey 2011; McLennan 2020; Shaw 2012). Participatory design is "a process of investigating, understanding, reflecting upon, establishing, developing, and supporting mutual learning between multiple participants in collective 'reflection-inaction'" (Simonsen and Robertson 2013, p. 2). The process takes participants through a lived reality of a disaster situation and shows them what is required, individually and collectively, as a community to be prepared. Several studies have demonstrated the value and contribution of community-led initiatives for resilience. For example, following the New Zealand earthquakes, Cretney (2016, 2018) found that strong community networks and community-led preparedness initiatives contributed to community resilience. Rahmayati et al. (2017) studied floods in Jakarta and argued that local lived experience and connection to place supports innovation through community-led approaches. Soetanto et al. (2017), in a UK flood study, found perceptions of social responsibility contributed to community willingness to undertake collective behaviors. Community-led initiatives have been shown to be more effective than government-led initiatives (McLennan 2020; King and Cruickshank 2012) in developing community capacity. A community-led approach to community engagement contextualizes and prioritizes community needs in ways that build capacity and capability of a community to take a more active role in recognizing and minimizing risks to that community.

Community development generally aims to improve communities in material ways. Drawing on community development theory (Phillips and Pittman 2009) is one way to build the capability of communities through education and local decision-making (Long 1975; United Nations 1995) and to work together in ways that solve problems. Phillips and Pittman (2009) argue that community development should be centered around creating community connections and knowing which community factors create marginalization or exclusion of community members. They argued that communities need to have shared understanding and values. Communities develop when they bring networks of people together around local activities. Community development succeeds when community members learn to work together (Long 1975) for the betterment of the group. Local decision-making therefore is crucial (Christenson and Robinson 1989) and helps to create community-level social capital (Phillips and Pittman 2009).

Community-based participatory processes and codesign programs have emerged as a sustainable framework for community-led resilience (Liu et al. 2017; Mason et al. 2016; Wolff 2021). Some authors cite a number of challenges to community-based programs (Geekiyanage et al. 2020) with concerns raised due to inherent assumptions that exacerbate marginalized groups (Gladfelter 2018). However, evidence suggests if this is done well, community-based participation addresses vulnerabilities, increases resilience, and overall achieves better community outcomes (Peng et al. 2020).

Codesign is "the idea that different people with differing ideas and motivations, from a variety of backgrounds and with different skills can take part in a series of conversations that seek to change the state of things" (Manzinin 2017, p. vii). Aspirations toward more participatory and shared-responsibility approaches to community engagement reflect a shift to greater community agency and capacity building in emergency management (Burnside-Lawry and Carvalho 2015), or more specifically, how to involve a community authentically and sustainably with such agency. Current approaches to community engagement vary, and there is little empirical evidence that gives insight into how community-centered approaches offer sustainable, capacity building approaches suited to disaster preparedness. Recognizing this gap, this study seeks to understand what community engagement approaches are used and valued by emergency managers to engage community members. The data provide evidence to inform a model of community engagement in natural hazard

preparation that can guide natural hazard preparedness. The next section will present the method for this study followed by the results of the interviews.

3 Method

Based on the preceding literature and focusing on the preparedness stage of disaster management, this study was guided by three key research questions. The first research question aimed to understand *approaches used by practitioners to engage communities for preparedness*. The second research question asked *what attributes of community engagement for preparedness are valued in practice and why*. The third research question investigated *how these attributes contribute to a framework for community engagement for preparedness*. The answers to the three research questions will be used to derive a model of engagement. To answer these questions, a two-stage research design employing qualitative semi-structured interviews and document analysis focused on the conceptualizations of community engagement practitioners. The first stage, in-depth interviews with practitioners from a wide range of Australian agencies, local governments and not-for-profit emergency management organizations, investigated the practice and aspirations of practitioners, and conceptualized community engagement practice within an emergency management context. The second stage established the systems context that practitioners worked in and determined the depth of commitment of agencies to community engagement and the way it was practiced and supported within each organization. The two-stage approach allowed the project team to understand community engagement enablers and obstacles within the emergency management environment, and to develop a clear picture of what was practiced and what was aspirational. Both the current realities and the aspirations of the interviewees inform the proposed model.

3.1 Sample

The sampling method ensured emergency agency perspectives on community preparedness ranging from single types of natural hazards (such as agencies dedicated only to flood or fire) through to all-hazards response organizations that concentrate on all types of risks. In Australia, emergency management for preparedness spans state and local government agencies, supported by a range of nonprofit organizations. Criterion for sampling of participants was to ensure that all disaster types, agency types, and all Australian states and territories were represented. Participants who were identified as having a community engagement role were recruited by personal invitation, agency notifications/advertisements, and snowball sampling. While more than 43 participants were approached, the final sample included 30 participants (21 female, 9 male) from 25 emergency management agencies, three local government (LGA), and two nonprofit organizations.

3.2 Interview guide

The in-depth, semi-structured interview guide was developed from the literature. Questions addressed participants' role and responsibilities, conceptualizations of preparedness (including goals), the barriers and enablers to community preparedness, and competencies for preparedness and responsibilities. Questions also probed perceptions of risk, community engagement (approaches and timing), the role of community leaders, networks, and

evaluation. The full interview guide and ethics documents are available from the researchers. Interviews were conducted by two researchers via zoom (audio and/or video). Interviews ranged from 40 and 80 min.

3.3 Analysis

Each interview was double coded—first by each researcher at the word, sentence, and paragraph level into nodes, or key topics. These analyses were then compared, discussed, and resolved, with some nodes combined to produce an agreed list. At this stage of analysis, 102 topic nodes were created as parent nodes, and a further 82 nodes were coded as child nodes. The second stage of analysis was analytical and interpretive, seeking relationships and patterns across the data to generate more theoretical based themes that reflected participant attributes of community engagement and the meanings associated with these values for preparedness. As the lens of the analysis was constructivism—the analysis focused on participants' conceptualization of community engagement, and their experiences in designing, implementing and evaluating community engagement for preparedness. Quality of coding was managed through double coding and coming together to discuss every fifth case to compare coding for quality and consistency. The next section presents the results from the study.

4 Results

Results from the study are presented to respond to each research question. Research questions 1 and 2 investigated current approaches used in community engagement for natural hazards and help to identify the attributes of successful community engagement. Research question 3 provides insights into the practitioners' perceptions about a successful community engagement approach.

4.1 Approaches to community engagement

The first research question asked, what approaches are used to engage communities for preparedness? The findings suggest that no single approach dominated practice. Rather, practitioners worked to a variety of community consultation, engagement, and/or development frameworks. The International Association for Public Participation framework (IAP2) was mentioned most frequently as an endorsed approach for community engagement, for example, as noted by participant #217 "We try to use that as an overarching philosophy of IAP2." However, a number of other engagement frameworks emerged across all participants that captured how community engagement was done. Community development and more participatory approaches, such as codesign and community-based emergency management, emerged as a strong theme in the data, for example, when describing the approach used: "… taking a community development approach" (#351), or ideally, how a participant would prefer to start to engage a community: "In a perfect world, I would start with co-design" (#232).

An agency command-and-control approach was found to be used in some circumstances that reflected the varying situations faced by emergency managers. Several participants noted cultural and structural challenges of trying to move toward more shared-responsibility community approaches. Participant #343 summarized this theme: "Some of our more

structured – 'command and control' structures don't actually allow or permit that [shared responsibility]. Our command-and-control structures are used in situations where command-and-control is not required". Other participants acknowledged the funding model does not always allow for anything more than directed activities. "…you are working in a climate that says, 'We are funded for 12 months; we are going to run a program through the community engagement team; this is what we are going to do,' and it's done, that's not always a conducive environment for true community engagement… So at the heart of that is that alignment between the values, principles, funding, all of those other things that we believe—…versus just business practice of some of those agencies or people." (#224). Participants recognized the importance of command-and-control in response situations, but this is not sustainable. Participant #222 captured this theme "…we actually need to engage community into disaster management systems/arrangements; not just prep them up so that they are ready for warnings and they know how to prepare. We need to include them in the planning process; we need to include them in the exercises that we do as agencies in the back room,"

In summary, while no dominant approach to community engagement was found, the common themes of community development, IAP2, codesign, and command-and-control appear embedded across practitioner approaches with differing rationales being offered for approaches. The lack of a common approach is significant because it suggests that practitioners have to cobble together approaches rather than having a clear model of community engagement. The next section will present research question 2, identifying the attributes of an engaged community.

4.2 Attributes of community engagement for preparedness

Research question 2 identified the attributes of community engagement for preparedness that were valued in practice. Two themes were found in the data—the first representing a philosophical orientation to community engagement while the second reflected a strategic programmatic view of engagement.

The philosophical orientation to engagement related to the purpose of community engagement, approaches to capacity building of a community, and the ideal outcomes from engaging with a community. For example, "We are not telling you what to do. We are engaging in conversation… Now it's the case that unless you engage genuinely, the public are not fools" (#226). The philosophical view described a relational foundation to community engagement—one that focused on positive outcomes that emerged from activities. "It's about building a relationship with community. So, if we are out in our orange overalls; it is about relationships; it's about hopefully influencing community to take some sort of positive action, whatever that might be" (#347).

While the mix of knowledge, skills, and resources needed to achieve a level of community preparedness were identified as important by participants, there was an emphasis on tailoring programs to suit specific community characteristics. A variety of engagement programs and activities were related to preparedness; however, the key focus was on the need to tailor and design engagement to support community-led preparedness, described by participant #230—"the goal is to help communities to develop processes, so that they can respond and recover; look after themselves, basically, until emergency services can get to them; develop resilience within that community, so that they can look after themselves… with any community engagement that we have been doing prior to as well as since then, we have tried to make it community led/focussed" (#230). How to do this also formed part

of the philosophical orientation as the motivation behind community engagement efforts. This was articulated well by #222 "We need to open the doors, so that we are bringing the community with us on our journey in strengthening and improving the disaster management arrangements".

The strategic or programming attributes of community engagement were the second widely shared theme and included articulating what preparedness meant, nurturing the enablers, and mitigating the barriers to engaging for preparedness. Determining what 'preparedness' meant, or what was deemed sufficient, was a challenge recognized by participants as it depended on the community and the type of risks associated with that community. This view reinforced the need to tailor a program to suit the current profile of a community. "I would start by building that kind of profile; … understand some of the key demographic things of note; what the households are like, what the property ownership is like and what they use their land for in that community… you need to qualify that and make sure that that information is actually true on-the-ground" (#353).

Understanding a community's characteristics, in addition to risk perception, was viewed as the key 'enabler' for preparation activity. An enabler supports natural hazard preparation or motivates individuals or communities to prepare. Understanding community and its connections includes community relationships, community ownership and connection to place, community leadership, and community resourcefulness. As one participant noted, it really is about developing a community-based community of practice, "that people are supported to develop the skills to navigate uncertainty and complexity, in an improved way or in an enhanced way; and that they do that in relationship with other people around them" (#352).

There were also barriers to preparedness. Barriers or obstacles included embedded systems, optimism bias, and conflicting messages. Embedded systems and processes reflected more traditional approaches to emergency management and are part of an enduring narrative and community belief that 'someone' will come and save their community at the time of need. Optimism bias by individuals within communities was also viewed as a barrier—such as community members refusing to accept that particular natural hazard could happen to them. There was also concern that official messaging may create obstacles to preparation when people hear conflicting messages about hazards and agency response. Addressing the barriers is key to improving natural hazard responses.

4.3 Building a community engagement framework for preparedness

Research question 3 asked what practitioners believed contributed to a successful community engagement approach. Six key themes emerged to build a community engagement model, including understanding communities, exploring and nurturing connections, building capacity and competencies to prepare, supporting and sustaining community-led action, and finding ways to measure outcomes and impacts.

4.3.1 Communities need to be well understood

The first attribute reflected the importance of understanding any community before attempting to engage. This theme recognized that communities were unique and each community had different capacities, risks, resources, and networks. The need for communities to be understood essentially challenged assumptions made about communities and highlighted the need that baseline information, data gathering, and 'profiling' of a community were a critical step prior to any actions or plans being made. While having a local contact

with existing knowledge and networks was viewed as valuable and important, participants recognized that this was not always possible. This made taking steps to understand a community even more important.

Varying terms were used by participants to describe approaches to understanding a community, the most common term used was *Community Profiling*. Community profiling comprised steps to understand the make-up of the community in terms of demographics, economics, social connectedness, natural hazard history, and geography. The need to profile a community was also important post any changes or events, to understand the influence of the change on the community.

Finally, practitioners felt that while some communities were open to changing their behaviors [to prepare] or learning new ways, other communities were less inclined. Therefore, practitioners felt it was important to have evidence to show communities the difference valuing preparedness as a community can make. Benchmarking (see later section on evaluation) the knowledge and skills of a community's state of preparedness was also viewed as essential. "…local assets are really important; particularly…builds that notion of risk in communities…So building up those networks is vitally important for connecting with those existing networks; and building that notion of hazard and risk and consequence within those networks; so networks is paramount; because you want to build that knowledge" (#229).

4.3.2 Community connections

Community connections emerged as the second core attribute, not only to understand how the community related to each other, but also the sense of community leadership, connection to place, and others. *Community connections* described the strength of ties that comes from cooperative community connections. Current and existing relationships with other community members were also viewed as important—and how socially connected the community was. Generally, there was a strong level of agreement that communities that were more socially connected were better placed to prepare. Current and historical connections with emergency agencies were also deemed as important as this legacy ensured that communities had access and were open to sharing concerns and obtaining resources from agencies to lead the response. Participants recognized the need to identify opinion leaders in a community, and the role they played in influencing others: "If you want to find the influential people within the communities that you are working with, ask around; find who is involved, who has leadership roles, who has less obvious leadership roles but are highly influential within those communities; and you foster relationships with those guys. So it's that ripple effect …It's kind of a social network analysis that people tend to do, as practitioners." (#351).

4.3.3 Building capacity and competencies to prepare

The third attribute is about building both capacity and competencies. Many practitioners either implicitly or explicitly identified with a community development approach reinforced the importance of building capacity and competencies in community members to prepare, both individually and collectively in the community, through education and experiences. *Capacity building* provides insight into what a prepared community looks like and how the required skills and qualities to achieve that state can be developed.

Central to capacity building for many practitioners was a philosophy of codesign, where community members had the opportunity, confidence, and knowledge to state what they wanted to achieve in their own community in terms of preparedness. Tailoring community activities was seen as essential to community engagement as this way the community owned their own programs. This was felt particularly important to continue to progress toward a shared-responsibility approach. "It is taking community development principles into our engagement rather than us going to the community for our purposes; it was more about starting with the community and working out how we can build the capacity of the community; but, also, how we sit as part of the context of a community rather than coming in there and being government" (#344).

4.3.4 Community-led action

Participants reflected that community-led action that is mentored, resourced, and fostered will lead to stronger ability of self-reliance and shared responsibility. *Community-led* action, the fourth attribute, describes communities that take the initiative to generate their own preparedness aims and objectives. Participant #341 provided an example of this action

> it's community members that have come … to say, 'I am really worried about a particular risk. This is something that we want to establish; and I want to try and get my local community involved, whether it is a geographical street or another type of community.' We have got some guidance documents and processes and things like that in place that we can provide training on, to those people, on how to run a community type of group. And then we assist them to establish that group and they essentially take that and amended it and shape it to suit their local situation; and then run that group. We are obviously there, if they need to come back for resources, training, or anything like that; but they run the group, how they see fit; and they run the sessions and the activities that they see fit, that are suited to their local areas.

This type of action requires the support, resourcing, and fostering of community-led action by agencies. Preparedness action is enacted when community members take steps to mitigate risk. Local opinion leaders and influencers are important in taking leadership roles in motivating and connecting discrete community groups. In this context, community relationships and network ties really do matter and relationship strength or weakness in a community will influence the outcomes of community engagement for preparedness.

4.3.5 Local risks require specific actions

Local risks and hazards emerged as the fifth attribute. *Local risks and hazards* require specific actions related to specific locally identified risks and hazards. Practitioners considered tailoring and localizing both the risk and hazards were important for engagement activities. Localizing risks, actions, and activities recognizes that some hazards – whether it is a bushfire, flood, or cyclone—require specific actions, messages, and risk type communication. Localization therefore responds to these unique and local risks and recognizes that not all hazards are equal.

4.3.6 Ensuring engagement programs are monitored, evaluated, and lessons learned

Finally, the sixth attribute is a need for continuous learning and sharing best practices. Understanding impact, or linking practice with evidence-based outcomes, was one of the key challenges reflected by participants. While all participants acknowledged the importance of evaluation, only a few practitioners had access to agency funded evaluation specialists. Generally, the lack of measurement for reporting—and subsequent learning—from community engagement programs was framed as a weakness and often meant that community engagement activities were recorded as outputs (activity based) rather than outcomes (impacts achieved). There is a recognition that monitoring, evaluation, and learning need to be embedded in preparation programs: "Going forward, when we have more of a strategy, there will be a really strong evaluation component and a big part of that will be community voice" (#348).

In summary, the findings in the study responded to three research questions about community engagement for preparedness that can be synthesized into a framework to scaffold community–agency relationships and empower local communities to initiate, lead, and build capacity to understand and mitigate risk in an ongoing sustainable way. The findings foreground the changing role for emergency agencies in working with communities to understand, identify, and build on existing social capital in ways that strengthen existing relational networks and reinforce the role of communities in codesigning initiatives to prepare. The interviewees' answers, in addition to the literature on natural hazard preparedness, inform a model of community engagement.

5 Discussion: a community-centered engagement model for preparedness

Based on the reviewed literature and findings from this study, a framework (see Fig. 1) was conceptualized that specifies five iterative steps that can be operationalized at the community level: (1) community profiling, (2) relational ties and connections, (3) capacity building,(4) community programs, and (5) local hazard action. The steps are both iterative and generative because each step is the antecedent or groundwork required for the next step (Fig. 1).
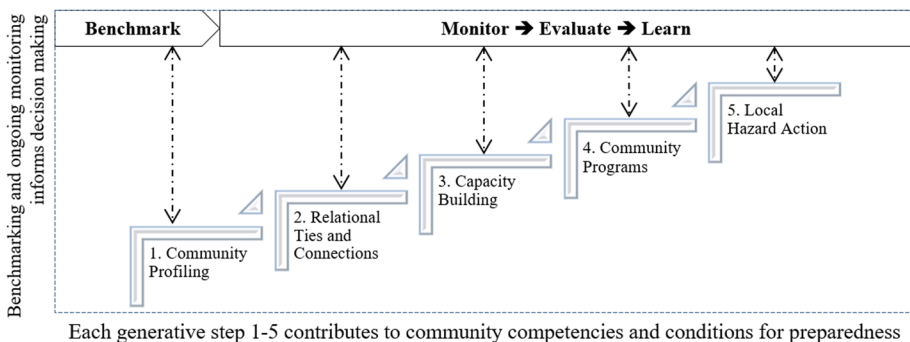

Fig. 1 A community-centered engagement model for preparedness

5.1 Step 1: Community profiling

Community profiling is a research technique that draws together primary and secondary data specific to the focal community to give baseline information and insight into a community's knowledge, structure, resources, and issues. Data gained during community profiling also provide an understanding of the accuracy of local risk knowledge and perceptions about those risks (Paton 2007; Prior and Paton 2008).

Community profiles build an evidence-based profile of a community and allow practitioners to set baselines, benchmarks, and agency objectives. A baseline is important as it provides a data point prior to the commencement of any engagement activities. Benchmarks are the standard against which program results are measured and when adopted across different communities, allow for comparison and learning (i.e., what worked and what didn't work). Identifying baselines and benchmarks are one of the only ways to establish a relationship between activities and improvements in the community and are an essential step in program evaluation.

Community profiles provide information and insight on how a community is constructed, the infrastructure available, past emergency history, social and economic characteristics, and how active and socially oriented the community is. Profiling allows practitioners to understand the community so they can tailor approaches to meet the needs of a community. Typical information provided by undertaking a community profile exercise is summarized in Table 1.

Data used for community profiling draw on secondary and on primary data sources. A number of existing data points are available from government and local county sources (such as federal bureau of statistics, federal bureau of emergency management (FEMA), police, education, health, and local government). For example, the Australian Bureau of Statistics has census data and QuickStats based on postal codes. An analysis of local media will provide insight into the current issues concerning a community, and public opinion sentiment about different issues. A social media analysis of local community groups (using analytics software such as Hootsuite or analytics through Facebook) can also identify influencers in the community.

Primary data collection is vital to gain a local perspective. This is achieved through conducting local surveys, interviews, or focus groups with representative samples from the focal community. These data will provide information about community member

Table 1 Typical information provided through a community profiling exercise

What hazards are the community most susceptible to, and what are attitudes to these hazards?
The community's demographic features
The relationships that already exist
What institutions and volunteer organizations and activities are already part of the community fabric, e.g., show society, mothers' groups, schools, community support networks
Where are the community leaders already working and who are they? These are community leaders, not necessarily people in power such as councilors and politicians
Where are the tensions within the community?
What are the key relationships, positive and negative, that you need to be mindful of?
How do the agencies already work together and what potential is there for closer cooperation?
What work have emergency agencies already undertaken in this community and how well did that go?

knowledge of risks and hazards, the accuracy of these, attitudes, behaviors, and barriers to and enablers of preparedness and resilience activities. Competency and capability indexes also provide a tool to score a community on different types of knowledge and skills for preparedness.

The timing of undertaking community profiling is important. Community profiling should be conducted prior to engaging with a community, and then at regular intervals (annually or biannually per hazard season or if a transient community) or after a disaster event or change that has affected the community population. Community profiling should be included in all community engagement plans as one of the initial phases in implementation. A step-by-step guide to undertaking a community profile is found here (link removed for peer review).

5.2 Step 2: Relational ties and connections

An engagement approach to disaster preparedness supports and empowers a community through communication and relationships. Understanding relational ties also recognizes the role of relationships to facilitate information, resources, and access to different groups and types of people in a community. Relationships as 'ties' form a social network. These ties can generally be classified as strong, weak, or absent.

Understanding a community's relationships and networks is important as it allows engagement to strengthen current or existing social ties and connections. This includes identifying opinion leaders and influencers in the community that have strong local connections or may have a role in the community as an innovator. Key opinion leaders may hold legitimate positions (such as religious leaders, local journalists, sporting, school, or community club presidents) or unofficial roles (such as the local barber, legion clubs, or bloggers).

Relational mapping can be done twice a year to identify ways to connect with marginalized groups, new groups, or strengthen existing relationships. Mapping will also help to explore factors that underpin marginalized, disempowered, silent, or vulnerable groups. In this case, these groups need to have focused attention with the aim to remove barriers to exclusion.

Communities need to have a shared vision and understanding of the risks to their community and the benefits from building community level capacity to prepare. Through understanding how a community is networked and connected, communities will be better placed to mobilize and organize, strengthen existing networks, and take action. Johnston and Lane (2018) refer to this as relational capital—as a resource that can be transferred or drawn on, depending on the circumstances. It is through leveraging these ties that communities can establish context and relevance for preparedness and use these connections to share and champion baseline knowledge for preparedness. The community not only benefits from enhanced preparation during this step, but this also builds relationships that can be leveraged for other community issues.

5.3 Step 3: Capacity building

While community capacity building is focal in many emergency management approaches to preparedness and is a central organizing concept for community development approaches, the capacity building phase builds on existing relationships and segments of the community that are motivated to prepare. Community-based activities in this phase are

instigated/supported by agencies to provide information through community education and experience, resources, and mentorship as it relates to preparedness. For example, this may be about hosting local school or community events to help families create plans, checklists, and decision trees; field trips; workshop, seminars, or meetings; or networking events. In this phase, key community outcome indicators reflect increasing knowledge, capacity, or behavior change relating to preparedness.

The findings from the current study also reinforced that many agencies work with volunteer arms, including community engagement-tasked volunteers who are based within local communities, who work on community engagement and require training in this area because they have no expertise. Building the capacity of these volunteers to, in turn, trigger and develop capacity in their own communities was seen as the key method of improving the impact of community engagement programs across their jurisdictions.

5.4 Step 4: Community programs: participatory codesigned

In this phase communities generally have high levels of knowledge about their risk and are active in taking steps to reduce or mitigate the risks. Codesign and community participation frameworks allow communities to tailor their own knowledge, contexts of risk, and capacity to respond directly to relevant local hazards. For instance, members recognize that natural hazards are likely and will impact their community and will seek guidance, support, and mentoring from emergency agencies. Through collaboration and collective participation, communities become responsible for decision-making that helps them prepare for their own local hazards. A participatory codesign process facilitates community members—individually and collectively—to articulate their aims and milestones for hazard preparedness and then work together to develop ways and actions to achieve these aims. It also allows both the community and local agencies to monitor and track the level of preparedness in that community.

Examples might include community members bringing their plans to the local hazard agency for input and refinement. These communities seek guidance and support from preparedness practitioners, but the agency may be moving from the role of facilitator to critical friend. This changes the relationship and the locus of responsibility for preparedness and signals that the community is fully engaged.

5.5 Step 5: Tailoring for local hazards action

The local hazard action phase relates to specific actions and contexts for that community's locally identified risks and hazards. While the first four steps reflect an engagement process focused on building a sustainable community base through connection, education, involvement, and application suitable for *all* hazards, the final step recognizes that different risks require specific and tailored community activities particularly around risk communication, messaging, and actions. Local hazards—that are context and location specific, support the need to create local ownership over the message and the actions. Sufri et al. (2020) showed how local engagement helped to keep people safe in Aceh. Local engagement is recognized as contributing to sustainable, lifesaving practices with measurable benefits in resilience building through encouraging personal and social responsibility (Kelly and Ronan 2018). A tailored, localized step is important because the capacities built in the earlier steps create the capacity for a community to apply the knowledge and skills build across the steps to any kind of natural hazard or threat to the community. For example, a community may have

a codesigned flood preparation plan and then decides to apply the lessons learned from the plan to bushfire or other local risks.

5.6 Overarching step: embedding monitoring, evaluation, and learning in community engagement

Formative and summative research, incorporating monitoring, evaluation, and learning, is an overarching activity that should guide all community engagement activities. Monitoring is the systematic oversight of a preparedness project. Monitoring involves looking at project records of outputs such as events, activities, and outreach. Evaluation occurs when practitioners look for the outcomes of the different outputs and often involves some type of research. Data collection might be analyzing social media engagement, the number of households reporting that they have undertaken a preparedness action, or a local council adapting suggested preparedness plans. Learning occurs when practitioners and the community step back to answer the question of what worked and what needs to be changed.

Monitoring and evaluation supports a culture of lessons learned and best practices that can be woven into new initiatives (Macnamara 2018; Taylor et al. 2020). A system of monitoring allows for continuous improvement and refinement in the five steps of the model and it is the only way to show the outcomes and impacts of natural hazard interventions. More importantly, because the model is cumulative and iterative, each engagement outcome becomes the next baseline for future preparedness projects. Overtime, the cumulative outcomes of the engagement will create real community impacts that build resiliency to a host of hazards. Getting local agencies to adapt monitoring, evaluation, and learning approaches is not easy. While many practitioners feel they do not have the level of skill, resources, or interest in evaluation, any kind of formal approach to learn from past natural hazard preparation and responses will strengthen future responses.

6 Conclusion

The community-centered engagement model for preparedness is empirically built and supports a high-level commitment by emergency organizations to engaging with the community so that lives can be saved, and property damage mitigated through risk identification and action. The model provides a holistic approach to emergency management that has been missing from other approaches and is informed by the practitioners who work in the preparedness space. The model reflects what practitioners see as best practice and provides a way forward for them to plan future preparedness activities.

Furthermore, the findings suggest a successful community engagement approach draws on community development principles to incorporate education and capacity-building activity and learning. Research participants believed that individuals and communities should be encouraged to take their own initiatives, while agencies needed to recognize that communities were unique and may vary in terms of risk awareness understanding and capacity to prepare. The findings provide structure for a new framework to be operationalized as a community-centered engagement model for preparedness. This model emerged from the very heart of current practice in emergency management and empirical foundations. The model draws on empirical principles of communication engagement, community development, and preparedness.

The community-centered engagement model for preparedness is a significant step forward because it provides a framework for action to support agencies and communities prepare for all types of natural hazards. The strength of this model is that it is forward looking and applicable to floods, bushfire, earthquake, tornado, and other local hazards. The capacities and relationships built early in the model provide the backbone for emergency responses. The findings from this study suggest that the model is not only a good approach for supporting the development of shared responsibility but also the model creates social capital in a community making it resilient to other threats such as health, economic, or even political upheaval.

7 Implications and future research

The implications from this study point to a framework to guide more community-centered engagement approaches for preparedness, and which provides a foundation for capacity building in a human resource-scarce environment. The framework challenges assumptions of 'one-size-fits-all' engagement and delivers a practical means to build local capability for more sustainable preparedness activities. The model also supports practitioners to better understand how to plan and implement community engagement for natural hazard taking a shared-responsibility approach to preparedness than mainstream community engagement models currently afford.

This model is really the beginning of an effort to improve emergency response and requires additional research that focuses on the processes of community engagement.

Future research is needed to understand how community engagement based on the model presented in this paper may vary across different settings and regions in an effort to build capacity, particularly in new and volunteer practitioners. It would also be critical to investigate what effect any capacity building based on this model might have on levels and quality of natural hazard preparedness in a range of communities. In particular, understanding how the model can support practitioners in successfully working with hard to reach or reluctant to engage communities will be important.

There are several limitations that are noted in this study. This study aimed to understand agency and practitioner perspectives toward community engagement for preparedness. The study is limited by this organizational/agency perspective and future research is needed to understand the community's perspective of engagement for preparedness. Undertaking research that gathered both agency and community perspectives would provide valuable insight into these lived experiences and the effectiveness of the approaches. The study is also limited by an operational perspective of community engagement for preparedness. While participants represented a diverse range of agencies and geographic regions, all participants were operational. Future research could explore more strategic perspectives at a leadership level toward community engagement for preparedness. Finally, the study is limited by potential cultural differences between Australian emergency management agencies and communities, and those in other countries. There is potential for cultural differences to affect the proposals put forward in this model.

Preparing a community for natural hazards can be overwhelming. Well-meaning practitioners often have no idea where to start. The community-centered engagement model for preparedness provides a road map of where to start and ways a practitioner can help his or her community move through the model for greater community empowerment and preparedness.

Declarations

Competing Interests The authors have no relevant financial or non-financial interests to disclose.

Ethical approval This study received institutional ethical clearance (Approval Number 1800000931) prior to commencement of the study.

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