A SYSTEMATIC LITERATURE REVIEW OF EFFECTIVENESS OF COMMUNITY ENGAGEMENT FOR PREPAREDNESS TECHNIQUES

Dr Barbara Ryan[1,4], A/Prof Kim Johnston[2,4], Prof Maureen Taylor[3,4], Dr Ryan McAndrew[2]
[1]University of Southern Queensland
[2]Queensland University of Technology
[3]University of Technology Sydney
[4]Bushfire and Natural Hazards CRC

Version	Release history	Date
1.0	Initial release of document	15/06/2020

Australian Government
Department of Industry, Science, Energy and Resources

Business
Cooperative Research
Centres Program

TABLE OF CONTENTS

EXECUTIVE SUMMARY

This systematic literature review originally aimed to provide detail of the effect of disaster preparedness activities by individuals on their household's safety and coping during a natural hazard. The aim was presented as:

To present an index of what has been found to be the most effective household/personal preparedness activities across a range of hazards.

However, as the review proceeded, two things indicated to the research team that the focus of the project needed to be reviewed.

Firstly, no articles were found that effectively measured the effect of any single preparedness activity on the safety or coping of people in a natural hazard. This is explained further in the report.

Secondly, the review process uncovered significant numbers of studies that had measured the effect of community engagement techniques. At this point, the research team decided to add an engagement tools evaluation to the review and present the results of both aspects of the preparedness picture, with this additional overall aim:

To present a review of community engagement techniques and their levels of success.

This report details the process and outcomes of the systematic literature review component of the project.

It documents a systematic literature review that is part of a larger Bushfire and Natural Hazards Co-operative Research Centre project, Mapping Approaches to Community Engagement for Preparedness in Australia.

As a systematic literature review, it uses protocols already employed by disaster social scientists (such as Miller et al., 2017) and is informed by the Campbell Collaboration and similar protocols for these types of documents. The review builds on the work of a number of researchers (Dunlop, McNeill, Boylan, Morrison, & Skinner, 2014a). Dunlop et al. 2014; Heagele 2016; Kohn et al., 2012; Uscher-Pines et al., 2013) to identify most effective and therefore most important preparation activities. The objectives of the project were to:

1. Collate a list of personal preparedness activities that have been examined for their effect around the world, and these examinations published in English

2. Collate a list of all of the community engagement tools and techniques that have been evaluated around the world and these examinations published in English

3. Review the success or otherwise of these tools in quantifiable terms

4. Emerge from the review with a tool kit for community communication and engagement containing a wide range of tools for a variety of circumstances

Four research questions guided this systematic literature review:

1. What are the most effective household/personal preparedness activities across a range of hazards?

2. What philosophical or engagement frameworks are being used or examined in the literature?

3. What tools are being used to engage communities?

4. What research methods were used to evaluate these tools or programs?

Using a systematically developed set of search terms that focused on preparedness activity , we searched a range of databases and secured 1,331 articles. In addition, we searched a range of grey literature sites and found a further 120 possibilities. After a search for duplicates, we had a database of 1,451 studies. Two screening processes were then employed – searches of titles and abstracts, at which point, 1,328 studies were discarded because they were off topic, about recovery, conceptually off track, dealt with human-generated hazards, used descriptive data, or researched agency responses instead of community.

At this point we realised that studies researching the effect of discrete preparedness activities were not emerging and that community engagement techniques were. Once a decision was made to also consider community engagement techniques, the process was repeated for the same result. The search was effective for both because of the focus on preparedness activity, which is also an effect of good community engagement. Articles were then read in full to assess eligibility on the same criteria as the previous step, with 82 excluded at this point, leaving 41 articles for review.

The next step was the review the articles with each of the objectives in mind.

Objective 1 was not achieved because of the lack of research undertaken on this topic.

Objective 2 was collation of a list of community engagement tools used and evaluated around the world and this is presented in table form. The engagement techniques ranged from our own strategic community fire safety programs such as Community Fire Safe and FireGuard, to one off tools such as gaming simulations, exercises and co-design workshops. It also included information and education tools, some of which were shown to be effective.

Objective 3 related to a review of the success or otherwise of these engagement tools. Evaluation methods ranged from statistically rigorous pre and post surveys, as well as some attempts at longitudinal studies, to observation of workshop activity. Because of the systematic review process, research quality has been calculated and reported according to formulae developed for this process. The outcomes and quality are summarised in Tables 5 and 6, but detailed further in the report.

Objective 4 related to emergence of a toolkit of community engagement techniques that is also a deliverable for the wider project. The toolkit is detailed in raw form in Table 5, and articulated in more detail in Section 3.5. A toolkit format that sits more comfortably outside the systematic literature review and is more easily used by practitioners has been developed as a deliverable of the larger project and is available on the BNHRC website.

We have made recommendations arising from the limitations that we encountered in undertaking this study. The key of these limitations was that agencies establish a more systematic process of evaluation, and a more scheduled subsequent sharing of program and technique evaluation results. As well, agencies have taken the lead on preparedness checklists as an easy mechanism for the community to undertake preparedness. Academic research has followed, but has overlooked testing the assumptions on which these checklists rest.

Household preparation techniques are backed by fire science, and building and property codes subsequently based on this science, but personal safety and coping preparation activities have not been tested for efficacy. We recommend from this limitation that the effect of discrete preparedness activities be tested, and we have suggested research techniques that could be used. Thirdly, the studies we reviewed lacked consistency and rigour, making comparisons difficult and context hard to determine. We believe that industry and academia could collaborate to develop minimum requirements for such research that enables full closure of the community preparedness knowledge loop.

1. A PRACTITIONER'S GUIDE TO READING THIS REPORT

A systematic literature review is usually a report that is dense with methodology and process, slow to reach the point, and with findings hidden toward the back of the document. This guide is intended to point the practitioner reader to the sections of greatest interest down to the sections of least interest.

1. Start with the most important part, Section 3.3: RQ1 – what are the most effective household/personal preparedness activities across a range of natural hazards?

2. Then go to Section 3.5: What tools are used to engage communities? This section gives you a summary of studies themselves. The first is in table form on page 20 - the authors, context, methods used, effect, quality of the research as it was reported (out of 100) and outcomes. It also summarises what each of the included studies was about, from section 3.5.1 onward

3. From there you can go to Section 5: Implications and Recommendations

4. From here, Sections 5.2: Future Research and Section 6: Conclusions

5. Then Section 3.4: RQ2 – What philosophical or engagement frameworks are being used and examined in the literature?

6. Section 3.6: RQ4 – What research methods were used to evaluate these tools or programs?

7. Section 2: Objectives and Methodology of the Review

8. Section 3 up to Section 3.3: Results (which actually refers to the results of the process of searching and the articles found, rather than reporting the synthesis of those articles

9. Section 4: Limitations and Section 5.1: Recommendations arising from the limitations

We hope this guide makes reading this research more relevant and useful!

2. BACKGROUND FOR THIS SYSTEMATIC LITERATURE REVIEW

2.1 THE PROBLEM

The impact of natural hazards around the world is substantial and growing. The United Nations Office for Disaster Risk Reduction reports that between 1998 and 2107, disaster-affected countries reported tangible losses worth $US2,908bn, an increase of $US932bn on the period from 1978-1997 (Wallemacq & Below, 2018). In Australia, tangible costs of disasters are on average $AUD13.2bn per year, and predicted to grow to $39bn a year without factoring in the cost of climate change (Deloitte Access Economics, 2017). Intangible costs are even greater: from 1987 to 2016, 971 Australians lost their lives, 4,370 were injured, 24,120 made homeless, and 9.02m were affected by disaster (Deloitte Access Economics, 2017).

The human and financial impacts of natural hazards has prompted examination of the effect of better mitigation and preparedness by individuals and communities on reducing this toll. In addition, the current investment in these two phases of emergency management (de Vet, Eriksen, Booth, & French, 2019; Deloitte Access Economics, 2017) and overall resilience (Australian Government, 2018; Committee, 2009) has become a focus of governments and communities. The potential value of 'being prepared' has been measured and found to produce tangible benefits. For instance, the Community Fireguard program in Victoria, Australia is estimated to result in reduced property loss (at a one in 10 year risk of bushfire) of $732,747 and reduced fatalities worth $1.4m (Gibbs et al., 2015) at a benefit to cost ratio of 2:1 (Deloitte Access Economics, 2017). In cyclone-prone areas, being prepared could reduce minor damage to houses worth between $440 and $820 per household (Urbis, 2015), for a cost benefit ratio of 3.2 – 14.9 (Deloitte Access Economics, 2017). Preparedness education and engagement is therefore worth the investment of time and resources, even though both are limited in agencies around Australia.

Levels of readiness for a natural hazard are generally measured by:

- examining the number of physical activities householders have undertaken from a list of possible activities (such as Chaney, Weaver, Youngblood, & Pitts, 2013; Lam et al., 2017; McLennan & Elliot, 2011)

- investigation of social-cognitive characteristics such as community networks, social norms, community and individual vulnerability and psychological resilience (for instance McLennan, Paton, & Beatson, 2015; Douglas Paton, 2003; Douglas Paton & Johnston, 2001)

This report will focus on the physical. It aims to help agencies in their efforts to best allocate these resources by reviewing research into the effect of specific individual, household and community preparedness activities and engagement techniques designed to prompt these activities. The results will articulate which preparedness activities have been measured and been shown to work most effectively, and the context in which these activities worked. The effect of community engagement at a number of levels will also be presented.

For this review, preparedness is defined as (Australian Institute for Disaster Resilience, 2018):

> *The knowledge and capacities developed by governments, response and recovery organisations, communities and individuals to effectively anticipate, respond to and recover from the impacts of likely, imminent or current disasters. Preparedness action is carried out within the context of disaster risk management and aims to build the capacities needed to efficiently manage all types of emergencies and achieve orderly transitions from response to sustained recovery.*

Preparedness or aspects of preparedness have also been referred to by a range of synonyms, some rooted in action, others in social and situational factors that can affect an individual's level of preparedness:

- 'Readiness' (McConnell & Drennan, 2006; Simpson, 2008)

- 'Contingency planning' (Balamir, 2002; Bloom & Menefee, 2006)

- 'Emergency planning' (Lindell & Perry, 2007; Perry & Lindell, 2003; Shrivastava, 2008)

- 'Disaster capacity building' (Tadele & Manyena, 2009)

- 'Resilience building' (D Paton & Johnston, 2006)

- 'Resilience planning' (Lucini, 2014)

- 'Business continuity planning' (Hémond & Robert, 2012; Lindström, Samuelsson, & Hägerfors, 2010)

2.2   PREPAREDNESS IN AUSTRALIA

The act of getting ready for a natural hazard has tended to occupy physical, psychological, emotional, and social aspects, of people's lives and so this context presents an array of obstacles to getting prepared (Prior, 2010). The economic, cognitive, social and physical barriers presented have resulted in agencies developing an array of informational, educational and engagement tools (Elsworth, Gilbert, Stevens, Rowe, & Robinson, 2010; Gilbert, 2007; Oloruntoba & Sridharan, 2017; Rhodes, Gilbert, Nelsson, & Preece, 2011) that have potential to move most individuals from having no awareness of the hazard through a range of steps including actively preparing, with some ultimately undertaking advanced levels of preparation (Rhodes, Gilbert, Nelsson, & Preece, 2011) and participating in community-level preparation efforts (Office of the Inspector-General for Emergency Management Victoria, 2016).

Preparedness activity falls into clusters according to their purpose. McLennan and Elliott (2011) developed five clusters in which they grouped bushfire preparedness activity according to:

- bushfire safety planning

- preparation for leaving

- preparation for active house defence

- preparation to reduce danger to the house

- preparation to reduce the vulnerability of the house

For storm and other weather-generated events, a number of researchers suggested preparedness activities that could be the foundation for a sixth category, 'preparation activities by individuals for survival post impact' (Cretikos et al., 2008; Faupel, Kelley, & Petee, 1992; Hung, 2017; Meyer, 2013; Sattler et al., 2002).

These clusters provided a framework for the review of research on preparedness activities, but a review of Australian agency materials and government policy on building for bushfire defence showed that three of them – those related to property protection – had been extensively studied in the scientific fields of fire and built environment, and that the evidence base was already well understood by agencies and planners (shown in publications such as Department of Environment Land Water and Planning, 2011; Department of Housing and Public Works, 2019; Western Australian Planning Commission, 2017). Having accounted for preparation activities for building safety, the remaining preparation activities to be addressed by this review were:

- bushfire safety planning

- preparation for leaving

- preparation for the period post-impact

This review will also look at the tools that are available for agency communication and engagement practitioners, and how and in what circumstances they have worked.

This review is part of a larger Bushfire and Natural Hazards Co-operative Research Centre project: Mapping approaches to community engagement for preparedness in Australia – 2019.

3. OBJECTIVES AND METHODOLOGY OF THE REVIEW

The objectives of this systematic literature review are to:

1. Collate a list of personal preparedness activities that have been examined for their effect around the world, and these examinations published in English

2. Collate a list of all of the community engagement tools and techniques that have been evaluated around the world and these examinations published in English

3. Review the success or otherwise of these tools in quantifiable terms

4. Emerge from the review with a tool kit for community communication and engagement containing a wide range of tools for a variety of circumstances

3.1 RESEARCH QUESTIONS

Four research questions guided this systematic literature review:

1. What are the most effective household/personal preparedness activities across a range of hazards?

2. What philosophical or engagement frameworks are being used or examined in the literature?

3. What tools are being used to engage communities?

4. What research methods were used to evaluate these tools or programs?

3.2 METHOD

As outlined by the Campbell Collaboration (2019) the purpose of a systematic review is to sum up the best available research on a specific question; this is done by synthesising the results of several studies. This review will build on the work of several researchers ((Dunlop, McNeill, Boylan, Morrison, & Skinner, 2014b; Heagele, 2016; Kohn et al., 2012; Uscher-Pines, Chandra, Acosta, & Kellermann, 2012) to identify systematic review protocols already employed by disaster social scientists (such as Miller et al., 2017). The four main steps in the systematic literature review are as follows: Search process, inclusion and exclusion, data extraction, and synthesis and evaluation; and these are summarised below with more details in the next section.

Searching for relevant studies involves using a broad net to capture relevant studies. As outlined by Campbell Collaboration (2019) this must include a systematic search for unpublished reports, such grey literature, to avoid publication bias (Hemingway, Pippa & Brereton, 2009). Miller (2017) also notes that it is important to identify both primary studies and grey literature reports. Grey literature is generally defined as literature that has not been formally published (Hopewell, McDonald, Clarke, & Egger, 2007). Examples include conference abstracts, research reports, book chapters, unpublished data, dissertations, policy documents and personal correspondence (Hopewell et al., 2008).

Additionally the search process should be international in scope (Hemingway, Pippa & Brereton, 2009). Decisions on which studies to include and exclude are carried out by at least two reviewers who work independently and compare results (Hemingway, Pippa& Brereton, 2009). Data extraction involves systematic coding and analysis of included studies, this process is also conducted by two reviewers to ensure accuracy. Finally, the results are synthesised, and evaluation of methods presented.

3.3   SEARCH STRATEGY FOR IDENTIFICATION OF RELEVANT STUDIES

Three major academic databases and other grey literature databases/search engines were utilised. These included Web of Science, Scopus, ScienceDirect, and Google Scholar. 'Preparedness' and all possible variations, including 'preparation' and 'ready' was the first keyword. 'Disaster' and all variations of same was the second keyword, however this was broadened to include the specific types of hazard such as flood, *fire, cyclone etc. Table 1 presents the search terms clearly. Database specific conventions were followed to 'explode' or 'truncate' key terms as appropriate. A list of free-text terms which were identified in the literature supplemented the syntax developed. Study design and outcomes were not included as part of the search strategy as it was anticipated that this would potentially lead to the omission of relevant literature.

Bibliographies from included and some excluded studies (e.g. literature reviews) were used to guide forward citation searching. Australian agency and agency oversight websites, the website of the Bushfire and Natural Hazards Co-operative Research Centre, and key journals such as the Australian Journal of Emergency Management were manually searched. The 'Not' criteria, which excludes certain papers, was not used in order to keep the search parameters broad. While adding terms such as 'recover' to the Not criteria might assist in removing studies that focus only on recovery programs (not the focus of this study) it may also exclude papers that examine both preparedness and recovery in the one study.

Table 1 Search terms

Category	Search terms
Who	"Community N2 engagement" OR "community N2 participation" OR "community N2 involvement" OR "community N2 led" OR "community-led"
AND	
What	Preparation OR preparedness OR ready
AND	
What	Disaster OR emergency or Catastrophe OR hazard
AND	
What (events)	flood OR *fire OR cyclone OR hurricane OR typhoon OR storm OR tornado OR earthquake OR tsunami OR *slide OR heatwave OR icestorm

3.4   CRITERIA FOR INCLUSION AND EXCLUSION OF STUDIES IN THE REVIEW

The criteria for inclusion and exclusion are detailed below. Natural hazards were the focus of this study, as such hazards that were human-generated, such as terrorism, war, and civil unrest, formed part of the exclusion criteria. Studies on generic adaptions to anthropomorphic climate change were excluded, unless they had a specific natural hazard focus. Studies were included where they had

used a program intervention, and this required involvement participants engaging in some activity, such as participating in workshops or being exposed to communications. Therefore, conceptual or descriptive studies focusing on research questions comparable to "what demographic characteristics can be attributed to heighten preparedness?" were not the focus of this research. As anticipated, an exception is made for control groups who do not participate in an activity but are used as a comparison group for an intervention sample, as is the case for randomised controlled trials (RCTs).

English language studies were the focus of this research, thus excluding all other languages other than English. The studies must focus on preparedness that occurs before a natural hazard, meaning that studies focused only on activities after a hazard event, such as response and recovery, they were excluded. Some studies focused on both recovery and preparedness within the same community and same natural hazard, such as work on the Christchurch earthquakes of 2010 and 2011; these were included. Community engagement studies focusing on residents or households were included. The specific time frame imposed on the search was from 2008 to April of 2019, exceptions were made for relevant grey literature identified by the research team.

Table 2 Inclusion and exclusion list

Categories	Inclusion	Exclusion
Hazard Type	Natural Hazards	Human made
Research type	Intervention	Descriptive, Conceptual
Language	English only	LOTE
Stage	Preparedness (occurring prior to)	Response or Recovery (occurring after)
Audience	Community Engagement	Business
Time frame	Between 2008 and April 2019	Before 2008

In addition, as explained in the Background section, the potential list of preparedness activities, which are represented in checklists by both agencies and researchers, could be narrowed down to those that preserved personal safety and coping abilities, discarding preparation activities that preserved property. Actions such as these had been extensively studied in the scientific fields of fire and built environment, and that the evidence base was already well understood by agencies and planners, and was in Australia at least, already contained within legislation and building codes. This provided us a criteria on which to cull articles that emerged from the literature search.

A second culling criteria was the requirement for a data driven approach to the two aspects of the review:

1. How individual preparedness activities affected personal safety and coping during and after a disaster
2. How a community engagement activity affected preparedness

A number of studies reported anecdotal evidence that an activity or technique had worked, but this was not enough evidence for this review.

3.5   DESCRIPTION OF METHODS USED IN THE COMPONENT STUDIES

There is a wide range of research methods across publications. The methods are listed below, and a description of the methods provided for the 41 studies included in the sample. A number of studies used more than one method, and

some articles listed and reviewed a range of case studies, each of which may have used one or a variety of research methods. These have been distilled and counted here.

Case study (n=5):	The case study is documentation of a process or technique in a specific application or circumstance and allows empirical inquiry that investigates a contemporary phenomenon within its real-life context; when these boundaries are not clear; and in which multiple sources of evidence are used (Stake, 1995). A critical element of case study research is its reliance on multiple methods of data collection to illuminate every aspect of the phenomenon under study (De Poy & Gitlin, 1998).
Content analysis, document analysis (n=3):	This is a research method that uses a set of procedures to make valid inferences from text. These inferences are about senders, the message itself, or the audience of the message (Weber, 1990). The aim is to describe a phenomenon, and the outcome of the analysis is concepts or categories that achieve this. Usually the purpose of those concepts or categories is to build up a model, conceptual system, conceptual map or categories (Elo & Kyngäs, 2008). The text is coded by categories and themes, and insights drawn from these.
Cost benefit analysis (n=1)	Cost–benefit analysis (CBA) is a set of tools for guiding decisions. These tools allow the researcher to assess the cost an action will incur and the benefits it will bring, balance the one against the other, perhaps consider other influences, and then ask: 'Is the benefit worth the cost?' (Snell, 2011)
Experimental research (n=1)	Experiments in social science are generally a series of activities or treatments that are applied or assigned randomly to groups of subjects, usually in a controlled setting. Groups are generally offered different treatments so the reactions to these treatments of each group can be compared. When the method is implemented properly, differences in future outcomes for experimental groups provide unbiased estimates of differences in the impacts of the treatments offered (Bloom, 2006).
Focus groups (n =6)	Focus groups are group interviews in which diverse understanding, judgements and experiences relating to certain topics or issues can be allowed to emerge. The premise of focus groups is that the group interaction produces data and insights that would be less accessible through one on one interviews (Lindlof, 1995).
Interviews (n=12)	Interviews create an environment and an event at which the interviewer encourages another person to share experiences or articulate opinions and interests freely (Lindlof, 1995). The types of interviews are known as in-depth, informal, unstructured and semi-structured. This does not include the closed-ended face-to-face interview that can be used in survey research.
Observation (n=6)	Subjects are watched, listened to and recorded for a specific time period and criteria for this method developed before the observation activities are undertaken. The way the observation is undertaken might be structured or unstructured, participatory or removed from the subject, narrow focus to broad, and time limited to fully immersed (De Poy & Gitlin, 1998). In this report, pilot testing has been classified as case study research.
Social network analysis (n=2)	Social network analysis is a method of plotting and analysing ties between individuals and/or entities (social actors). It is grounded in systematic empirical data, draws heavily on graphic imagery to

	explain the results, and relies on the use of mathematical and/or computational models (Freeman, 2004).
Surveys (n=25)	A list of questions designed to illicit quantifiable information about an issue, topic or behaviour; generally administered to a large sample of people who are representative of a certain population. They can be conducted by mail, online, face to face or by telephone (De Poy & Gitlin, 1998).
Literature search (n=2)	Literature search is a systematic and well-organised search from already published research and data to identify existing discussion on a specific topic (Grewal, Kataria, & Dhawan, 2016)

4. RESULTS

The preferred reporting items of systematic reviews and meta-analysis, otherwise known as PRISMA, can be illustrated by a flow diagram to visualise how many papers are included at each stage of the search process. The PRISMA flow diagram for this systematic literature review is displayed below. At the identification stage a total of 1,331 articles were found through database searches. A further 120 were obtained through other information source such as grey literature. Thus, generating a total of 1,451 records after duplicates were removed. The remaining records were then screened and checked for eligibility. In the screening process 724 papers were excluded by title, leaving 702 behind for screening by abstract. 604 papers were excluded from which included papers that were: Off-Topic (304), Recovery (42), Conceptual (34), Human Made (7), Intervention not carried out (212), and Agency focused (5). This left a total of 123 papers for full-text analysis. Upon full-text inspection a further 82 were excluded, these were found to be: Editorial in nature (1), Recovery focused (8), Lacking enough detail (18), or Off-topic (55). At the end of the screening and eligibility process a total of 41 articles were found which fulfilled the inclusion criteria.

Figure 1 PRISMA flow diagram
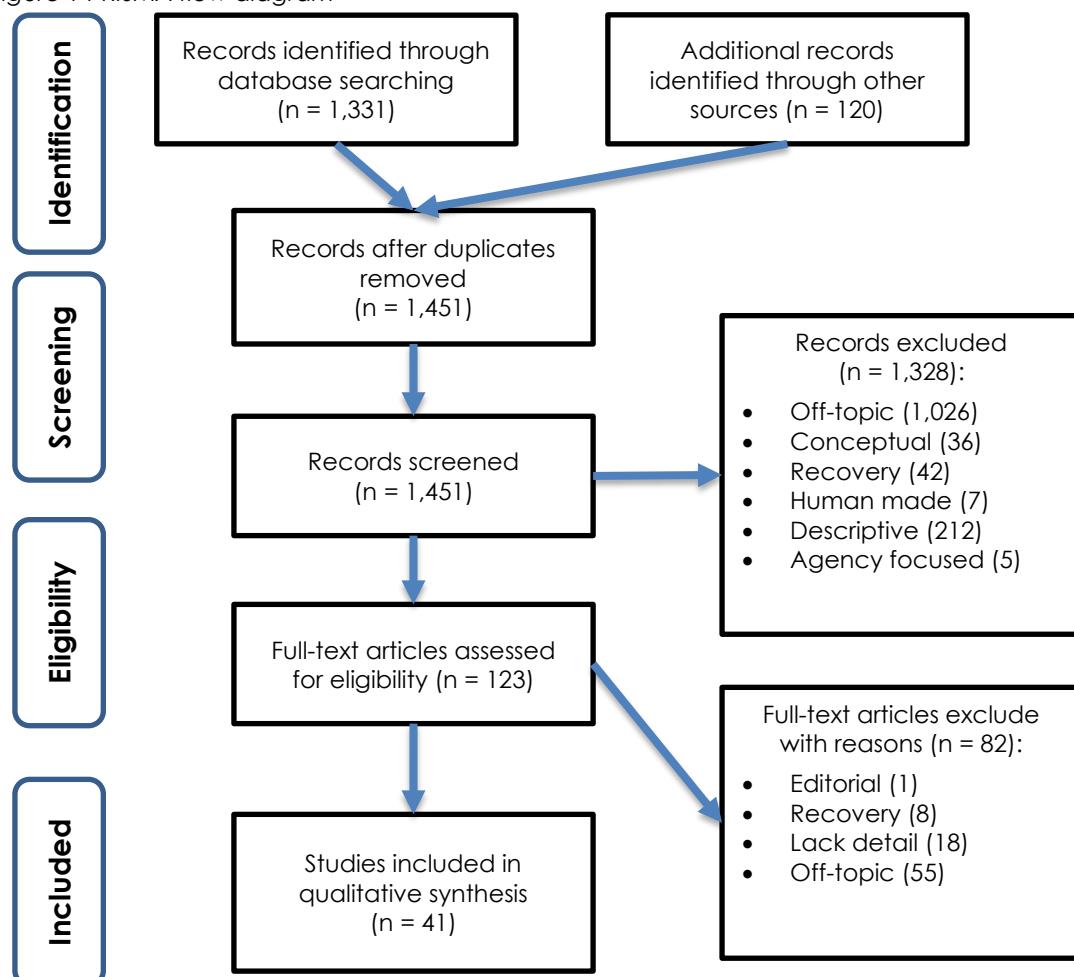
4.1 DESCRIPTIVES

The composition of evidence was mostly from peer-reviewed journal articles (30 papers, 73%); however, important sources of information included grey literature, which made up ten percent of the sample. Grey literature came in the form of reports on pilot interventions (Dufty, 2008), industry presentations which evaluated community capacity building and behavioural economics (Nous, 2013; Daniels, 2017), preliminary research insights from bushfire CRC funded projects (McNeill, 2016), and work from the Australian Institute for Disaster Resilience's knowledge hub (Webber, 2017). It was important to incorporate grey literatures as "excluding grey trials from a systematic review and or meta-analysis may artificially inflate its results and conclusions" (Hopewell et al., 2008, p. 6).

Figure 2: Grey and peer reviewed literature
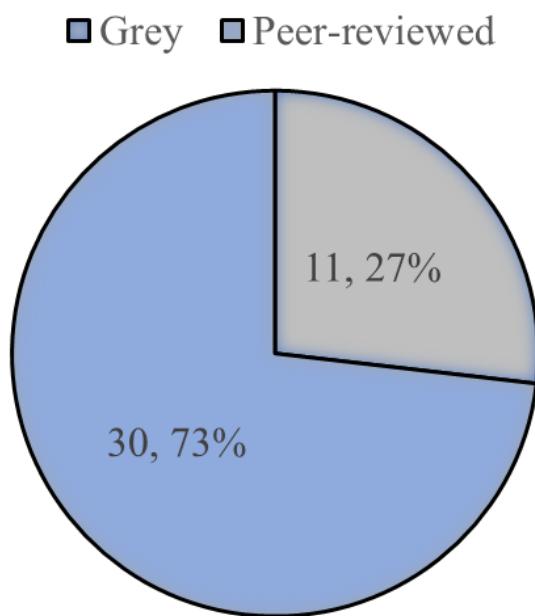
4.2 ARTICLE QUALITY

Article quality was assessed using evaluation criteria tools. These appraisal tools are used to determine the extent to which a study has addressed the possibility of bias in its design, conduct and analysis. Depending on the study design different evaluation tools were used. This follows Miller and colleagues (2017) practices where they adopt relevant appraisal tools for corresponding research designs. This research adopts three main tools. For quantitative studies the Study Quality Assessment Tools (SQAT) produced by National Heart, Lung, and Blood Institute (NHBL, 2019) are used. For qualitative studies the Critical Appraisal Skills Programme (CASP, 2018) is used. Last, for mixed-method studies the Mixed Methods Appraisal Tool (MMAT) (Hong, Gonzalez-Reyes, & Pluye, 2018) was used. More details on the tools, their scoring and evaluation is provided later.

4.2.1 Journal rankings

Publisher rankings can be assessed on papers that are published in journals or peer reviewed conferences papers. From the 41 papers assessed, 28 were able

to have a ranking metric reported. One conference, Procedia Engineering, reports partial metrics as it publishes only on conference proceedings delivered between 2012 and 2017. Three metrics are explained below - these are the H-index, quartile rankings, and journal rankings:

- H-index. The h index quantifies both journal scientific productivity and scientific impact. It expresses the number of articles published by the journal (h) that have received at least h citations. The higher the h-index the higher indication of quality

- SJR rank. The Scimago journal rank (SJR) expresses the average number of weighted citations received in the selected year by the documents published in the selected journal in the three previous years. The higher the SJR rank the higher the prestige

- Scimago quartiles ranking. The set of journals have been ranked according to their SJR and divided into four equal groups, four quartiles. Q1 comprises the quarter of the journals with the highest values, Q2 the second highest values, Q3 the third highest values and Q4 the lowest values

Table 3 Publisher rankings

Source	Count	H-index	Scimago rating (best quartile)	SJR
Australian Journal of Emergency Management	6	21	Q2	0.35
International Journal of Environmental Research and Public Health	3	67	Q2	0.74
Disaster Medicine and Public Health Preparedness	3	30	Q3	0.47
International Journal of Disaster Risk Reduction	2	20	Q1	0.77
Applied Geography	2	67	Q1	1.32
Ocean and Coastal Management	1	62	Q1	0.90
World Development	1	140	Q1	2.12
Environmental Hazards	1	40	Q2	0.53
Marine Technology Society Journal	1	35	Q3	0.30
Procedia Engineering (Conference)	1	40	n/a	0.28
Journal of Homeland Security and Emergency Management	1	15	Q3	0.24
Design Studies	1	75	Q1	0.94
Geographical Research	1	39	Q1	0.63
Health Education Research	1	93	Q1	0.85
Environment and Planning A	1	106	Q1	1.35
Australasian Journal of Disaster and Trauma Studies	1	13	Q4	0.23
Critical Sociology	1	26	Q2	0.54
TOTAL	**28**			

The highest number of papers were published in the Australian Journal of Emergency Management, followed by the International Journal of Environmental Research and Public Health, and the Journal of Disaster Medicine and Public Health Preparedness. Thirteen articles came from grey literature. The cluster of papers published in the Australian Journal of Emergency Management could reflect the industry/academic focus of this journal as well as the Australian locus of this study.

Table 4 Quartile rankings

	Q1	Q2	Q3	Q4	Grey Literature
■ Count	10	11	5	1	13
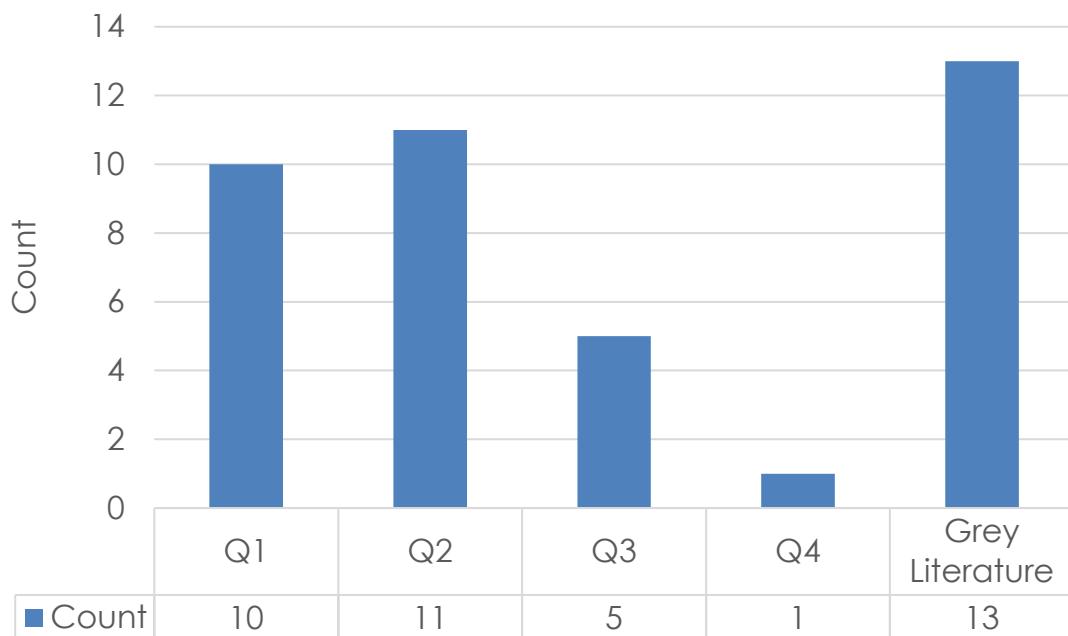
4.2.2 Natural Hazards

The most common natural hazard in the data was bushfire (14), followed by flood (13), all hazard or generic emergencies (9), and earthquake (5). Approaches to multiple hazards were reported in some articles. Two somewhat common natural hazards, tsunami and pandemic, were not found in the dataset.

Figure 3 Natural hazards
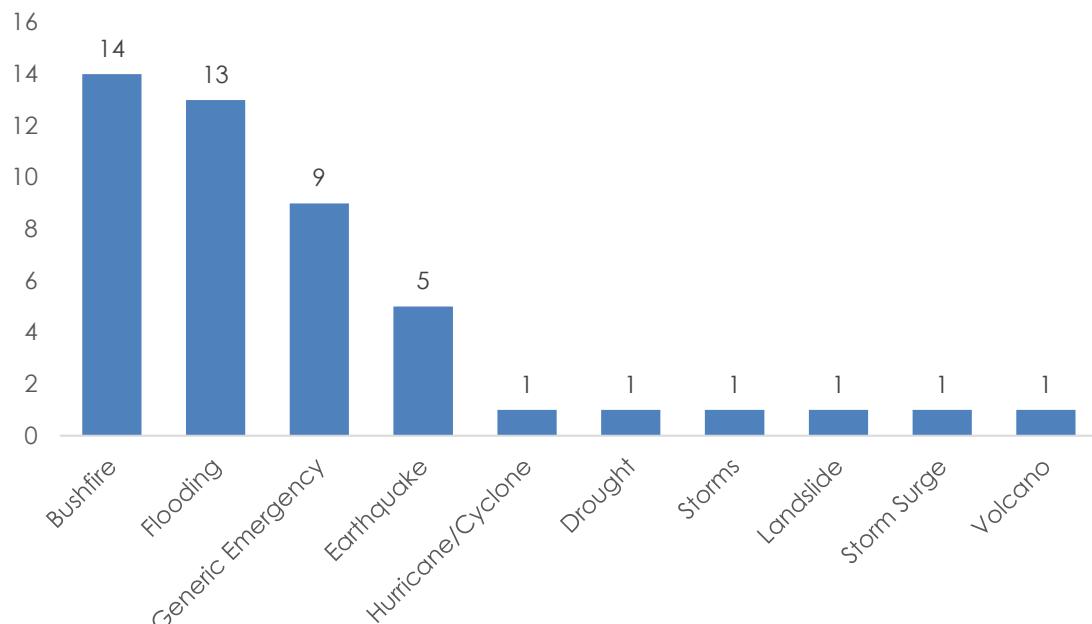
Most studies were based in Australia and the United States, with a wide variety of other countries fulfilling the inclusion criteria.

Figure 4 Study country of origin
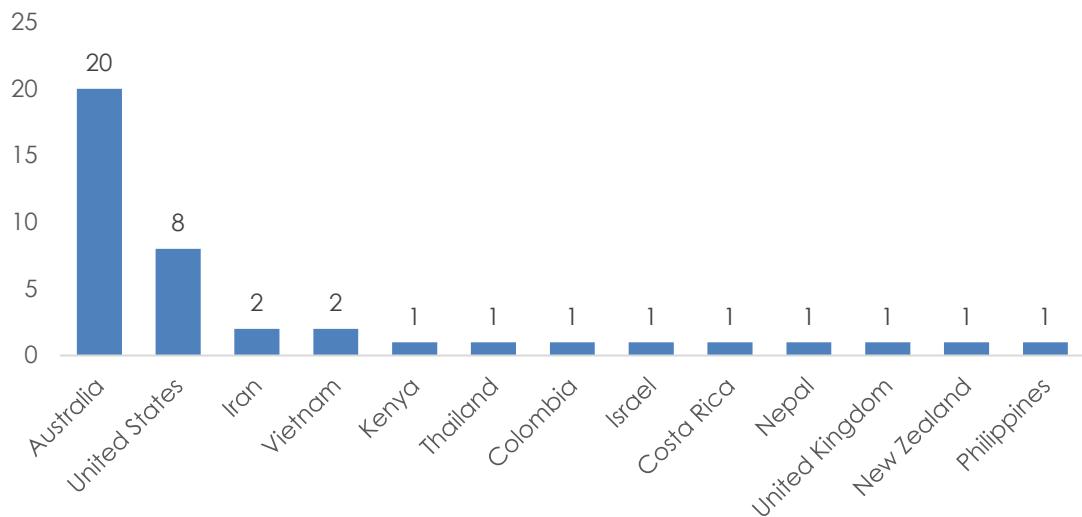
Sample sizes ranged from five cases (Nous group, 2013) to 19,210 households (Ardalan et al., 2013), with a median of 187. Four studies made no mention of the samples sizes they studied.

4.2.3   The articles we reviewed – a summary

The full list of studies, along with a summary of their approach, methods, quality and findings, is in Table 5 on the following pages. The process involved at arriving at a quality score is explained starting in Section 3.6.1. The Rhodes et al. 2011 study contained evaluations of multiple programs that were two complex and bulky to appear in this summary table, so the findings from this document has been summarised in Table 6.

Because we couldn't find studies that tested discrete checklist items for personal family safety and coping, this aspect of the study does not appear in this table.

Table 4 Summary details of the studies that remained at the end of the systematic culling process

Authors	Name and details	Date	Publisher	Approach	Intervention and research method/s	Community type/s	Study quality % score[1]	Good	Not so good	Successes?
Adame, B. J.	The persuasive efficacy of real versus salient hazard scenarios in motivating citizen-level hazard preparedness Comparing the Zombie Apocalypse campaign with preparedness outcomes across hazards United States, all hazards	2018	Int. Journal of Disaster Risk Reduction	Information – social marketing	Information delivery QUANT: Survey (n=776)	Sample from across the US	83	Tested a program that had run for general hazard preparedness – Zombie Apocalypse	Data collected from online crowdsourcing software. Zombie Apocalypse information attracted interest but didn't convert to preparation behaviour	Cut through for recognition
Adams R.M., Karlin B., Eisenman D.P., Blakley J., Glik D.	Who participates in the Great Shakeout? Why audience segmentation is the future of disaster preparedness campaigns United States, earthquake	2017	Environmental Research and Public Health	CBDRM	Exercise QUANT: Survey (n=2,052)	People registered to take part in ShakeOut	21	Tested a program and established four groups in terms of participation levels	Quality of the study – a number of items not reported	Highlighted the importance of different campaigns for different segments of the community
Akama Y., Ivanka T.	What community? Facilitating awareness of 'community' through Playful Triggers Participatory mapping and postcards containing stories as conversation starters Victoria (Southern Otways), bushfire	2010		Community led	Participatory mapping workshop Seminar Storytelling QUAL: Social network analysis Interviews Observation	At risk residents, Apollo Bay area	90	Mapping exercise created community networks where none had existed; strengthened existing relationships; exposed and tested assumptions of agency/community	Difficulty connecting with holiday house owners who want to disconnect from everything	Catalyst for behaviour change and common understanding /common cause
Ardalan A., Mowafi H., Malekafzali Ardakani H., Abolhasana i F.,	Effectiveness of a primary health care program on urban and rural community disaster preparedness, Islamic Republic of Iran: A community intervention trial	2013	Disaster Medicine and Public Health Preparedness	Community led	Seminar Champions QUANT: Survey (n=500)	Randomly selected households for intervention and control groups	36	Disaster preparation training incorporated into health education program	Backgrounds of three communities participating varied, which might have	Intervention households improved awareness and preparation

[1] The quality score is explained from Section 3.6.1

Authors	Name and details	Date	Publisher	Approach	Intervention and research method/s	Community type/s	Study quality % score[1]	Good	Not so good	Successes?
Zanganeh A.-M., Safizadeh H., Salari S., Zonoobi V.	Training household heads to spread the word Iran, earthquake								skewed results, but accounted for in multiple regression analysis	activity across all measures
Ashida S., Robinson E.L., Gay J., Slagel L.E., Ramirez M.R.	Personal Disaster and Emergency Support Networks of Older Adults in a Rural Community: Changes after Participation in a Preparedness Program Iowa, US, all hazards	2017	Disaster Medicine and Public Health Preparedness	CBDRM	Seminar on emergency support networks QUANT: Survey (n=30) Social network analysis	Adults 60+ Iowa	50	Improved social networks; potential for decreased social isolation for people in rural areas	Small sample	Possible that better social networks leads to better emergency preparedness
Bromley E., Eisenman D.P., Magana A., Williams M., Kim B., McCreary M., Chandra A., Wells K.B.	How do communities use a participatory public health approach to build resilience? The Los Angeles county community disaster resilience project Investigated community resilience (CR) and enhanced standard preparedness (ESP) coalitions operating in LA Los Angeles, all hazards	2017	Environmental Research and Public Health	Community led	Mapping Information kit Community coalition Seminars QUAL: Focus groups (n=5) Interviews (n=22)	Key people in community coalitions, facilitators and participants	90	Increased reciprocity in relationships; diffusion of ideas more rapid in community coalitions; showed superiority of community resilience (CR) model over enhanced standard preparedness (ESP) model		Personal connections made in a wide network, which spread the efficacy of the programs. CR groups more effective than ESP groups.
Chapple R., Blignault I., Fitzgerald A.	Communicating bushfire risk in the Blue Mountains: A case study of the Fire Stories film Blue Mountains, bushfire	2017	AJEM	Storytelling	Storytelling – film QUANT: Survey (n=104)	Film buffs and audiences	8	Increased preparation activity as a result of watching the film	Recruitment methods and sample size	Seems to be effective, but methodology let it down
Coles A.R., Quintero-Angel M.	From silence to resilience: prospects and limitations for incorporating non-expert knowledge into hazard management Recruited women to train in understanding mudslides, reading warning signs, undertaking mitigation works aimed at	2018	Environmental Hazards	Community led	Champions Training QUAL: Interviews Content analysis	Female heads of household	90	Reduced frequency of landslides and mitigated effects	Political culture prevents this type of bottom up program from working at capacity.	Recruitment of non-experts to become the local, onsite experts and champions

Authors	Name and details	Date	Publisher	Approach	Intervention and research method/s	Community type/s	Study quality % score[1]	Good	Not so good	Successes?
	spreading the word in their community. Rural Colombia, mud/landslide									
Curato N., Calamba S.J.	Surviving Disasters by Suppressing Political Storms: Participation as Knowledge Transfer in Community-Based Disaster Governance Examines purok system of 20-50 households working together on issues facing them. Cebu, Philippines, all hazards	2018	Critical Sociology	Community led	Community coalitions QUAL: Interviews Observations Content analysis	Village communities	50	Clusters of households get together to prepare for hazards; planning, and implementing disaster preparedness	Exclusion of dissenting voices.	All on the island survived Typhoon Haiyan, which out of the ordinary
Daniels, M.	How behavioural science can help ensure that more people take the right kinds of actions in emergencies	2017	Conference paper	Information – social marketing	Information MIXED: Survey (n=?) Measures such as web searches	Randomly selected NSW residents	43	Refined techniques of information delivery designed to make preparation decisions simple, increased preparation levels year on year	This was a conference paper, so much information on the study methods was missing	Information delivery that motivates engagement
Dufty, N.	Evaluation of the FloodSmart and StormSmart pilot programs and their transferability to the urban environment (report) Benalla and Wodonga, Victoria, flood and storm	2008	Neil Dufty, BePress	Information and community involvement	Information Seminars MIXED: Pre Survey (n=252) Post survey (n=155) Interviews Focus groups	Flood and storm prone communities in Victoria,	100	Floodsmart: great increase in awareness indicators; some increase in prep immediately after program, but tailed off after two months. Stormsmart: significant increase in awareness after; increase in preparedness indicators immediately and after two months.	Small sample, not longitudinal (doesn't examine behaviour change by residents), no verification of responses	Increased knowledge of storm risk, but hard to maintain the motivation to prepare.

Authors	Name and details	Date	Publisher	Approach	Intervention and research method/s	Community type/s	Study quality % score[1]	Good	Not so good	Successes?
Eriksen C.	Gendered risk engagement: Challenging the embedded vulnerability, social norms and power relations in conventional Australian bushfire education – investigating female preparedness for bushfire Measured perceptions of staff and volunteers on what CE methods were more engaging for women Victoria, bushfire	2014	University of Wollongong	Community involvement	Workshops MIXED: Survey (n=?) Focus groups	CE staff and volunteers from rural fire services	29	F2F on-property fire training and field days felt to work well; brigade open days and media advertising felt not to have a positive effect on female involvement in preparedness	Measured perceptions of agency staff, not participants	Women more likely to interact at these types of events.
Every, D., Reynolds, A., Clarkson, L., Bearman, C., Matthews, R., Haigh, L. & Dawson, D.	Capturing community experiences in the 2015 Sampson Flat fire: report for the South Australia Country Fire Service. Project 2 measured effect of Community Fire Safe groups on bushfire safety. Sampson's Flat, bushfire	2015	BNHCRC	Community led	Community Fire Safe program Information MIXED: Project 2 Survey (n=33) Interviews (n=10)	Community Fire Safe group members	43	Community Fire Safe group members 6.7 times more likely to have developed a plan since becoming a member; 3.5 times more likely to undertake planning and preparation; 90% of group members stayed in touch with their group during the fire; have greater understanding of bushfire risk.		Increased community involvement improved preparedness and confidence
Foster H.	Interactive hazard preparation strategy efficacy: Considerations for future community engagement programs Examined effect of home visits on preparedness Victoria, flood and bushfire	2013	AJEM	Community involvement	Community doorknock CFA Home Bushfire Advice Service MIXED: Surveys (doorknock n=106)	Victorians who had been contacted via one of these interventions	71	High rates of information retention for both programs, high rates of preparation activity as a result of the contact (91% for flood, 69% for bushfire).	Less likely to retain bushfire information and less likely to act on flood advice delivered via home visits	These f2f methods are effective.

Authors	Name and details	Date	Publisher	Approach	Intervention and research method/s	Community type/s	Study quality % score[1]	Good	Not so good	Successes?
					(HBAS n=90)					
Frandsen M., Paton D., Sakariassen K.	Fostering community bushfire preparedness through engagement and empowerment Forums followed by field days/focus groups as a foundation for community development approach to preparation in four Tasmanian communities Tasmania, bushfire	2011	AJEM	CBDRM	Forums MIXED: Interviews (n=?) Survey (n=77)	People who attended community forums	43	Increased knowledge, increased preparedness, increased information seeking.	Small numbers	15 Bushfire Ready Neighbourhoods formed. More interaction with local fire brigades including property assessments
Gaillard J.C., Monteil C., Perrillat-Collomb A., Chaudhary S., Chaudhary M., Chaudhary O., Giazzi F., Cadag J.R.D.	Participatory 3-dimension mapping: A tool for encouraging multi-caste collaboration to climate change adaptation and disaster risk reduction Participatory 3D mapping of risk Bochahi, Nepal, flood	2013	Applied Geography	Community led	Participatory mapping QUAL: Observation	Workshop participants	60	Increased recognition of all hazard risk; increased community preparation; increased collective action		Recognition of wider risk; increased collective activity
Gilbert, J.	Community Education, Awareness and Engagement Programs for Bushfire: An Initial Assessment of Practices Across Australia Assessed a number of programs in Australia Bushfire	2007	BNHCRC	Range of programs – Information through to community led	Information – media, publications Storytelling Community involvement Community participation CBDRM QUAL: Interviews Reviews of agency documents and websites	Agency staff Event attendees	80	Compilation of a database of community engagement methods	No data used to evaluate programs	

Authors	Name and details	Date	Publisher	Approach	Intervention and research method/s	Community type/s	Study quality % score[1]	Good	Not so good	Successes?
Glik D.C., Eisenman D.P., Zhou Q., Tseng C.-H., Asch S.M.	Using the Precaution Adoption Process model to describe a disaster preparedness intervention among low-income Latinos	2014	Health Education Research	Education & Information	Home visits Information delivery QUANT: Surveys (n=187)	Participants in both programs	17	F2F programs shift people's stage of thinking/doing about a plan and communication plan; home visits/education more effective than information delivery	Small sample, not randomly chosen	Overall improvement in preparedness, but home visits more effective than information kit.
Grillos T.	Women's participation in environmental decision-making: Quasi-experimental evidence from northern Kenya All hazards, especially drought	2018	World Development	Community participation	Workshops QUANT: Quasi-experimental Survey (n=226)	North Kenyan women	67	Increased preparedness on a number of indicators	Cultural norms prevented women from speaking up at workshops and implementing ideas at community level	Household level increases in drought preparedness
Haworth B., Whittaker J., Bruce E.	Assessing the application and value of participatory mapping for community bushfire preparation Assesses volunteered geographic information as a CE tool	2016	Applied Geography	CBDRM	Participatory mapping MIXED: Case studies Surveys (n=31)	Workshop participants	14	Increased social connectedness, understanding of local bushfire risk, and engagement in risk reduction activity	Small samples	Local knowledge can be applied and seen as valuable; increased preparation activity as a result
Jamshidi E., Majdzadeh R., Namin M.S., Ardalan A., Majdzadeh B., Seydali E.	Effectiveness of Community Participation in Earthquake Preparedness: A Community-Based Participatory Intervention Study of Tehran Three day workshop on earthquake preparedness, including mapping and preparation Tehran, earthquake	2016	Disaster Medicine and Public Health Preparedness	Community education and participation Becoming community led	Workshop (intervention and control groups) QUANT: Pre and post surveys (n=619)	Residents Tehran Zone 17	50	Knowledge increased, and preparedness increased almost three fold.		Participatory intervention is successful for earthquake preparation – evidence of community led approach emerging
Jurjonas M., Seekamp E.	Rural coastal community resilience: Assessing a framework in eastern North Carolina	2018	Ocean & Coastal	CBDRM	Focus groups/workshops	Residents of rural, flood	57	Tested framework; authors think valuable tool in	Very small sample; problems	Increased understanding of hazard risk;

Authors	Name and details	Date	Publisher	Approach	Intervention and research method/s	Community type/s	Study quality % score[1]	Good	Not so good	Successes?
	Focus groups aimed at fostering dialogue about flooding in rural communities North Carolina		Manageme nt		MIXED: Pre and post surveys (n=)	prone communities Vulnerable in terms of risk and resilience, likelihood dependency and diversity, inequality and prosperity		identifying strategies to build capacity in vulnerable communities	recruiting participants	decreased perception of own preparedness,
Mackie, B., McLennan, J. & Wright, L.	Community understanding and awareness of bushfire safety: January 2013 bushfires - Research for the New South Wales Rural Fire Service Tests reactions to RFS Bushfire Survival Plan Yass, Coonabarabran and Shoalhaven, bushfire	2013	BNHCRC	Informatio n	MIXED: Interviews (n=238) Survey (n=975)	Residents of fire affected communities	100	68% had a plan for bushfire, 8% had rehearsed it, 9% had written it down		Community seemed well prepared.
McNeill C.C., Alfred D., Mastel-Smith B., Fountain R., MacClemen ts J.	Changes in Self-Reported Household Preparedness Levels among a Rural Population after Exposure to Emergency Preparedness Campaign Materials Tested Texas Ready or Not campaign All hazards	2016	Homeland Security & Emergency Manageme nt	Informatio n	Information/educ ation materials QUANT: Pre Survey (n=136) Pre and post survey (n=42)	Attendees at East Texas Medical Outreach	8	Increase on all preparation factors tested – possession of document bag increased 54.8%, emergency kit 23.8%.		Generally better prepared
McNeill, I. M., Boldero, J. & McIntosh, E.	Household preparedness for bushfires: the role of residents' engagement with information sources Tested responses to agency interventions Australia, bushfire	2015	BNHCRC	Informatio n	Information Education QUANT: Survey (514)	Bushfire affected areas of Tasmania, Victoria, South Australia, Western Australia	42	Bushfire meetings generated significantly higher preparation activities across all preparedness clusters; website and brochures aided high levels of	Cause and effect on television commercials not well explained	Significant changes in preparedness after interventions

Authors	Name and details	Date	Publisher	Approach	Intervention and research method/s	Community type/s	Study quality % score[1]	Good	Not so good	Successes?
								preparation; TV commercials also had some effect on prep		
McNeill, I. M., Boldero, J. & McIntosh, E.	Household preparedness for floods: the role of residents' engagement with information sources Tested responses to agency interventions Australia, flood	2015	BNHCRC	Information	Information Education QUANT: Survey (n=286)	Residents of flood affected areas in NSW and Qld	50	Information meeting attendees reported more preparation actions; information seeking via agency website, brochure increased;	TV commercials had no impact on preparation	
Mitchell A., Glavovic B.C., Hutchinson B., MacDonald G., Roberts M., Goodland J.	Community-based civil defence emergency management planning in Northland, New Zealand Kaitaia community response plan development process New Zealand, all hazards	2010	Australasian Journal of Disaster and Trauma Studies	CBDRM	Community coalition Workshops Seminars QUAL: Case study Observation	Participants of the response plan development process – Kaitaia community members	40	Committed community involvement in the process		Process for community participation in such an exercise was mapped
Nguyen H., Hien H.M., Shaw R., Thi T.T.M.	Community based disaster risk management in Vietnam Maps the Four on the Spot process used in Vietnamese communities for collective preparation All hazards, mostly floods and storms	2013	Book chapter: Forms of Community Participation, Nova Science Publishers	CBDRM	Workshops Education Training Exercises MIXED: Case studies	Case study community residents	100	Reduced flood fatalities and losses in the communities studied		
Nous Group	Community Led demonstration project - Evaluation findings Mapped experiences with community capacity-building projects facilitated by the Country Fire Authority for future improvement to process Victoria, bushfire	2013	Nous Group	Community led	Workshops to build community plan QUAL: Interviews (n=?)	Participants of the projects in 5 Victorian communities	50	Increased and improved community relationships and participants considered this the most important aspect to community preparedness	No change to community capability; changes not consistent	Process is longer term than the project

Authors	Name and details	Date	Publisher	Approach	Intervention and research method/s	Community type/s	Study quality % score[1]	Good	Not so good	Successes?
Phillips R., Cook A., Schauble H., Walker M.	Can agencies promote bushfire resilience using art-based community engagement Arts-based workshops with young people Victoria, bushfire	2016	AJEM	Community participation	Workshops QUAL: Interviews Observation	15 young people (5-16 years) in a small rural community	40	Improved relationships with agencies, improved community networks	Not clear on effect on preparedness as no pre-testing was done	Started to overcome a trust problem between community and agency
Redshaw S., Ingham A.P.V., Hicks P.J., Millynn J.	Emergency preparedness through community sector engagement in the Blue Mountains Tested two agency initiatives – Meet your Street and More than a Fire Plan in Blue Mountains NSW, bushfire	2017	AJEM	Community participation	Networking event (MYS) Seminar (MTFP) QUANT: Survey (n=533) Interviews (n=61)	People who took part in the programs from the Blue Mountains	42	MYS: Improved community networks -33% said they had met new people MTFP: increased conversations about planning with others in community; increased preparation activity – kits, plans, meeting neighbours, prepare house		Increased networking and conversations about bushfire.
Rhodes, Alan, John Gilbert, Catherine Nelsson, and Emily Preece	Evaluation Report 2010-2011: C2.10b Evaluation and Effectiveness Project Evaluation of CFA's community engagement programs Victoria, bushfire	2011	CFA	Range of programs – Information through to community led	Information – media, publications Storytelling Community involvement Community participation CBDRM QUAL: Interviews Reviews of agency documents and websites	Agency staff Event attendees	100	See results presented in the Table 7 for techniques for which data was available.	Home Bushfire Assessment tool (online tool) received mixed results	Fire Ready Victoria community and street meetings, Home Bushfire Advice Service were effective at triggering preparation activity
Schmidt J.	Notes on national earthquake education programs in Israel	2018	Procedia Engineering	Education	Seminars MIXED:	Isolated larger towns, working	70		Apathy persisted	

Authors	Name and details	Date	Publisher	Approach	Intervention and research method/s	Community type/s	Study quality % score[1]	Good	Not so good	Successes?
	Earthquake				Observation Interviews Pre and post survey (n=2000+)	and middle class. Interviews with teaching and agency staff Surveys with students			toward earthquakes; low resilience indicators persisted. Researchers thought problems with pedagogy and impact of culture and religion	
Soane E., Schubert I., Challenor P., Lunn R., Narendran S., pollard S.	Flood perception and mitigation: The role of severity, agency, and experience in the purchase of flood protection, and the communication of flood information United Kingdom, flood	2010	Environment & Planning	Information	Information delivery QUANT: Survey (n=2109)		7		Only one 15.2% of survey respondents looked at information offered; most of these opted not to undertake the actions suggested	
Tanwattana P.	Systematizing Community-Based Disaster Risk Management (CBDRM): Case of urban flood-prone community in Thailand upstream area Evaluation of a community co-operation game approach Thailand, flood	2018	Int. Journal of Disaster Risk Reduction	CBDRM	Gaming approach MIXED: Case study Interviews Survey Observation Focus groups	Three communities in rural, flood prone Thailand	100	Games allowed exploration of scenarios that members hadn't thought of. Group involved continued collective preparation outside the game; wider community involvement after the project finished		
Tran P., Shaw R.	Enhancing community resilience through information management: Flood risk mapping in Central Viet Nam Viet Nam, flood	2009	Geoinformatics for Natural Resource Management	CBDRM	Participatory mapping QUANT: Observation	Rural villagers	79	Integrated local knowledge and villages emerged with more useable and effective maps		Process prompted networking and common goals.
Van Manen S., Avard G.,	Co-ideation of disaster preparedness strategies through	2015	Design Studies	CBDRM	Ideation workshops	Residents of a village and a	90	Residents in these areas are already	Assumption could be made	Increased commitment

Authors	Name and details	Date	Publisher	Approach	Intervention and research method/s	Community type/s	Study quality % score[1]	Good	Not so good	Successes?
Martínez-Cruz M.	a participatory design approach: Challenges and opportunities experienced at Turrialba volcano, Costa Rica Explores two ideation workshops about Turrialbo Volcano La Central/Santa Cruz in Costa Rica, eruption				QUAL: Pre and post survey (n=36)	large town in rural Costa Rica		highly prepared: 71-75% had undertaken most prep activities.	that most who attended are aware, while those who didn't attend could be unaware of need for prep. Difficulties getting people to think creatively.	by residents to champion preparedness in their neighbourhood.
Webber, D., Gissing, A., Dufty, N. & Bird, D.	Community participation in emergency planning Case study of pilot project to encourage community involvement in flood emergency planning in three NSW communities Narrabri, Burringbar/Mooball, Chipping Norton, floods	2017	AJEM	CBDRM	Community coalition MIXED: Interviews (n=36) Social media content analysis	Rural and urban, small and city	100	Improved relationships between agency and community; better role understanding; better understanding by community groups of flood and emergency risks.	Engagement in metropolitan communities was a challenge; time challenges – the process takes time, doesn't fit to a timeline.	Improved engagement capacity of agency staff, tighter relationships with community, confirmation that cross-agency involvement is important.
Wie Yusuf J.-E., Rawat P., Considine C., Covi M., St. John B., III, Nicula J.G., Anuar K.A.	Participatory GIS as a tool for stakeholder engagement in building resilience to sea level rise: A demonstration project Assess a mapping exercise in rural, flood-prone Virginia	2018	Marine Technology Society Journal	CBDRM	Participatory mapping MIXED: Observation Survey (n=48)	Rural residents, Hampton Roads area of Virginia	14	Local knowledge incorporated into risk mapping;	Did not measure social or other preparedness aspects of exercise.	
Williams M.V., Chandra A., Spears A., Varda D., Wells K.B., Plough A.L., Eisenman D.P.	Evaluating community partnerships addressing community resilience in Los Angeles, California Measuring development of coalitions across two points in time	2018	Environmental Research and Public Health	Community led	Community coalitions QUANT: Survey Social network analysis	Members of 16 LA community resilience coalitions	25	Coalitions start with large groups/low trust and break down trust issues over time; groups grow over time; very active in getting information out into their community,	Less active on more interactive activities such as exercises or mapping	Growth of networks over time

Authors	Name and details	Date	Publisher	Approach	Intervention and research method/s	Community type/s	Study quality % score[1]	Good	Not so good	Successes?
	Los Angeles, all hazards									
Molino, S. & Huybrechs, J.	Do education strategies sink and communities swim? Evaluation of the Woronora preparedness strategy five years on Woronora, NSW, flood	2004	AJEM	Information	Information Education QUANT: Survey (n=100)	Flood affected residents in metropolitan Sydney	58	66% of residents retained one message from permanent signs; 24% still had flood info kit; mailed brochure retained by 20% of residents;	No baseline gathered so, difficult to make comparisons or change judgements. Little preparedness activity recorded; 4% have emergency flood response kit	Retention of information.

Table 6 Summary of evaluation undertaken by Rhodes et al 2011 for which data was available

Program	Basis for classification	Context	Research method	Outcomes
FireReady community and street meetings	• Meetings involving local people onsite	• Post-Black Saturday evaluation of CFA education and engagement	• Content review, surveys, interviews	• 47% of survey respondents had attended in the past • 1 in 4 attended in last six months, but a drop on last survey in 2009-10 • Top reasons for attending meetings were – • to get information about bushfire risk in their local area • to get information on new developments or issues that they may not be aware of, and • to assist in the development of their bushfire survival plan. • People who attended felt the meetings – • Provided useful information and updates about changes and initiatives; • Provided motivation to undertake preparation and planning actions; • Assisted with decision making and development of bushfire plan; and • Created a basis for cooperation with neighbours. • 28% of responses identified the information and understanding generated through the meeting as a main benefit of attending. • 15% cited insights into how to prepare their property and households to improve their safety as a major benefit • 12% suggested that the meeting prompted better planning including decisions about protective actions and evacuation • The 'active and involved' group were much stronger in the view that they are looking for information updates whereas the other groups' responses were more evenly spread across the other benefits. • The 'done it already' group were more likely to say that there were no benefits in attending, reflecting their general belief that they were well informed about

Program	Basis for classification	Context	Research method	Outcomes
				bushfire safety and that the threat from bushfire was minor.
Home Bushfire Service - CFA	• Home visits by fire officers to give advice on preparation activity	• From a Victoria Bushfire Royal Commission recommendation	• Content review • Interviews with fire safety officers • Observation • Survey	• 17% of respondents accessed the service • 54% knew of the service • Why people use it: • checking, reviewing, confirming and validating existing preparation and plans (16% • recognition of living in a bushfire prone area (15%) • to get information and advice from CFA (37%).
Household Bushfire Assessment Tool – CFA	• Online and paper tool that walks householders through factors that allow them to assess their level of preparedness	• VBRC recommendation	• Survey	• Low usage and high dropout rates • 15% of all respondents indicated that they had used the online tool • 51% of these had done so in the preceding 12 months. • 49% had worked through the whole tool • 7% of all people in high risk areas used HBSAT to get a final result about the defendability of their property • Reasons for not completing the tool: • too complicated / not user friendly • got distracted • found approach obvious • Respondents identified the main benefits of using the tool as • advice on what needs to be done to make a property defendable (15%) • new ideas or things that hadn't previously considered (15%) • informing a decision on whether to stay and defend (11%) • 26% reported no benefits of the tool. • Average 'bounce rate' of 57% - more than half of visitors to the HBSAT site immediately left the site without viewing additional pages

Program	Basis for classification	Context	Research method	Outcomes
Bushfire Planning Workshops	• Interactive, story-sharing workshop designed to help participants develop a bushfire plan	• Targeted at top 52 high risk areas in Victoria	• Interviews with facilitators • Observation	• Low participation rates • Attendees coming with low knowledge base, many having not attended a FireReady meeting • Resource intensive, with evidence that participants are not emerging from w/s with a plan. • Can be hijacked by local issues such as with neighbours or the local council • Engagement was most successful when the FSO-W provided information in a manner that was interesting and motivating and encouraged the resident to think through the issues and discuss them. • Seems to affect decision to leave early – with fewer people (12%) intending to stay and defend than six months previously (18%). • Topics discussed: • defendable space around the property (72%) • ways to maintain the house and make improvements (71%) • maintenance activities to prepare the property (68%) • intended actions if a fire threatens the property (67%).

4.3 RQ1 – WHAT ARE THE MOST EFFECTIVE HOUSEHOLD/PERSONAL PREPAREDNESS ACTIVITIES ACROSS A RANGE OF HAZARDS?

The original aim of this systematic literature review was to find studies that established the effect of each of a range of household preparedness activities that are presented by agencies and scholars as necessary for personal safety during a disaster and which would achieve the AIDR's definition of preparedness effect (Australian Institute for Disaster Resilience, 2018). This was to: "…build the capacities needed to efficiently manage all types of emergencies and achieve orderly transitions from response to sustained recovery." In particular, we focused on preparedness activities that were related to personal and family safety during and after the hazard impact, which were generally clustered this way:

- bushfire safety planning

- preparation for leaving

- preparation for the period post-impact

However, disappointingly, no such studies were found at any stage of the culling process. Instead, we discovered no shortage of grey and academic studies that investigated how prepared people were (or not) in response to campaigns or components of those campaigns (such as Dunlop, McNeill, Boylan, Morrison & Skinner, 2014, Glik et al., 2014, King, Goudie & Dominey-Howes, 2006; Kleier, Krause & Ogilvie, 2017; McLennan, Elliott & Wright, 2014; McNeill, Boldero & McIntosh, 2104a, 2014b). No studies investigated the effect of an activity on the personal safety or resilience of the person who undertook the activity. Many studies reported on the effectiveness of a community engagement technique or program from an interaction perspective, where successful outcomes were behavioural adoption, increased awareness or affirmative attitudes. The effectiveness of tools were rarely discussed regarding their efficacy in dealing with a natural hazard event. As shown in the figure below, the tools to be used by community members were usually chosen based on industry standards.

As McNeill et al. (2016, p. 118) wrote: "The impact of preparedness efforts on outcomes and risk reduction cannot be tested in the absence of a real-life disaster." We might add a scenario or exercise such as ShakeOut to their assertion.

Therefore, research determining the effect of preparedness activity would most likely feature the following:

- randomised trials of a single preparation activity per group, including a control group (similar to Glik et al., 2014)

- an intervention in which the activity was explained and participants persuaded to undertake that activity (also following Glik's methodology)

- longitudinal surveys or indepth interviews before and after the trial

- a repeat of the data collection methodology after the impact of a hazard in that community

- a repeat of the data collection methodology after a drill or simulation of a natural hazard (similar to Adams et al., 2017)

A more achievable and less costly (but also less rigorous) approach in Australia might be to expand BNHCRC post-event survey instruments from 'what preparation activities people undertook before the event' to 'what effect they thought each activity had on their safety and ability to cope'.

In the meantime, preparation checklists suggested for personal safety during and after a natural hazard's impact are a tool used by agencies that does not have an evidence-base. We identify this as a research opportunity using the simulation option – although streamlining the checklists used by agencies might not be sufficient justification for the cost of such a large and comprehensive multi-hazard study or series of smaller (but still costly) single hazard studies.

4.4 RQ2 – WHAT PHILOSOPHICAL OR ENGAGEMENT FRAMEWORKS ARE BEING USED AND EXAMINED IN LITERATURE?

A wide range of theories and frameworks emerged from the literature review, with 20 papers that we found and retained in this review using some type of framework. They generally fell into two categories – those using a description of a community engagement for disaster management approach, and those using a general outcome philosophy. They ranged from information delivery approaches to community-led, community design frameworks, but mostly sat comfortably within the IAP2 spectrum of community engagement. In some papers, models were developed to describe the phenomenon researchers were investigating, or had been developed by those researchers for other applications – in some of these cases, the frameworks mimicked other, more mature models, and indicated shortcomings in the literature search foundations underpinning the model presented by the authors.

Some studies used a specific community engagement theory or framework, others examined information processes by community members and residents, some used guiding principles from previously successful programs, while others used broad philosophical approaches. Many projects (50%) adopted a single unifying theory or framework for their work. Twenty-two percent of included studies adopted multiple theories and frameworks, weaving them together. Twenty-eight percent of studies did not report that a theory or framework was used.

*Figure 5 Theory and framework adoption*
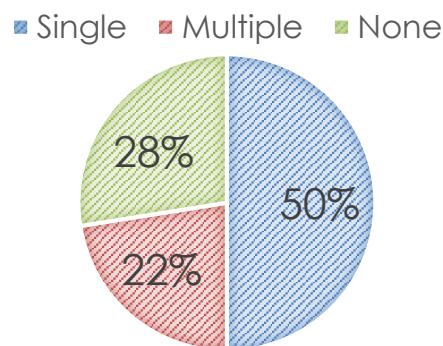
As expected, major frameworks such as Community Based Disaster Risk Management (CBDRM) were adopted by a variety of papers that examined them in different contexts. For instance, Nguyen et al. (2013) provided information about the status of CBDRM activities that international and local non-government organisations have implemented or are currently implementing. Tanwattana (2018) examined CBDRM from the point of view of spontaneous Community Disaster Risk Management Organisation (CDRMO) formation in the case study of Thai communities. Their work (2018, p. 799) emphasises that the Sendai Framework's priorities of 'enhancing disaster preparedness for effective response and to Build Back Better in recovery, rehabilitation and reconstruction' could be achieved through Community Based Disaster Risk Management (CBDRM) and Community Disaster Risk Management Organization (CDRMO) approaches."

Disaster risk reduction (DRR) was also a more popular framework, however it was used and defined by authors more as a philosophy than as a framework to guide an outcome. Van Manne et al.'s (2015) work on the promotion of disaster preparedness strategies for Costa Rican communities living near active volcanoes makes mention of DDR which is embedded in Costa Rica's governance structures. DRR is also mentioned by Gaillard et al. (2013) but mainly focused on anticipatory three-dimension mapping as a tool for encouraging multi-caste collaboration. Their road map for DRR is very broad and illustrated below.

Figure 6 Road map for disaster risk reduction
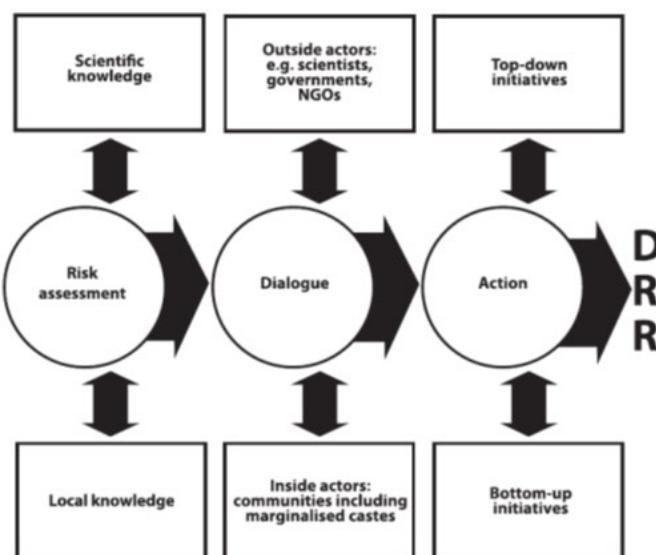
Exploring the benefits and limitations of interpersonal community engagement strategies was the focus of Foster's (2013) work. The process described in this paper demonstrates that many forces influence information retention and preparation uptake and the process is also influenced by the degree to which message transfer is passive. They also write that the failure by the community to understand or accept information is likely due to programs not meeting the diverse needs of communities, facilitators not explaining the significance of risks, nor how these risks will affect individual households; and not offering personalised, specialised solutions for households to mitigate their risk.

Figure 7 Factors influencing community engagement
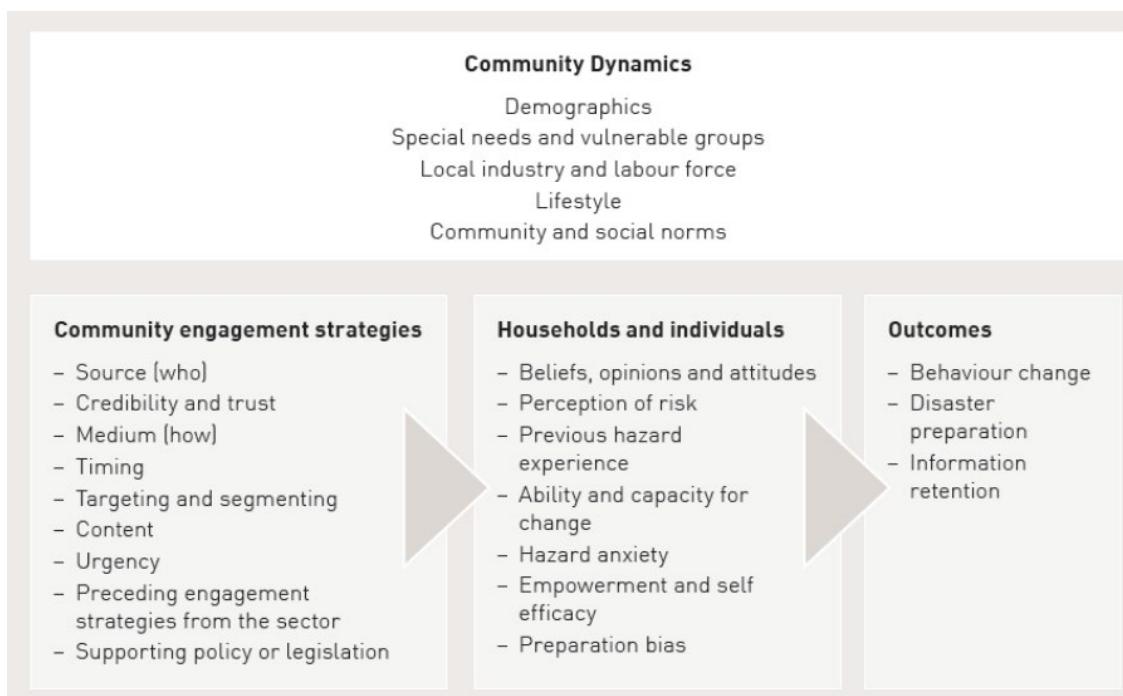
The question, can agencies promote bushfire resilience using art-based community engagement? was answered in a paper by Phillips et al. (2016). Here, four community engagement approaches sourced from Johnston (2010) were used:

1. Community information (e.g. agency websites, mobile applications communicating fire warning)

2. Community consultation (e.g. Victoria's 2016 Fire Operation Planning consultations)

3. Community participation (e.g. the 'Community FireGuard' educational program delivered to groups of households in a neighbourhood)

4. Ongoing relations engagement (e.g. Emergency Management Victoria's 2016 community-based emergency management planning initiative)

Gendered risk engagement that challenged the embedded vulnerability, social norms and power relations in conventional Australian bushfire education was examined by Eriksen et al. (2014). A theoretical or guiding framework was not provided, but the work did examine bushfire education through the lens of feminist inquiry.

Soane et al. (2010) used the constructs of responsibility and agency as important precursors to action. They found differences between responsibility - concerned both with a sense of moral duty and with a belief that action must be taken - and, agency, which they said refers to a sense that one is able to take effective action (Soane et al., 2010, p. 3025). They assume that in order to take action, homeowners need to accept that it is their responsibility to protect their home, rather than the responsibility of institutions of the state, and also that homeowners must believe that their actions will have positive, meaningful consequences.

This concept of empowerment was extended by Grillos (2018), who adopted Kabeer's (1999) framework for breaking down the unobservable process of empowerment into measurable moments. These included:

- Resources (pre-conditions)

- Agency (processes of decision-making)

- Achievements (outcomes)

Here, Kabeer's (1999) framework was operationalised by viewing "…resources as survey questions related to knowledge and social capital (resources), participation in decision-making processes (agency), and actual actions taken to prepare for emergencies such as severe drought (achievements)" (Grillos, 2018, p. 120).

This empowerment approach was continued in Yusuf et al.'s (2018) work on stakeholder engagement in building resilience uses the Action-Oriented Stakeholder Engagement for a Resilient Tomorrow (ASERT) framework. This framework was developed by Old Dominion University researchers as an approach to facilitate the engagement of stakeholders from across multiple sectors in building resilience (Considine et al., 2017). The ASERT framework emphasized the presentation of relevant and accessible information, coupled with the use of two-way communication and deliberative and participatory mechanisms. "The deliberative and participatory components of the ASERT framework build on the Structured Public Involvement approach that has been applied in high-conflict decision-making contexts such as environmental and transportation planning" (Yusuf et al., 2018, p. 48).

The precaution adoption process, used by Glik et al. (2014), conceptualised outcomes as stages of decision-making linked to having disaster supplies and creating a family communication plan. This process supports the idea that people pass through seven distinct stages of decision-making for health behaviour including:

1. Being unaware

2. Becoming engaged

3. Starting to make a decision

4. Deciding to act

5. Deciding not to act

6. Acting, and finally

7. Maintaining the behaviour

Each stage represented a different pattern of behaviour, beliefs, and experience. Of importance were understanding the transitions between stages, as this theory acknowledged that behaviour change is complex, embedded as it is within different types of social and communication environments.

This cognitive approach was also reflected in the work by Adame et al. (2018), who evaluated their program by using the heuristic-systematic model of information processing (HSM). The HSM framework outlines two cognitive routes

used to process information; the heuristic, and the systematic pathways (Chaiken, 1980). Heuristic processing is a superficial form of non-analytic processing characterised by the use of cognitive shortcuts - these may include decision rules and/or learned cognitive schemata. They typically involve a simple probability judgement about the validity, utility, and acceptability of the information.

Heuristics can be valuable when time is short, consequences are minimal, and/or when the decision-maker is well-trained, as they provide low cost guidance. Despite the advantages, overreliance on simple rules can lead to faulty decisions and detrimental consequences (Adame, 2018). Systematic processing is a deeper form of processing involving increased use of cognitive resources; it is characterised by careful examination of the available evidence and its relevance to the context at hand. Systematic processing relies on increased consumption of cognitive resources and is therefore limited by individuals' motivation and cognitive ability to process the message.

One of the few frameworks presented in the literature that included consideration of the effect or consequences of preparedness activity (or lack of preparedness activity) was that developed by McNeill et al. (2016). Their work examined the changes in self-reported household preparedness levels among a rural population after exposure to emergency preparedness campaign materials. Their conceptual framework illustrated the relationships among preparedness, resilience, and risk reduction, and within these, plotted a reduction in the consequences of failure. It provided the lens through which the results of their research could be interpreted.

Figure 8 Community Resilience Task Force Conceptual Relationships
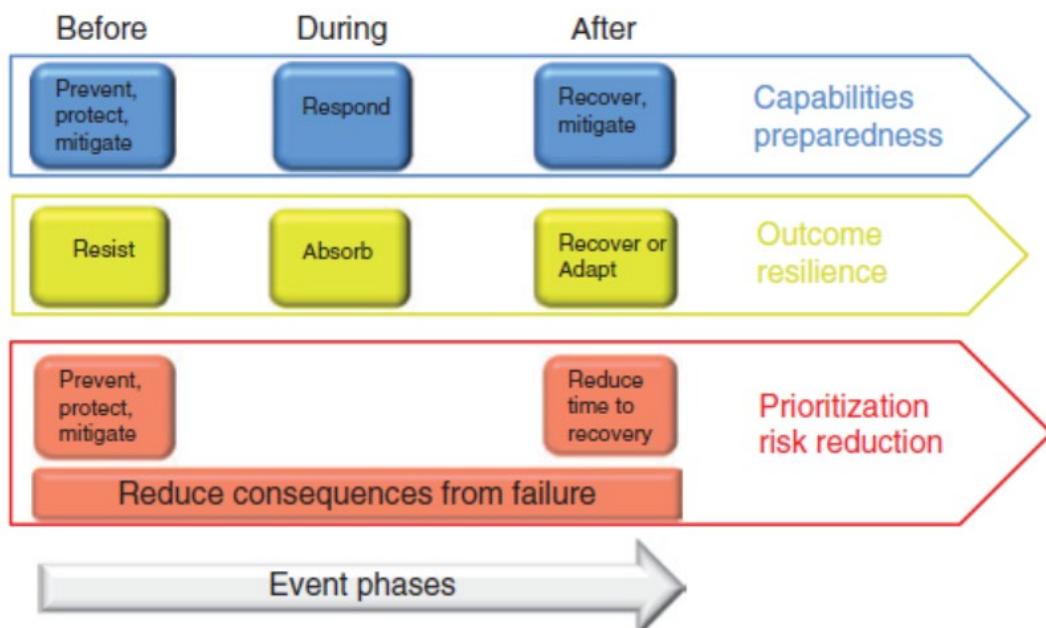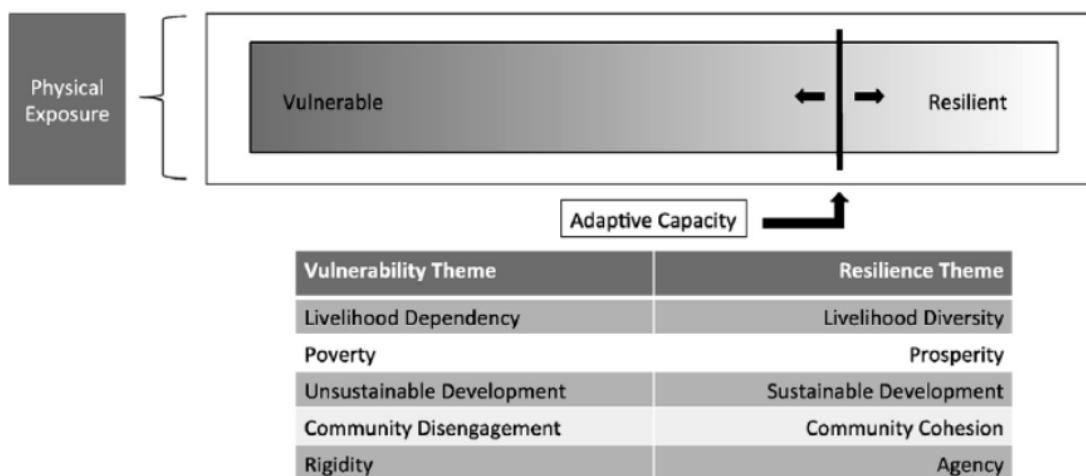

Source: McNeill, 2016, p. 117

A social norms approach was used by Adams et al. (2017) in their report on the large-scale community-based earthquake drill that drew on Bandura's Social Cognitive Theory whereby "rehearsing a behaviour improves one's ability to learn it, as practice allows them to refine the behaviour as a skill," (Adams et al.,

2017, p. 2). Social Cognitive Theory supports the idea that people learn from one another via observation and social modelling, which can then enhance their self-efficacy for engaging in a specific behaviour. Furthermore, self-efficacy, which is a measure of one's perceived ability to succeed in a specific action, is a reported as an important correlate of household and community disaster preparedness. Adams et al (2017, p. 2) found that learning with or from other people could reinforce norms and attitudes surrounding the behaviour, and encourage outcome expectations. "Positive expectations of a behaviour are also important correlates of disaster preparedness."

Coastal communities were the subject of both a framework and subsequent research by Jurjonas and Seekamp (2018). Their rural coastal community resilience (RCCR) framework was presented as a spectrum from vulnerable to resilient, in which a community's adaptive capacity was scaled between opposing indicators, with the line indicating the relative position of that community on this spectrum. The whole system or spectrum was influenced by the physical exposure of the community to climate change and hazard impacts. Here, vulnerability themes have a corresponding resilience theme on the spectrum - for example poverty and prosperity, and community disengagement and community cohesion.

Figure 9 Rural Coastal Community Resilience Framework

Vulnerability Theme	Resilience Theme
Livelihood Dependency	Livelihood Diversity
Poverty	Prosperity
Unsustainable Development	Sustainable Development
Community Disengagement	Community Cohesion
Rigidity	Agency

Source: Juronas, 2018, p. 139

The behavioural economics approach taken by Daniels (2017) aimed to help organisations better understand and influence stakeholder decision-making and focused on information processes and corresponding decision-making to determine what could be done to improve comprehension of bushfire preparedness material. He explains that different modes of thinking – System One (intuitive, emotional) and System Two (effortful, deliberate, reasoned) – influence behaviour and that cognitive overload can reduce motivation to act. Additionally, they found people were subject to a mass of cognitive biases that needed to be addressed to improve engagement and motivation to act. The diagram in Figure 10 illustrates their effort to overcome some of these biases - they chunked information into easy to navigate, simple successive steps that were clearly signposted. The use of icons helped reduce cognitive load and made the actions they were promoting more simple and achievable to community members.

Figure 10 Chunking information for behaviour change

Source: Daniels, 2017, p. 30

Michell's (2010) work on community-based civil defence emergency management planning focused on guiding principles drawn from Canadian efforts to promote collaboration and build consensus between diverse stakeholders in pursuit of sustainability. These principles were:

- **Purpose driven:** People need tangible reasons to participate in processes that demand their time and support

- **Inclusive not exclusive:** All parties with a significant interest in the issue should be involved in the process to ensure that the outcome can be implemented effectively

- **Voluntary:** Parties who are affected or interested should participate on a voluntary basis. Compelling people to participate will not result in support for the process

- **Self-designed:** The parties should design the process themselves rather than have the process prescribed to them. Different circumstances require different process responses, and participants are best placed to determine how to build collaboration and consensus

- **Flexible:** The process needs to be flexible to facilitate adaptation in the face of uncertainty and even surprise

- **Equal opportunity:** All parties must have equal access to relevant information and opportunity to participate effectively throughout the process. Otherwise the outcome may not be judged to have been fair and equitable. This principle requires special attention be given to the capacity building needs of all participants

- **Respectful of diverse interests:** Acceptance of the diverse values, interests and knowledge of parties involved in the process is essential for building trust and developing innovative solutions that can be implemented by participants

- **Accountable:** Parties are accountable to their constituencies and to the process that they agree to establish. Particular attention needs to be focused on ensuring that representatives and their constituencies, and the wider public, are well informed about the evolving process

- **Subject to time limits:** Realistic deadlines are necessary throughout the process to maintain focus; otherwise such processes can be seen to be 'never-ending'

- **Implementable:** Commitment to implementation and effective monitoring are essential parts of agreements reached; and a post-agreement mechanism should be in place to deal with any future problems that may arise

Curato and Calamba's work on knowledge transfer in community-based disaster governance used the "alternative lens" of Rikki Dean's (2017) four modes of political participation to understand public participation and community engagement (2018). They found it especially useful as it provided a descriptive taxonomy of participation on two dimensions: sociality and negotiability. Where sociality refers to the relationships among individuals in the public sphere, which can be agonistic (where people's pursuit of interests is conflictual), or solidaristic (where participants see themselves as interdependent members of a polity). Negotiability, on the other hand, refers to the extent to which a modality of participation is prescribed (imposition of participatory mechanisms to community members) or negotiated (community members themselves creating or securing a spot in the participatory space). Curato and Calamba used this model to explain the success of the globally recognised community-based disaster management program implemented in San Francisco, Cebu in the Philippines.

Table 7 Dean's (2017) four modes of public participation in policy decisions

Source: Dean, 2017

Rhodes et al. (2011) used a generic process-outcome model that they used to explain the community engagement evaluation process. This model was comprised of various forms of education and engagement programs which were intended to influence aspects of behaviour/response to the bushfire threat by providing information and advice to individuals and communities.

Figure 11 Generic process-outcome model of education and advice programs
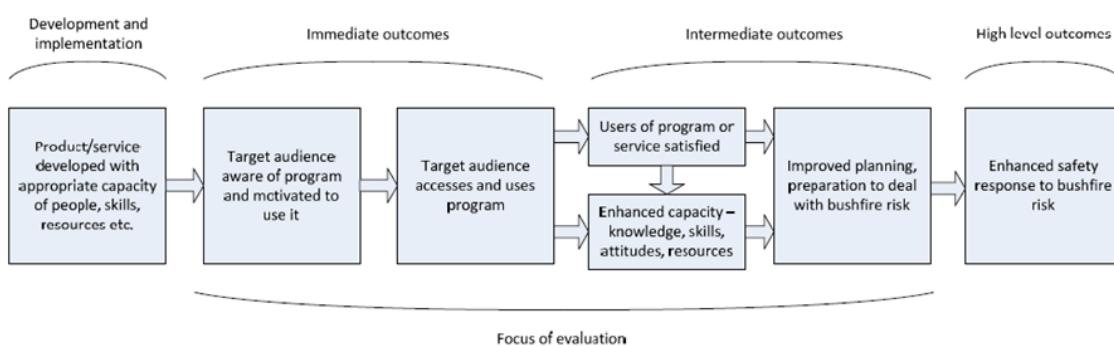
They detail the model this way:

- Reading the figure above from right to left, the model emphasises that to achieve the high-level outcome of improved safe response, people need to have adequate levels of planning and preparation to deal with the bushfire risk, which in turn is underpinned by the development of capacity in the target audience

- The model also includes an intermediate outcome of satisfaction with the program, reflecting that for people to adopt the recommended advice, they will have to be satisfied that it has met their needs

- In order to achieve these intermediate outcomes, a number of immediate or short-term outcomes are required, such as people initially being aware of the program and then accessing and using it

- All these outcomes depend on the program being developed and implemented as intended according to the program objectives

Eight essential levers for creating community disaster resilience are the key to the model used in Bromley's (2017) Los Angeles County Community Disaster Resilience (LACCDR) Project, and Williams et al. (2010) in their evaluation of community partnerships with that same program. This framework, developed from Chandra (2013) identifies these levers as: wellness, access, education, engagement, self-sufficiency, partnership, quality and efficiency (Eisenman et al., 2014).

The LACCDR Project was structured on four of these levers: education, engagement, self-sufficiency, and partnership. Education ensures ongoing information about preparedness, risks and resources before, during, and after a disaster. Engagement involves including community members and promoting participatory decision making in planning, response and recovery activities. Self-sufficiency refers to enabling and supporting individuals and communities to assume responsibility for their preparedness. Organisational partnership involves increasing and enhancing the linkages and collaborations between government and NGOs and between NGOs in the community. It is important to note that Candra (2013) defines community resilience not only as the ability to withstand and recover from disaster, but also involves the merging of disaster preparedness and community health promotion.

*Figure 12 Core components and levers of community resilience*
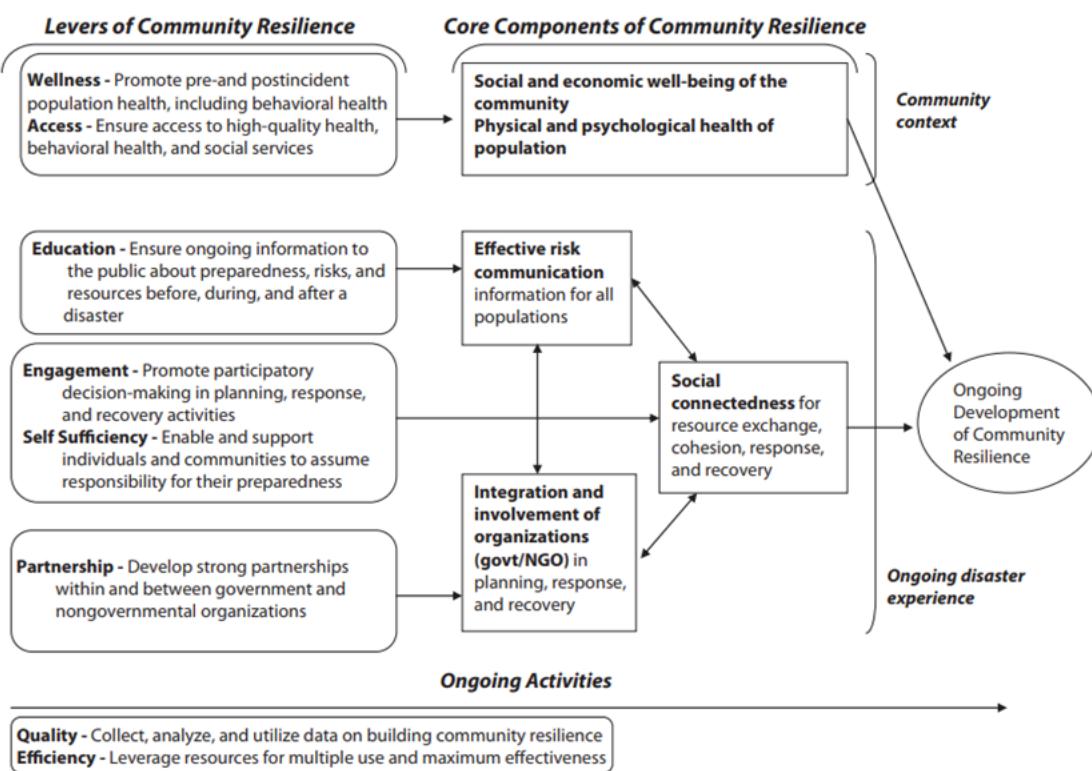
Note. govt/NGO = government and nongovernment organization.

Akama and Ivanka (2010) use both Participatory Disaster Risk Assessment (PDRA) and scaffolding to distil notions of community and critically reflect on challenges and obstacles faced when using participatory design methods in engaging a 'community' on bushfire risk awareness. PDRA is an established field of research that uses participatory, community-based approaches for empowerment, knowledge generation and leveraging negotiation for local change. Taking a critical view of PDRA, the authors apply scaffolding to participatory design as a focal point for discussion, "building on previous participatory design discourse that highlighted challenges, contradictions, issues of empowerment and problematic notions of participation" (Akama & Ivanka, 2010, p. 11).

Scaffolding supports "learning by the construction of temporary structures to provide alternative routes to problem solving and to enable cooperative learning activity with one another" (Akama & Ivanka, 2010, p. 12). One such example was the use of hand-written postcards to be passed through people's hands and facilitate communication between neighbours.

Figure 13 Scaffold postcards
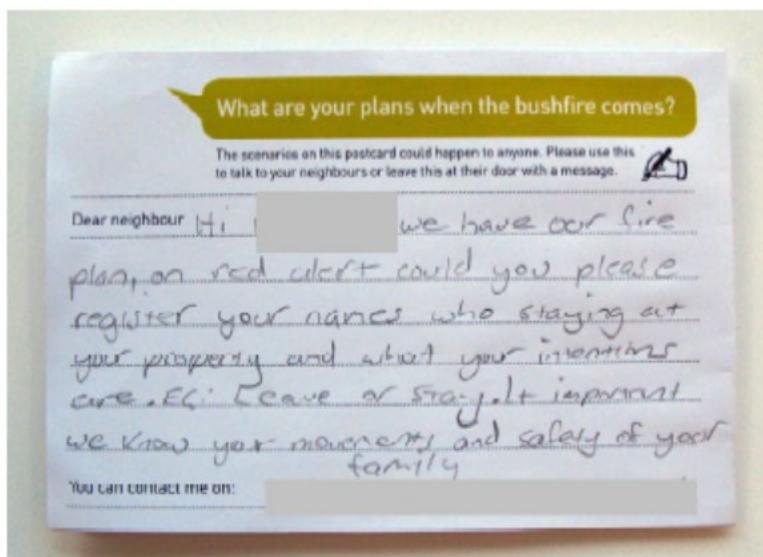
4.5   RQ3 - WHAT TOOLS ARE BEING USED TO ENGAGE COMMUNITIES?

This research question supported our search for the range of tools employed for community engagement for preparedness that have been subjected to empirical evaluation of effect in some form. Tools represent the method through which communities are engaged, made aware of, or interacted with. The most common tools in the literature we reviewed were a range of different types of workshops, community coalitions, information sharing and delivery, and participatory mapping. Workshops ranged in their focus and type, with most opting to use different types of activities to generate discussion and interaction from participants.

Participatory mapping was found to be common and used in combination with other communication activities and exercises. Notably, mapping could be conducted in physical construction forms as was the case in participatory 3-dimension mapping (Gaillard et al., 2013) where they using everyday objects to build a physical map their local area. These also worked well in digital form, such as in an Australian project that used participatory mapping for community bushfire preparation (Haworth, Whittaker, & Bruce, 2016) where information was added to be shared online.

Table 8 Tools reported in the studies

Tools*	Studies
Workshops	13
Community coalitions	6
Participatory mapping	4
Seminar	5
Information	6
Storytelling	1
Home visits	5
Exercises and drills	1
TOTAL	41

*See page 13 for summaries of each tool.

///////////////////////////////////////

4.5.1 Workshops

While 'workshop' as a term can be used to describe a range of activities spanning knowledge and skill building exercises, workshops featured in this review were used in combination with information sessions, educational exercises and information sharing. Workshops were conducted with different focuses and aims.

For instance, in the Phillips et al. (2016) studied if agencies could promote bushfire resilience using art-based community engagement through music workshops for young people in a small-town. Van Manen, Avard, and Martínez-Cruz (2015) used participatory ideation workshops where participants were asked to consider challenges of getting community ready for volcano eruption and came up with planning and implementation ideas based on what would motivate them to prepare. Eriksen (2014) investigated gendered risk engagement by challenging the embedded vulnerability, social norms and power relations in conventional Australian bushfire education, they used workshops to measure perceptions of agency staff on tool effects. Ardalan (2013) examined the effectiveness of a primary health care program on urban and rural community disaster preparedness by capacity building using primary healthcare networks. This involved community education training with household heads then a 90 min workshop about earthquakes (Ardalan et al., 2013).

Frandsen, Paton, and Sakariassen (2011) work on fostering community bushfire preparedness through engagement and empowerment, used workshops to generate community participation in preparation. This involved interactive information sessions where Tasmanian Fire Service (TFS) district officers provided expert bushfire advice, community members participated in question and answer sessions with a panel, fire pump demonstrations occurred, and a barbeque lunch was provided. Some other studies that seemed similar made references to workshops being used, but unfortunately did not detail the workshop itself (Grillos, 2018).

Tanwattana's (2018) workshop detailed a community cooperation game (CCG) for disaster management. Eight players are needed to play the game based on the eight roles-playing, one moderator and facilitator are also used. The game is played on board displaying a flood simulation area with topographic risk zones, activities cards are used by people to prepare before flooding, respond during flooding, and adopt prevention and mitigation strategies after flooding. The game's three objectives are to:

- encourage community based flood disaster management approach

- promote cooperation between local community and local government

- provide opportunity for mutual decision making of multi stakeholders

The game uses three main elements to achieve these objectives. Firstly, Scenarios which are designed based on flooding from overflowing rivers, they include normal situation (pre-flood), high risk zone flooding, all zones flooded, and after flood recovery stage. Secondly, Roles which represent groups of stakeholder and activity options, and includes mayor, volunteers, community leaders and community members of three zones. Lastly, Rules which control the flow of the

game, conditions for players and debriefing. Although not evaluated statistically, positive results of this study were identified (Tanwattana, 2018, p 212):

1. it reflected the real world situations of case studies and influenced decision making of community players

2. the game promoted cooperation within the community for disaster risk management

3. it promoted social resilience of community

In a New Zealand project, Mitchell, Glavovic, Hutchinson, MacDonald, Roberts, and Goodland (2010) adopted three main processes to generate community-led preparedness: community engagement, plan development, and plan approval. An initial public meeting to introduce the proposed plan, its key issues, and conceptualise outcomes was established. This was used to generate discussion about ideas and issues to be addressed. A working group was established, and meetings were held with all of the stakeholders to agree on an achievable timeframe for completion. Another public meeting was held to present the plan to the wider community for comment and feedback; encouraging further community participation and ownership of the plan as well as the planning process. The working group meet annually to review the plan. The plan development occurred in stages after the first community meeting.

This process was used to ensure participants articulated their concerns and ideas and contributed to the development of the plan, but also that the plan remained focused on building community response capacity and, ultimately, resilience. Multiple workshops and review meetings were conducted and used to update the development of the plan. Feedback and comments were used to make changes as the plan progressed. Comments and recommendations were considered and integrated into the plan. After the development of the final draft copy, the Group Emergency Management Officer and the Consultant reviewed the plan to finalise content and coordinated the release to the community. A second public meeting, attended by the wider community and other interested parties, and at this point, minor amendments were made.

Akama and Ivanka's (2010) research goal was to enable a participant-centred process of knowledge generation and exchange in a bushfire preparedness context. Their work (Akama & Ivanka, 2010, p. 13) "elaborates on the design research interventions that were carried out to engage and understand the 'community of place' of the local area." They first conducted social network analysis (SNA) by mapping community interest groups in the region (such as surf life-savers' club, lawn bowls club, country women's association, the football and cricket club) to identify potential 'connectors' and 'brokers'. These connectors and brokers could act as agents within the networks who can spread messages on bushfire awareness effectively to others. Critically, they found that while undertaking the SNA, large groups of residents were not represented in the activity.

Having identified these gaps, the researchers sought to capture residents who were not part of the local social-network by experimenting with a method to reach them through alternative means. Using the 'connectors' previously identified, they gave this group a set of postcards to be passed through their

networks. These cards were intended to prompt people to attend a bushfire awareness workshop in the town as well as facilitate communication between neighbours. Regarding the efficacy of the method, the researchers state that "we are uncertain whether it played the desired role" and also suggested that "the postcards would have been far more effective in its role had they been distributed by participants who came to the bushfire awareness workshop" (Akama & Ivanka, 2010, p. 16).

The bushfire awareness workshop was then used to employ 'playful triggers' an innovative method whereby commonly found objects were used to access, interpret, visualise, articulate and communicate implicit knowledge through facilitated conversations. Residents used buttons, beads, coloured matchsticks, and even toy animals to visualise their collective knowledge of the local area. Residents found the method to be intuitive, informal, and effective; it also assisted in revealing insights that they were not aware of before. The researchers concluding thoughts detailed that "the learnings from this research project can be used to leverage and negotiate the necessary changes within government and fire authorities. We see that this change can occur through participatory design, and through continuous attempts to strengthen the capacity and impact of its research and discourse"(Akama & Ivanka, 2010, p. 19).

Engagement activities piloted across three different communities – Narrabri (northwest NSW), Burringbar/Mooball (north coast NSW) and Chipping Norton (southwest Sydney) - were evaluated by Webber et al. (2017). Specific objectives were set for each pilot community: improving evacuation plans (Narrabri), developing flood plans (Burringbar/Mooball) and improving flood awareness and acknowledgement of the need for planning (Narrabri, Chipping Norton, Burringbar/Mooball). The process began by establishing reference groups consisting of community members, NSW SES members, local councils and other emergency services. These were used to assist in understanding the community and gaining local perspectives of the best methods for engagement. Community leaders representing specific community networks where chosen based on SNA and after consultation from NSW SES.

Workshop activities were developed and tailored to each community. They included small group discussions about warning systems and evacuation planning, social network mapping exercises, presentation of previous community-led initiatives, participatory mapping and group discussion of previous flood experiences. While details on the workshop activities were limited, the results included improved relationships between NSW SES and the community, and an increase in awareness and appreciation of NSW SES roles and flood risks.

Jurjonas and Seekamp (2018) tested a proposed framework of rural coastal community resilience (RCCR) by using focus groups. Their participant numbers were limited, but justified by the research team as mini-focus groups consisting of around three to seven people. A presentation was given to these participants discussing flooding mitigation and adaptation within the region delivered by an employee with expertise in hazard mitigation and experience working in the local region. Following the presentation, a series of posters were used to workshop ideas about resilience and risk. Changes were made to academic terminology to make words clearer and understood by participants, for example,

using words such as 'at-risk' instead of 'vulnerable' was suggested. Participants then voted on where they thought the community would be on a spectrum of resilience, the facilitator asked for explanations for their decisions and this was used to facilitate further discussion on the issue of community resilience and preparedness. Overall, the authors (2018, p. 147) found that "the RCCR framework, with its five resilience and opposing vulnerability themes, provides a starting point to stimulate the capacity building dialogue among community members, resource managers, planners, and other stakeholders necessary to maintain their rural coastal communities and way of life."

An education program on earthquake preparation in Israel was found to have major shortcomings rooted in pedagogy, according to Schmidt et al. (2018). They detailed the program as jointly operated by the Israeli Home Front Command and the Israeli Ministry of Education for staff and students and their families. The program was taught through readiness lessons offered to school children in grades two to 12 and was designed to be delivered by regular school staff. The stated objectives were to provide pupils with both theoretical and practical knowledge for preparing and responding to earthquakes within the school context, but students struggled to recall information and confused response recommendations with a rocket attack session conducted the day before in the same program. The program also intended for the students to be 'readiness agents', to convey information to their families. Evaluation of the program showed 'alarming disinterest', with practical community resilience to earthquakes virtually absent among both the student body and parents. Explanations to this ranged from general apathy to the threat, more pressing existential pressures, religious determinism ("the belief that natural disasters are in the hands of a divine power"), and even earthquake denial in the form of "purposefully disengage […] to avoid confronting stressful issues such as earthquakes or other potentially calamitous scenarios" (Schmidt, 2018, p. 1268).

4.5.2 Community Coalitions

Community coalitions are representative community groups who have formed to work together to achieve a common goal and were a feature of community led programs. This strategy was often combined with other activities such as information sessions, meetings, and exercises. The main benefit of this approach was the ability to pool resources and achieve a wider impact than if individuals or agencies were working by themselves.

Coles and Quintero-Angel (2018) examined the Colombian landslide management program, Guardianas de la Ladera (Guardians of the Slope). Organised in Manizales, Colombia, this program hired female heads of household to maintain landslide-prevention infrastructure and communicate landslide risk to the community. The women were employed and trained to recognise and report on landslide precursors and to educate their local community about landslides and warning signs. Multiple institutions supported this program through funding, coordination, and technical or developmental expertise.

Community coalitions have been a key component of the Los Angeles Community Disaster Resilience project, and were evaluated by Williams and

colleagues (2018), using a social network survey to measure the number, type, and quality of relationships among the coalitions.

Community-based organizations and government institutions such as schools, police/fire departments, local businesses, and neighbourhood councils were identified as basic infrastructure for developing a collaborative. Additionally, community coalitions included organisations and people such as local faith-based groups, emergency managers, churches, schools, nursing homes, and businesses. They found that by measuring relationships among collaboration members on a continuum of activity coordination, ranging from lower to higher resource intensive activities (e.g., process to integrated), coalition members in both types of communities (preparedness or resilience focus) tended to have greater process and cooperative relationships than coordinated or integrated relationships, however cooperative and integrated activities did increase over time. This suggests the community coalitions need time to form and adequately coordinate between themselves.

Bromley and colleagues (2017) also examined a range of coalitions comprised of government agencies, community-focused organizations (such as churches, schools, nursing homes), businesses and community members. In their work (Bromley et al., 2017, p. 2) they wrote that "community resilience entails enhancing preparedness through improving social connectedness and coordination between health and human services agencies." Their project was developed over two years by the Los Angeles County Department of Public Health working closely with community, academic, government and business partners. Four pre-defined levels measured whether coalitions were implementing the project (Bromley et al., 2017, p. 3) correctly: "engagement with community with particular attention to the needs of traditionally vulnerable populations, organizational partnerships specifically among government and nongovernmental organizations (NGOs), community self-sufficiency, and education and training through the disaster cycle."

A similar, but more active project in The Philippines was reviewed by Curato and Calamba (2018), who examined participation as knowledge transfer in community-based disaster governance in the small island of San Francisco, Cebu. A community-based disaster management program called 'Purok' was evaluated. This sub-village level organisational system empowered citizens to plan and implement disaster preparedness programs that fit their specific needs and geographical context. Specifically, they found "the purok system is a governance innovation that divides barangays or villages—the smallest administrative unit in local government—into zones or subgroups of 20 to 50 households. Puroks have no formal legal mandate, although they can perform government functions under the supervision of local officials. Each purok has a coordinator and a council of 'ordinary residents' trained to deliver basic services to households" (2018, p. 6). With limited access to the internet, mobile phones and radios, the purok system was used to disseminate information and risk assessments, with purok coordinators acting as couriers of information to residents.

'Bottom up goals' were a feature of an Australian community-led project, which were then fed through the emergency management sector system to improve its overall effectiveness (Nous, 2016). This addressed two central obstacles to

community resilience: community bushfire plans that are not locally driven endorsed and developed; and communities underestimating the hazard and agencies lacking local knowledge of vulnerability. Community steering committees of 8-10 community participants were assigned a facilitator to implement the five-staged community led planning approach. The five stage process involved community profiling, analysing the risk, engagement planning, plan creation, and implementing actions. Details on the actual step-by-step sub-processes were not included in their evaluation report, but their work (Nous Group, 2013, p. 11) did identify five key findings:

1. Participants recognised a need to improve their community's understanding of risk

2. The level of change in individual knowledge and skill varied considerably

3. Most felt their understanding of the community had improved

4. Stronger relationships proved the most important capacity improvement

5. Changes in the community's capabilities has not yet occurred

The Report for the South Australia Country Fire Service (CFS) on community experiences in the 2015 Sampson flat fire (Every et al., 2015) focused on bushfire safety, the CFS Community Fire Safe program and information and warnings. The Community Fire Safe program is (2015, p. 40) a "street-by-street and run by a group coordinator, aims to not only provide people with bushfire information, but also to create community level communication (e.g. through phone trees) and function as a source of support before, during and after a fire." Positive results included group members who reported that since joining a group they are more likely to a) have a bushfire plan, b) undertake those property preparations which were financially and situationally possible and c) alert neighbours of fires, and also that "group members were 6.7 times more likely to develop a plan since becoming a member of a Fire Safe group than prior to being a member" (Every et al., 2015, p.7).

4.5.3 Participatory Mapping

Participatory mapping is defined as any process where individuals, especially local participants, share in the creation of spatial data such as a map (Goodchild, 2007). Participatory mapping has played a key role in obtaining critical socio-spatial data that are relevant to ecosystem-based planning and management (Levine & Feinholz, 2015). The content below details the various ways in which participatory mapping techniques were adopted by researchers. Both digital and paper-based mapping processes are reported by authors and these are seen not as competing methods but, in some cases, complementary.

Digital participatory mapping was part of a project by Yusuf and colleagues (2018, p. 48) to "solicit and codify residents' perspectives on community assets and to help residents assess how these assets and the communities they are embedded in and are challenged and impacted by sea level rise and flooding." Using Nintendo Wii technology and weTable software they created an interactive tabletop that gave participants the ability to visualise rising water levels. The research project demonstration team used Google Earth to present spatial data and maps to weTable participants, who interacted with maps of

their local area. Participants were first asked to identify assets in the community, why they are useful and which assets should be prioritised and why. Then a flood layer was added to the map (specifically projections under the scenario of 1.5 feet of sea level rise and a 100-year storm surge), and a second question posed (2018, p. 49) "With this map as an aide, tell us what kinds of challenges you see?" The positive results outlined by Yusuf (2018, p. 52) find that the "demonstration project showed how participatory mapping can, by directly engaging residents in creating socio-spatial data, be a process-driven and vital way of building knowledge and fostering learning and deliberation in a complex issue such as resilience."

In a similar approach in Australia, application and value of volunteered geographic information (VGI) in bushfire risk reduction was assessed (Haworth, Whittaker & Bruce, 2016). They examined VGI as a social practice by considering the user experience of contributing VGI and the potential for these activities to increase community connectedness for building disaster resilience. The activities involved a paper-mapping exercise and web-based digital mapping. Held in local venues over a four to five hour period, researchers (2016, p. 118) found that mapping workshops allowed participants to test a range of mapping methods with hands-on activities specific to their community. It also got community members talking with each other.

Paper mapping involved two to five participants working on satellite and topographic maps with plastic overlays, coloured markers and stickers. They were asked to add information to the maps they considered relevant to bushfire preparation in their community and present their ideas to the group. The digital mapping exercise involved collating all the information each group had reported into a combined web map. Entries could be made with coloured pins, short written descriptions, and photos. The participants also evaluated the different map types detailing their strengths and weaknesses and these are shown in the table below.

Table 9 Strengths and weaknesses of mapping methods identified by participants

| Map	Strengths	Weaknesses
Paper	Good for discussion/brainstorming Good when technology is disrupted More fluid input e e.g. sketching Not reliant on power or internet access Useful to issue to new residents or tourists Inclusive activity	Difficult to maintain currency Resulting maps easily lost or damaged Poor legibility Limited scale/boundary of the page Limited audience/not easily communicated or shared Resource costs Information needs to be translated to digital to be used in other ways, e.g. in a GIS Unlikely to carry around final maps
Digital	Higher resolution Accessible to many Collating various information Increased accuracy and greater detail Can zoom/pan to locations e changeable scale Storage Mobile accessibility Multiple layers of information, e.g. satellite imagery Data can be combined and manipulated with other databases Easier to edit and update	Technology difficult for some to use Digital divide not everyone has access Technology failure Inaccurate/false information Information verification managing malicious intent Ephemeral nature of GIS platforms Dependent on power/internet access Time needed to learn the technology/software Who has access to the information mapped? E.g. the public, arsonists Cluttering of data on the map

Source: Haworth, 2016, p. 123

A variation of participatory three-dimensional mapping (P3DM) was facilitated by Gaillard et al. (2013), where locally available and cheap materials (e.g. carton, paper, cork, crepe sole) were used to overlap thematic layers of geographic information. It enabled the mapping of landforms and topographic landmarks, including land cover and use, and anthropogenic features, which are depicted by push-pins (points), yarn (lines), and paint (polygons)." Gaillard worked with local Filipinos for three hours every day for six days to develop a comprehensive map, with no financial compensation was given but snacks provided. The map allowed residents to discuss and assess disaster risk, and although the entire village usually gets flooded when levees are breached, the map gave villagers the ability to identify which areas will be the worst hit based on the sequence of events and depth of floodwater.

Tran and Shaw (2009) used a slightly more sophisticated approach to incorporate different layers of secondary information and household data, with their process diagram shown below. Using participatory rural appraisal (techniques, community participation was ensured and local knowledge incorporated. They detailed that "most of the process of flood risk mapping was placed in the village and was carried out by local people and local authorities. At village meetings the community members first share their ideas and opinions on the purpose of developing the flood risk maps and what important factors they would like to put into the map. The next step is to draft the household flood risk maps based on the data collected from the field, and to discuss what actions should be taken to reduce such risks" (2009, p. 172).

Figure 14 Flood risk mapping process
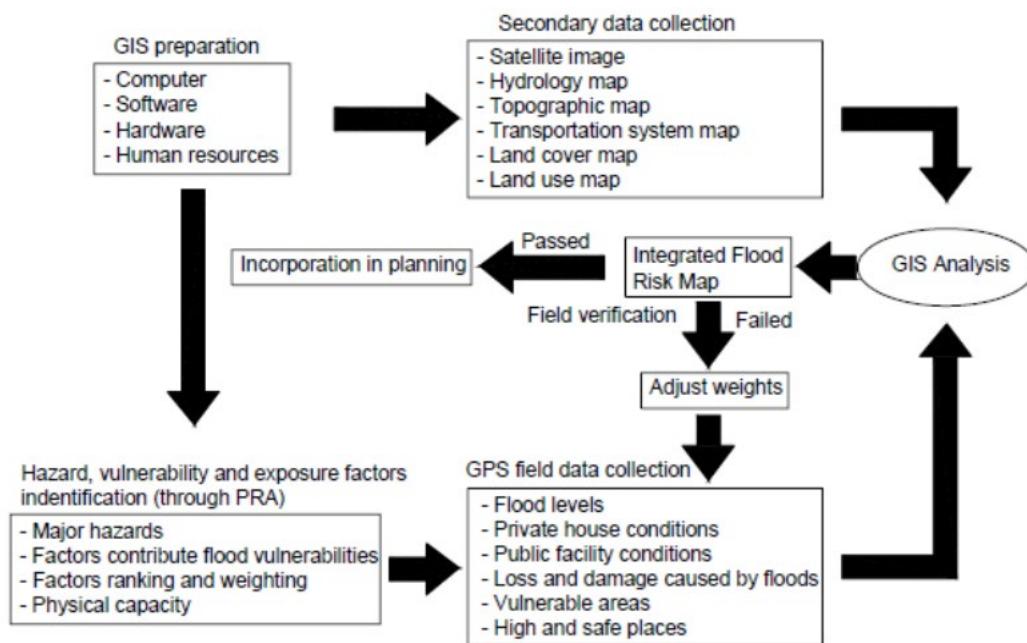
Source: Tran & Shaw, 2009, p. 172

Using both primary data collected and reported by households and secondary data from government institutions, they developed a map of household flood risk. Their flood risk mapping successfully transferred unrecorded local knowledge into maps and succeeded in establishing trust, respect and an exchange of information among local communities and local authorities as well as local

planners. Risk awareness was raised and once plans were implemented members felt responsible for their involvement.

4.5.4 Seminars

Seminars presented information to an audience and had limited activities. They are usually highly structured and take an audience through a predefined set of modules or stages and in many cases were considered education activities.

The PrepWise intervention was a seminar-type disaster preparedness training program for community-based older adults in Iowa (Ashida, Robinson, Gay, Slagel, & Ramirez, 2017). The intervention had older adults participating in a one hour training session in small groups, during which an experienced disaster preparedness educator walked through each module discussing the contents and assisting the participants to fill in the workbook as needed. The seven modules of the PrepWise program included:

1. knowing types of emergencies and what to do

2. vulnerability assessment (alerts/warnings, evacuations, transportation, communication, sheltering, personal care, and medical care and equipment)

3. developing a personal emergency support network (formal list of family/friends and local community members)

4. making an emergency plan

5. keeping a supply of medication

6. making an emergency supply kit

7. making home, school, work, and car travel safer

Participants were asked to develop and document their own personal emergency support networks by using a worksheet that listed their support provider details and what activities they assisted with.

Other information campaigns that used seminars were the Ready Campaign and the Texas "Ready or Not?" Campaign (McNeill, Alfred, Mastel-Smith, Fountain, & MacClements, 2016). The purpose of this study was to measure the self-reported preparedness levels of a rural population in the U.S. before and after an exposure to preparedness education materials during the seminars. The Texas Department of State Health Services (TDSHS) developed an educational campaign in partnership with the Ready.gov emergency preparedness campaign. The Texas campaign has been ongoing since its debut in 2011 and the materials are free to access. The educational resource was made available to participants at the East Texas Medical Outreach (ETMO) event. Representatives of the local TDSHS preparedness division utilised the ETMO as a venue for interacting and providing education, as well as sharing preparedness materials with attendees of the clinic. The ETMO was conducted over a three-day period with new participants attending each day. However, exposure to emergency preparedness campaign materials was secondary to attendance at the ETMO for purpose of medical services. The primary finding of this study is that

there was a significant change in the general preparedness levels after the emergency preparedness education.

In the field of bushfire education, McNeill, Boldero, and McIntosh (2016a) show that even after controlling for covariates such as bushfire risk perceptions, people who access and engage with information sources are better prepared for bushfires than those who do not. Information sources included active sources such as information meetings, websites, or brochures, as well as passive sources in the form of a television commercial. Their results showed that use of websites had the greatest positive impact on preparedness actions, followed by brochure use; meeting attendance and seeing a television commercial had only small effects on preparedness. Respondents who reported attending at least one information meeting, or one website, or one brochure on completed a significantly higher percentage of preparedness actions such as increasing the fire resistance of one's property, safely evacuating, safely defending, and planning, than those who did not attend any meetings, and those who attended at least one information meeting also attained, on average, a higher percentage of emergency kit items than those who did not attend any meetings.

McNeill et al. (2016b) also examined the same research question as their paper above, but regarding flood risk. They found that people who used one of the three active information sources (i.e., information meetings, websites, or brochures), had on average completed a significantly higher percentage of planning actions compared to those who had not accessed information (2016b, p. 26). Further research showed that only brochure use was significantly related to increased physical preparedness (i.e. attaining items for an emergency kit) with people who had viewed a flood-related commercial over the past three months were not more prepared in any capacity measured in this study than those people who had not seen a flood-related commercial. Additionally, people who had used multiple (two or three) active information sources were not more prepared in any capacity, compared to those people who had accessed only one information source. While brochures had the greatest positive impact on planning and physical preparedness website use and meeting attendance only had only small effects on planning. Notably, non-attendees reported having more social support for response available to them, compared to those who did attend a meeting.

Two partnership programs established by the community and emergency services sectors in the Blue Mountains, New South Wales featured seminar-type activities and both successfully raised the level of emergency preparedness and community resilience to disasters (Redshaw, Ingham, Hicks, & Millynn, 2017). The first program was More Than a Fire Plan (MTFP) a structured, two-hour seminar held in central with presentations from emergency services staff. The information provided allowed people to understand the functions of each service, preparedness, and emotional preparedness. The second program, Meet Your Street (MYS), involved barbecue events organised in local parks. They were attended by neighbourhood centre staff and RFS representatives, where staff could have conversations with people about fire preparedness. Results of the program indicated substantial improvement in preparedness of attendees, especially with respect to preparing homes for an emergency, as well are spreading detailed awareness.

4.5.5 Information

Information focused on simple message delivery and evaluated message processing through framing considerations. Information was mostly in the form of written content that a person had to read themselves to understand.

Soane, Schubert, Challenor, Lunn, Narendran, and Pollard (2010) examined how to encourage home owners to protect themselves and their residences from flooding. They surveyed for baselines levels of flood-protection devices and domestic flood protection purchases. They then examined responsiveness to information about flooding. Soane and colleagues detail the process as follows, (2010, p. 3028) "participants were given the opportunity to click on headings and read additional information about several aspects of flooding: flood risk, health risks associated with flooding, preventive action, likelihood of future flooding, and flood location. After reading the information, participants were asked to rate the extent to which the information was useful; their intentions to purchase flood-protection devices; how costly it was for them to install flood protection; and how beneficial they thought installation of flood protection might be." Notably, only 15% chose to look at the additional information that was given in the survey, Soane (2010) takes this to suggest that the majority of participants were not responsive to flood-related information.

One of the highest profile campaigns of recent times was the U.S. Centers for Disease Control's Zombie Apocalypse program, which attempted to frame citizen-level preparedness in the context of surviving a zombie apocalypse. Adame's (2018) research measured several theoretically relevant cognitive and attitudinal constructs to examine the persuasive efficacy of the zombie message as compared to a similar one addressing a real, salient natural hazard. The zombie condition begins with a brief historical summary of zombies as a cultural phenomenon, and then moves on to discuss preparedness behaviours that should protect one from a hypothetical zombie attack. These message manipulations resulted in four distinct hazard messages: zombies, hurricanes, tornados, and earthquakes. They found that participants in the zombie condition report slightly higher levels of perceived interest content, as well as higher rates of attention, importance and behavioural intentions for preparedness activities (specifically, assembling an emergency kit, making a disaster plan, and seeking disaster information).

The best measured of the information campaigns was that of the NSW Rural Fire Service, documented by Daniels (2017). It modified an information dense bushfire preparation website using a behavioural economics approach, simplifying messaging and calls to action. The initial challenge was that (2017, p. 24) "not only did people think the issue of bushfire preparedness was not important enough to take action, but the way information had been presented made taking action harder. The survival plan contained an overwhelming amount of information with few cues to aid in behavioural navigation, likely to cause cognitive strain, system overload, and choice paralysis." The team focused its efforts on developing action-orientated material with simple successive steps, using concise language, chunking of information, developing easy to use checklists, colour coding content, and adopting visual symbols. Results by 2017 showed increased correct assessment of risk, bushfire plan discussion, and increased levels of preparation.

Specific preparedness messaging channels were investigated by Mackie, McLennan and Wright (2013) as part of a wider investigation into the community's reaction to a bushfire, and their level of understanding and awareness of bushfire safety in regards to the rural NSW January 2013 fires. "The aim of this project was to provide the NSW RFS with an understanding of community bushfire preparedness and responses to warning messages in three NSW areas that had been identified as being particularly impacted by fires in January 2013: the Wambelong fire near Coonabarabran, the Cobbler Road fire near Yass and the Deans Gap fire in the Shoalhaven area" (Mackie et al., 2013, p. 1). Most respondents were shown to have knowledge of official bushfire warnings or messages, these included those delivered via television, radio, the internet, email, SMS and landline phone calls along with warnings received via the RFS website and Fires Near Me app. It was found that once the respondents became aware there was a bushfire threat, they undertook a variety of preparatory actions such as turning on the radio, telephoning friends and relatives, and going to the NSW RFS website for more information. As part of the concluding reflections, the researchers found that community bushfire safety campaigns have to compete with other calls on time and attention. A table of bushfire warnings, messages and warning media are displayed below.

Table 10 Information types and respondent awareness

Information types	Percentage of respondents
Fire Danger Ratings	65%
Prepare, Act, Survive	57%
Bushfire alerts	53%
Roadside billboards	42%
Sirens	22%
Radio broadcasts	42%
NSW RFS Total Fire Bans	56%
NSW RFS Fire Danger map	22%
NSW RFS Fires Near Me app	17%
None of these	11%

Glik, Eisenman, Zhou, Tseng, and Asch (2014) examined two different disaster preparedness interventions in Latino communities in the U.S. Residents were randomly assigned into either: (1) household preparedness education received through a group called 'promotora' where a community health worker led small group meetings, or (2) household preparedness education received through print media.

The high-intensity group involved one hour face-to-face discussions about disaster preparedness led by trained lay community health workers. Participants in these groups both received materials and discussed and practiced carrying out individual household preparedness actions over a four week period, meeting once a week. The low-intensity group received mailed, culturally competent, print materials consisting of a pamphlet, a laminated shopping card, and six pre-printed cards for disaster communication planning with instructions on how to fill it out. These mailings were repeated twice. Ultimately they find (Glik et al., 2014, p. 272) that "simple media-based communications may be sufficient to encourage disadvantaged households to obtain disaster supplies; however, adoption of the more complex disaster family communication requires interpersonal education."

4.5.6 STORYTELLING

Storytelling, either in person or via some type of media, has been used as a behaviour prompt in public relations campaigns in other fields as well as emergency management, but the effects not measured in the emergency management context. One exception was the documentary film, Fire Stories - A Lesson in Time, presented a narrative of the devastating fires in the upper Blue Mountains in 1957 that destroyed over 170 homes. The film's purpose was to allow local communities to learn from a previous disaster (Chapple et al., 2017). The film was 35 minutes, produced by the Blue Mountains World Heritage Institute, and portrayed local residents describing their experience of the 1957 bushfires and reflecting on what they had learnt. The film was viewed by 2,600 people at two cinema events, and by another 12,000 people based on DVD sales and YouTube views.

A behaviour change activity list was used to evaluate any changes in preparedness activities before and after viewing the film. Positive results were achieved with an increase in the activities such as developing and rehearsing plans, preparing gutters and gardens, and in a small number of cases installing water tanks, fire pumps, and fire protection equipment. As reported by the evaluators (Chapple et al., 2017, p. 65) their study "reinforced the benefits of alternative community-based approaches that enhance the effectiveness of community bushfire safety endeavours. Films that present personal narratives of past experiences can allow social learning based on storytelling. The Fire Stories film project can be described variously as a means of communication, an education activity and a mode of engagement."

4.5.7 HOME VISITS

Home visits provided tailored information to householders in a form that is easy to digest and more interaction than simple information delivery, and also provided a chance to ask questions on issues specific to a house hold or property.

Foster (2013) evaluates two home-based engagement strategies, the Victoria State Emergency Services (VIC SES) 'Community Education Doorknocks', and the Country Fire Authority's (CFA) 'Home Bushfire Advice Service' (HBAS). The door knock campaign involved pairs of volunteers visiting households at risk of over floor flooding. They would discuss with householders the impacts of flooding and ways to minimise the impact by preparing effectively. They also left an information kit at the home at the conclusion of the visit. Households that did not answer had an information kit left on their doorstep with an invitation to connect VIC SES for further information. The HBAS program focused on bushfires and involved a Fire Safety Officer visiting the property to provide specialised advice. A follow-up written report would be posted to the householders detailing the key points. Commonalities and differences between the programs are outlined in the table below.

Table 11 Commonalities and differences among Home Visits programs

Commonalities	Differences
Face-to-face interaction Visit to the homes of community members Provision of specific information relevant to their household, and Provision of supplementary, written information to prepare for the hazard	The CFA engagement strategy is instigated by the householder and a suitable time is determined The VIC SES engagement strategy is instigated by the agency and is carried out without a time being pre-arranged with the household The CFA engagement strategy has been running for three years, and The VIC SES engagement strategy was in pilot phase.

Source: Foster, 2013, p. 10

Results of the programs showed positive results (Foster, 2013, p. 11), with 98% of respondents (89 people) who participated in the HBAS kept their written report, while 77% of respondents (43 people) doorknocked by VIC SES kept their information kit. In terms of making changes and adopting preparedness activities only 9% of people in the VIC SES program reported changes, however 69% of HBAS respondents adopted the recommendations made. These included clearing gardens, purchasing firefighting equipment or generators, and relocating combustible materials.

Rhodes, Gilbert, Nelsson, and Preece (2011) reported on multiple evaluations of bushfire programs, specifically Fire Ready Victoria Bushfire Planning Workshops, Home Bushfire Advice Service (formerly the Advice to Property Owners program), Household Bushfire Self-Assessment Tool, and CFA's advice to the community as presented in its suite of published materials. With some aspects of the following programs assessed, Community FireGuard, Township Protection Plans – Community Preparedness Guides, Neighbourhood Safer Places and Fire Danger Ratings. The various programs used street meetings (to promote comprehensive community education and engagement), workshops (which had minimal impact in the community), home advice and doorknock visits (mainly only benefiting those already interested in preparedness), self-assessment tools (useful as a niche tool for those already interested into bushfire preparedness), guides, neighbourhood safer places, and fire danger ratings (where "rather than seeing fire danger forecasts as authoritative advice to be followed, many people regard the forecast as just one factor in their decision making"). Overall, they found (2011, p. 2) that "many people undertake 'easy to do' preparation actions, but more complex and necessary measures are much less likely to be undertaken."

Similarly, Gilbert (2007) reported on multiple practices across Australia in relation to programs for improving community safety in bushfires. They detail a large database of over sixty distinct programs that have been classified into eleven overarching types of programs and activities. These are:

- Media campaigns (used as an outlet to get information to a large audience in a practical and timely manner, and include commercials, radio commercials and phone-ins, as well as press advertising and feature articles in local and regional newspapers)

- Warnings

- Printed publications

- Interactive publications

- Local brigade activities (may take the form of displays or presentations at schools, fêtes and other community events. Brigades in some states have dedicated mobile education units)

- Street and community meetings

- Community briefings during and after a fire (arranged at short notice to provide an update on the current situation, information about the likely threat faced by the community, the options available to residents and where to get further information.)

- Community Groups with Preparedness Focus (designed to equip a group of neighbours with the knowledge they require to prepare their properties for bushfire and devise strategies about how to protect themselves in a way that suits them best.)

- Community Groups with Predominant Response Focus (provide a group of neighbours with the necessary skills and equipment to protect their own properties before, during and after a bushfire.)

- Community Development Based Approach

- On-on-One Consultations (visits from the facilitator or a local brigade member to a household, empowering but resource intensive)

Regarding storm and flood education, pilots of two regional community education programs called FloodSmart (Benalla) and StormSmart (Wodonga) were evaluated by Dufty (2008) The FloodSmart pilot report greater impact across the community than the StormSmart project, which could have been a result of differences between approaches of local SES units. Effective tools appear to be flipcharts that people could hold onto for the duration of the season, action guides and meter box stickers (only for FloodSmart). The community barbeques and stalls (for FloodSmart) were the most effective types of community events. Dynamic and static elements were used - static engagement tools consisted of an Action Guide, FloodSmart generic flip chart, FloodSmart signage, FloodSmart posters, FloodSmart web pages on the VIC SES website, promotional items such as tote bags, frisbees, pens, magnets and stickers and meter box stickers. Dynamic elements were implemented over an eight week intensive campaign involving the local SES unit, regional and state staff, with Benalla Rural City and community organisations. These dynamic activities included: community presentations, meetings, focus groups and door knocks, community events coordinated by SES volunteers and supported by other organisations, and community groups (e.g. Lions Club, Neighbourhood Watch). These events included free community barbeques and local market stalls. Additionally, a pilot school program was adopted to provide ongoing early engagement and awareness regarding all hazards household planning and preparedness. The effect of the program on preparedness levels in the target populations is shown in Table 12.

Table 12 - FloodSmart's effect on preparedness (Dufty, 2008)

Flood preparedness indicator	Level	Before FloodSmart %	Immediately after FloodSmart %	Two months after FloodSmart %
Perceived level of preparedness	Unprepared	31	19	2
	Slightly prepared	30	30	23
	Moderately well prepared	28	37	41
	Very well prepared	0	9	25
	Extremely well prepared	1	5	9
Have a home emergency plan	Yes	8	39	24
	No	92	61	76

The StormSmart pilot adopted similar engagement tools and included StormSmart Action Brochure, StormSmart DL brochure, StormSmart poster, StormSmart meter box sticker, promotional items such as tote bags, frisbees, pens, magnets and stickers. This project also had a dynamic implementation phase which included community events such as barbeques. Dufty reported the following results for StormSmart's motivation of preparedness in Table 13.

Table 13 - StormSmart results (Dufty, 2008)

Storm preparedness indicator	Level	Before StormSmart %	Immediately after StormSmart %	Two months after StormSmart %
Perceived level of preparedness	Unprepared	17	11	6
	Slightly prepared	20	17	21
	Moderately well prepared	58	56	31
	Very well prepared	5	16	36
	Extremely well prepared	0	0	6
Have a home emergency plan	Yes	12	11	20
	No	88	89	80

Jamshidi (2016) and colleagues conducted a community-based participatory intervention on people's earthquake preparedness in a pilot area of Tehran. They first established an exhibition on earthquake preparedness in the local area with various stakeholders such as the municipality, disaster mitigation, the management headquarters of the local council, the hospital, and firefighting organisations. Their rationale for this was that because earthquake preparedness was not a priority of people an exhibition was needed as a prerequisite to carry out the programs and motivate voluntary participation. They detail the next steps as follows (2016, pp. 212–213): "In each household, a responsible person over 18 years of age was interviewed. Trained volunteers provided face-to-face training to the households in the intervention neighbourhoods. The volunteers were equipped with an emergency kit and card, checklists of teaching items, and educational booklets and pamphlets prepared in a simple and comprehensible way."

4.5.8 EXERCISES AND DRILLS

The first Great ShakeOut campaign, a drill that took place in earthquake prone Los Angeles was measured by surveying those who registered for the campaign about their participation in the drill and other campaign activities. These activities consisted of (Adams et al., 2017, p. 3):

1. participating in the "drop, cover and hold" drill on 13 November at 10 a.m.

2. practicing a disaster plan

3. helping others prepare for the ShakeOut

4. participating in a meeting in their workplace or school about preparing for earthquakes

5. joining a MySpace ShakeOut group

6. joining a Facebook ShakeOut group

7. playing the Beat the Quake game on the ShakeOut Website

8. signing up to play AfterShock, which became available after the launch ShakeOut drill

The frequency of participation in activities is displayed in the table below, and these were grouped into four main factors namely behavioural, interpersonal, games, and social media. Although participation, the main focus of the program, was high at 71%, all other of the other activities have participation levels below 40% and social media below 5%.

Table 14 Activities and participation rates

Activities	Participation rate	Factor
Drop, cover and hold during drill	71.0%	Behaviour
Practice a Disaster Plan	39.0%	Interpersonal
Help others prepare for Shakeout	39.0%	Interpersonal
Participate in a meeting	33.0%	Interpersonal
After Shock game	8.0%	Games
Beat the Quake game	12.0%	Games
Join Facebook	3.0%	Social Media
Join MySpace	0.3%	Social Media

Another exercise-based engagement activity is used in Vietnam, where "the local government has highlighted the importance of improving community awareness and individual knowledge on climate change so that each member in social community can create their own solutions to response to disaster from their experience" (Nguyen, Hien, Shaw & Thi, 2013, p. 128).

The Vietnamese government used games in a program it called "Four on-the-spot" which included a range of community-level organised training and simulation exercises for agencies directly engaging in flood and storm prevention and rescue; preparedness planning, and mobilisation of all local resources, first aid, and self-management. Additionally, early warning systems and information networks were considerably strengthened at the commune and village level. The main objectives of these groups were to help local people to prepare human resources, facilities, food and funds; to approve the plans for flood and storm prevention and to monitor. Nguyen et al. (2013) detailed this program, and recorded improved community and individual knowledge on climate change and its disaster affects, as well as generation by communities of their own solutions to response to disaster.

4.6 RQ4 – WHAT RESEARCH METHODS WERE USED TO EVALUATE THESE TOOLS OR PROGRAMS?

The third research question asked what research methods were being used to evaluate these tools. Given the variety of research designs, quality was appraised differently depending on study design used for given project. This is consistent with Miller and colleagues (2017) who adopt the relevant appraisal tools for corresponding research designs. This study used three main appraisal tools. For quantitative studies the Study Quality Assessment Tools (SQAT) produced by National Heart, Lung, and Blood Institute (NHBL, 2019) were used.

These tools were based on quality assessment methods, concepts, and other tools developed by researchers in the Agency for Healthcare Research and Quality (AHRQ) Evidence-Based Practice Centers, the Cochrane Collaboration, the USPSTF, the Scottish Intercollegiate Guidelines Network, and the National Health Service Centre for Reviews and Dissemination (NHBL, 2019). These tools include questions for evaluating potential flaws in study methods or implementation, including sources of bias (e.g., patient selection, performance, attrition, and detection), confounding, study power, the strength of causality in the association between interventions and outcomes, and other factors (NHBL, 2019). Quality reviewers select "yes," "no," or "cannot determine/not reported/not applicable" in response to each question on the tool.

Given the variety of quantitative research designs, four different tools within the SQAT set were used to review papers. These are list below, with the research designs for which they were most relevant contained brackets:

- Controlled intervention studies (for random control trials)

- Observational cohort and cross-sectional studies (for cross-sectional surveys)

- Case-control studies (for surveys with a control group that is not randomised)

- Before-after (pre-post) studies with no control group (for longitudinal survey, with no control group)

These appraisal tools are used to determine the extent to which a study has addressed the possibility of bias in its design, conduct and analysis. One limitation of this process is that although studies may have been rigorous, if all appraisal criteria are not addressed the work may score poorly. Thus, low ranked papers may reflect papers that are missing content, and are not in that rank because of poor quality.

Based on the question in each tool, reviewers judged each study to be of "Complete" "Somewhat Complete," or "Incomplete" quality. The ratings on the different questions (Yes, No, or Not Reported) were used by reviewers to assess the risk of bias in the study due to flaws in study design or implementation. NHBL (2019) reports that in general terms, a study has the least risk of bias and results are considered to be valid when all their criteria are met. A study that is susceptible to some bias deemed not sufficient to invalidate its results is one that is somewhat complete in terms of fulfilling the criteria questions. The category is likely to be broad, so studies with this rating will vary in their strengths and weaknesses. An 'incomplete' rating indicates significant risk of bias.

For qualitative studies the Critical Appraisal Skills Programme (CASP, 2018) was used. The CASP checklist is comprised of ten questions divided into three broad issues needed to be considered when appraising a qualitative study (CASP, 2018). Similar to the SQAT checklist, ratings were recorded as either "yes", "no" or "can't tell" An example of a question used to assess quality is: "Has the relationship between researcher and participants been adequately considered?" Further considerations are given for each question to assist in appraisal; for instance, for the previous question the following is suggested: whether "…the researcher critically examined their own role, potential bias and

influence during (a) formulation of the research questions (b) data collection, including sample recruitment and choice of location."

Lastly, for mixed-method studies the Mixed Methods Appraisal Tool (MMAT) was used. The MMAT was developed in 2006 (Pluye, Gagnon, Griffiths, & Johnson-Lafleur, 2009) and was revised in 2011 (Pace et al., 2012). The 2018 version was used for this study, and was developed on the basis of findings from a literature review of critical appraisal tools, interviews with MMAT users, and an e-Delphi study with international experts (Hong et al., 2018). The tool uses two initial screening questions to assess the empirical nature of the paper, then mixed-methods specific criteria are rated as either "Yes", "No" or "Can't tell". An example to assess quality is: "Are the different components of the study effectively integrated to answer the research question?" Further explanation is given to assist in assessing this element: Look for information on how qualitative and quantitative phases, results, and data were integrated (Pluye et al., 2009). For instance, "how data gathered by both research methods was brought together to form a complete picture (e.g., joint displays) and when integration occurred (e.g., during the data collection-analysis or/and during the interpretation of qualitative and quantitative results)" (Hong et al., 2018, p. 7).

Table 15 Research design and appraisal tools

| Research Design	Appraisal Tools
Quantitative studies	Study Quality Assessment Tools (SQAT) • Controlled Intervention Studies (RCTs) • Observational Cohort and cross-sectional studies (Cross-sectional surveys) • Case-Control Studies (Control group but not randomised) • Before-After (Pre-Post) studies with no control group) (Longitudinal no control group)
Qualitative studies	Critical Appraisal Skills Program (Critical Appraisal Skills Programme UK, 2018)
Mixed-method studies	Mixed methods appraisal tool (MMAT) (Hong, et al., 2018)

Most research reviewed in this study was conducted using quantitative methods. These studies attempt to maximise objectivity, replicability, and generalisability of findings and are typically focused on the use of instruments such as tests or surveys to collect data, and reliance on probability theory to test statistical hypotheses that correspond to research questions of interest (Conrad et al., 2014).

Mixed methods research adopts both qualitative and quantitative research designs and represented over a third of all studies reviewed here. It has been said that mixed methods provides insights not possible when only qualitative or quantitative data are collected (Johnson & Onwuegbuzie, 2007). Mixed methods can be designed either as concurrent, used at the same time, or sequentially (Alavi & Hąbek, 2018).

Qualitative research represented the fewest, but not insignificant pieces of the included studies. This represents work that focuses on discovering and understanding the participants' experiences, perspectives, and thoughts; and explores meaning, purpose, or reality (Conrad, Serlin, & Harwell, 2014; Hiatt, 1986).

Figure 15 Research design breakdown
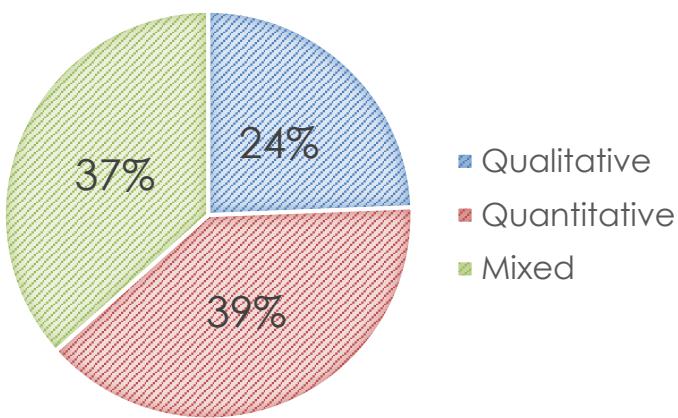
For the quantitative studies sixteen papers were appraised using SQAT. Risk of bias was categorised in terms of complete, somewhat complete, and incomplete. Six studies were found to be incomplete, indicating a significant risk of bias. It should be noted that these studies could have adopted best practice in their delivery but may have omitted important elements in their reports, lowering their appraisal scores. Seven studies were somewhat complete, where there is susceptibility to some bias, but this is deemed not sufficient to invalidate its results. Finally, three rated as complete, which have the least risk of bias with results considered to be valid.

Four different evaluation criteria were used to assess the various quantitative study designs. The breakdown of the studies are as follows: One random control trial (RCT), five case-control studies which were quasi-experimental, four observational or cross-sectional designs, and six programs that test pre- and post-intervention with no control group.

For the RCT, the researchers determined the effectiveness of a primary health care program on urban and rural community disaster preparedness (Ardalan et al., 2013). This work was reported as 'somewhat complete'. The study performed well in randomisation, having similar groups of people in the baseline, low drop-out rates, large sample sizes, and valid and reliable outcome measures. However, it was let down by failing to adopt stringent RCT criteria such as having participants and providers blinded to treatment; which is difficult to achieve in the area of community engagement and preparedness.

For the quasi-experimental case-control studies, all five studies clearly articulated their research objectives and defined their study populations. All studies reported that controls were selected from similar populations and conducted concurrently. Some problem areas were a lack of sample size justification, not detailing any inclusion or exclusion criteria for participants, and a lack of assessors being blind to the case or control status of the participants.

Four observational or cross-sectional study designs were reported in the quantitative data. All four studies clearly stated their research question or objectives and had subjects selected from the same or similar populations specificity their inclusion criteria. Issues arose in a lack of sample size justification,

larger than expected dropout rates, not incorporating potential confounding variables, and not using valid and reliability measures.

Six studies used pre and post designs with no control groups. All six clearly stated their study question or objective, the population selection criteria, and used populations representative of the general population of interest. Issues were identified as having insufficient sample sizes to provide confidence in the findings, and outcome measure limited to only pre and post (measuring multiple times before and multiple times afterward as seen as more valid). Most studies used statistical methods to examine pre-to-post changes, however one study did not report the statistical p-values limiting its value.

4.6.2 Evaluation of Mixed Methods Studies

Fifteen papers reported on mixed methods. Of these articles, six papers documented incomplete evaluation, three papers were somewhat incomplete, and six papers were ranked as complete. Given that more than half of the sample were incomplete or somewhat incomplete, caution is noted in drawing conclusions from these reports. The table below summaries the mixed methods evaluation results. Most papers provide adequate rationale for using a mixed methods design to address the research question.

Most papers provided adequate rationale for using a mixed methods design to address the research question. Two papers however did not detail their rationale and were therefore scored as incomplete. Similarly, most papers effectivity integrated the different components of the study to answer their research questions. However, two papers lacked detail and were coded as incomplete on this evaluation criteria. While the vast majority of papers scored favourably on these first two criteria the next three criteria show where major issues in study quality have stemmed from.

Ten papers adequately interpreted the integrative outputs of qualitative and quantitative components. However, five papers had incomplete details on their integration of the mixed methods. Studies here usually had a qualitative study dominating the research design follow up by a minimal quantitative piece, or vice versa. While the main study was very detailed the secondary study was limited and poorly integrated, if at all. Following on from integration, the next criteria asked if studies addressed the divergences and inconsistences between quantitative and qualitative results? Eight studies did detail complete answers to this question, four studies were somewhat complete, and three studies were coded as incomplete. Similar to the previous criteria some papers gave more weighting to one method over another and therefore did not detail much of the content needed to be addressed.

The last evaluation criteria require that the different components of the study adhered to the quality criteria of each tradition of the methods involved. Here is where most paper were ranked as incomplete, specifically seven, six scored complete and two scored somewhat complete. While papers that focused on qualitative methods were well executed and reported, their quantitative component was limited by small sample size, using items or scales that had not been previously validated, or low statistical power which effected external generalizability.

Table 16 Mixed methods evaluation summary

Evaluation criteria	Complete	Somewhat Complete	Incomplete
Is there an adequate rationale for using a mixed methods design to address the research question?	13	0	2
Are the different components of the study effectively integrated to answer the research question?	13	0	2
Are the outputs of the integration of qualitative and quantitative components adequately interpreted?	10	0	5
Are divergences and inconsistencies between quantitative and qualitative results adequately addressed?	8	4	3
Do the different components of the study adhere to the quality criteria of each tradition of the methods involved?	6	2	7

4.6.3 Evaluation of Qualitative Studies

For the qualitative papers overall, 18 papers were complete, seven mostly complete, and eight incomplete.

When examining more focused criteria, all of these papers were deemed to have used qualitative methods appropriately. The research design was also considered appropriate to address the aims of the papers. The recruitment strategy was found to be complete in seven studies and somewhat complete in three papers. These three papers did not write about their recruitment strategy in enough detail to allow other researchers to adopt their process. All but one study collected data in a way that addressed the research issue. The one study was a grey literature PowerPoint which was very light on any details, focusing more on imagery and presenting results than methodology. Half of the papers wrote about the relationship between the research and participants, an important element of most qualitative studies. This self-reflective evaluation criteria were somewhat complete in the other fifty percent of studies. Ethical consideration formed part of the evaluation criteria, with only two studies detailing their ethical concerns such as a university ethics code being reported in the text. It is likely that ethical considerations are assumed to be part of any published work involving participants, however it is disconcerting that they are not enough of a concern to report in the text. Rigorous data analysis was very limited with only two papers receiving a "complete" categorisation. A further eight studies were somewhat complete with many standard qualitative practices not reported. The last criteria was whether there was a clear statement of findings: all studies reported on this in a complete manner.

Table 17 Qualitative evaluation summary

Evaluation criteria	Complete	Somewhat complete	Incomplete
Is a qualitative methodology appropriate?	10	0	0
Was the research design appropriate to address the aims of the research?	10	0	0
Was the recruitment strategy appropriate to the aims of the research?	7	3	0
Was the data collected in a way that addressed the research issue?	9	1	0
Has the relationship between researcher and participants been adequately considered?	5	5	0
Have ethical issues been taken into consideration?	2	8	0
Was the data analysis sufficiently rigorous?	5	0	5
Is there a clear statement of findings?	10	0	0

5.LIMITATIONS

We encountered a number of limitations and obstacles while we were undertaking this systematic literature review.

First, there was no credible examination of the effect of preparedness activity on personal safety and coping during and after a natural hazard. This is a significant gap in the research, particularly as activity checklists are so widely used by agencies and academics.

The second key limitation was the lack of access to studies that measure current agency programs. The tendency was for individual events or techniques to be evaluated for their effect, or ad hoc measurement of older programs that may have changed in response to that original evaluation. Agency evaluation of programs perhaps tend not to be shared unless staff undertaking the evaluation are working with an academic who, realising the value to other jurisdictions, might push for publication. The literature we uncovered showed that re-inventing the wheel is a worldwide occupational hazard for both agencies and academics, but Australia has agency networks and systems in place that facilitate information sharing that could circumvent this problem.

Also, discerning if one strategy is better than another can only be determined when multiple strategies are tested within the one sample. By keeping all study design elements equal (similar participants, same outcome measures) differences due to the effect of the strategies can be isolated and tested. For instance, in one study (Glik et al., 2014) the same people (namely, low income, Latino residents of Los Angeles County) were randomly assigned either to a high-intensity or low-intensity intervention group. By measuring using the same outcomes, differences in efficacy could be to be determined, with the authors (2014, p. 272) finding that low-intensity programs "may be sufficient to encourage disadvantaged households to obtain disaster supplies" but high-intensity programs are need for the "adoption of the more complex disaster family communication requires interpersonal education."

Fourth, the programs all seemed to be testing whether they achieved behaviour change or an increase in knowledge by using community engagement techniques and activities. So whether people would act similarly when a real hazard struck was not the focus. As pointed out by Williams (2018, p. 6) "disasters did not occur during the study period; thus, it is difficult to truly assess resilience-related outcomes other than through exercises. Therefore, to assess progress toward resilience, we chose to measure intermediate activities at the community-coalition level."

Fifth, it was difficult to establish context within most of the studies, as demographic information, social networks, cultural values, political environment and many other factors affecting context were not reported in sufficient detail or consistency across studies.

Sixth, self-selection bias may play a role in some of the positive outcomes seen, with people already interested in being prepared for a natural hazard being more likely to join projects and programs. This may increase the positive outcomes beyond what would normally be expected with a random sample or the general population. Some studies compensated for this by using social

network analysis to identify isolated groups of people and then attempting to involve them in the programs.

Finally, a key limitation was a lack of consistency, or accuracy in use of tool terms. For example, a workshop could either be a discrete knowledge or skills building event, or simply a term used to describe a "coming together of community members" for a purpose such as an exercise of participatory mapping or information.

6. IMPLICATIONS AND RECOMMENDATIONS

This systematic literature review was aimed at discovering research that showed the efficacy of disaster preparedness activities, and their value in improving the safety and resilience of people who experience a natural hazard. However, we found that while there was substantial research into disaster preparation levels of communities and how effective community engagement for preparedness by agencies can be, there was no research on whether the activities that make up preparedness checklists actually contribute to survival and resilience.

Preparedness research and literature is not yet a closed loop – much research has been undertaken on when and how people should prepare, and what they do, but the effect of this activity is still an unknown quantity. One of the reasons for this could be that practitioners are ahead of academy, and in the absence of an evidence-base, they need to work with what they already have.

6.1 RECOMMENDATIONS ARISING FROM THE LIMITATIONS

Recommendation 1: filling the gap in knowledge

The key recommendation of this systematic literature review is that further research be undertaken in an effort to quantify the effect that preparedness activity has on personal and family safety and ability to cope during and after a disaster. This research should be empirical and feature tighter linkages between agency communication and engagement teams, and researchers.

Suggested research methodologies are detailed in the section 6.2 Future research.

Recommendation 2: information sharing

We also recommend that once agencies establish evaluation systems that allow review of their programs and techniques, that this information be shared in a systematic way. This information is important in fast-tracking progress in community preparedness generally, and some agencies are much further down the track of success than others. Using reliable and valid outcome measures that are statistically testable would greatly improve and standardise the evidence base. Measuring outcomes on an annual basis would give researchers and agencies a better indication of the level of preparedness and also in the event of a natural hazard, the ability to determine preparedness levels relationship on outcomes such as evacuation decisions and loss/preservation of life and homes.

Recommendation 3: evaluation of programs

That industry practitioners and researchers work together to develop a more consistent approach to community engagement research, including developing a common language, common models, benchmarking of evaluation research to allow comparisons across hazards and communities, and minimum requirements for evaluation research and a focus on outcomes using methods that are suitable for the program or technique. The continued focus of larger agencies on post-event surveys is supported.

Recommendation 4: establish consistent language around programs and techniques

The findings of this research have been used to develop a community engagement techniques toolkit, which accompanies this document on the Bushfire and Natural Hazards Co-operative Research Centre's website. This recommendation is that the community engagement techniques toolkit is used by agencies and their partner organisations as a starting point for a conversation on terms used to describe community engagement and each technique. An ending point for this conversation might be an addendum to the Australian Institute of Disaster Resilience's Manual 45/Handbook 6 and/or the AIDR glossary, which are both found on the AIDR website.

6.2   FUTURE RESEARCH

A number of future research opportunities arise from this systematic literature review.

1. The lack of evaluation of the effect of hazard preparation activities on safety and resilience during or after a hazard is cause for some concern, given the central role preparation activity checklists have in agency preparation campaigns. This is considered to be a research imperative and we suggest the following possible methodologies:

    * randomised trials of a single preparation activity per group, including a control group (similar to Glik et al., 2014)

    * an intervention in which the activity was explained and participants persuaded to undertake that activity (also following Glik's methodology)

    * longitudinal surveys or in-depth interviews before and after the trial

    * a repeat of the data collection methodology after the impact of a hazard in that community

    * a repeat of the data collection methodology after a drill or simulation of a natural hazard (similar to Adams et al., 2017)

    A more achievable and less costly (but also less rigorous) approach in Australia might be to expand BNHCRC post-event survey instruments from 'what preparation activities people undertook before the event' to 'what effect they thought each activity had on their safety and ability to cope'

2. Researchers need to move on from measuring preparedness levels (which belongs in agency evaluation of programs) and move onto investigation of lower preparedness levels in vulnerable communities. Much has already been done, but there is gap in the knowledge on effective community engagement techniques for such communities

7. CONCLUSIONS - REVISITING THE AIMS

The key aim of this project was the development of a list of personal preparedness activities that have a demonstrated effect on personal safety and coping during and after a disaster.

However, this type of research has not been undertaken, and no studies were found that used data-driven methods to examine or attempt to examine the efficacy of individual preparedness activities.

In the process of this search, we uncovered a treasure trove of studies evaluating community engagement techniques, so we expanded our aims to include the following:

1. Collate a list of all of the community engagement tools and techniques that have been examined around the world and these examinations published in English

   From the literature search, we have developed an extensive list of engagement techniques, many of which are currently used in Australia, some consistently (such as CFA's Community FireGuard and CFS's Fire Safe), and others more sporadically (such as participatory mapping, all hazard community coalitions, and champions programs)

2. Review the success or otherwise of these tools in quantifiable terms

   While we have been able to collect reliable evaluations on many of the community engagement approaches and tools that appear here, we are positive that there are many good stories of effective approaches that are held within agencies around the world. While the grey literature produced 11 articles measuring programs, the majority were written by academics rather than agency staff who implemented the project. This means there are techniques being used that anecdotally have great effect, but which have not been publicly evaluated and shared

3. Emerge from the review with a tool kit for community communication and engagement containing a wide range of tools for a variety of circumstances

   We have distilled studies that have measured community engagement approaches or individual tools, and collated these into the tables that start on page 20. This table explains the tool, the application of the tool, how it was tested and its effects. It is our intention, as part of the larger project, to produce a more comprehensive tool kit that explains each of the tools, their effect and how they can be implemented. This is a deliverable of the project and will be published on the BNHCRC website with the other project outcomes

REFERENCES

Adame, B. J. (2018). The persuasive efficacy of real versus salient hazard scenarios in motivating citizen-level hazard preparedness. International Journal of Disaster Risk Reduction, 31, 292–301. https://doi.org/10.1016/j.ijdrr.2018.05.019

Adams, R. M., Karlin, B., Eisenman, D. P., Blakley, J., & Glik, D. (2017). Who Participates in the Great ShakeOut? Why Audience Segmentation Is the Future of Disaster Preparedness Campaigns. International Journal of Environmental Research and Public Health, 14(11). https://doi.org/10.3390/ijerph14111407

Akama, Y., & Ivanka, T. (2010). What community? Facilitating awareness of 'community' through Playful Triggers. In Proceedings of the 11th Biennial Participatory Design Conference 2010. https://doi.org/10.1145/1900441.1900444

Alavi, H., & Hąbek, P. (2018). Addressing Research Design Problem in Mixed Methods Research. Management Systems in Production Engineering. https://doi.org/10.2478/mspe-10-01-2016

Ardalan, A., Mowafi, H., Malekafzali Ardakani, H., Abolhasanai, F., Zanganeh, A. M., Safizadeh, H. & Zonoobi, V. (2013). Effectiveness of a primary health care program on urban and rural community disaster preparedness, islamic republic of Iran: A community intervention trial. Disaster Medicine and Public Health Preparedness, 7(5), 481–490. https://doi.org/10.1017/dmp.2013.93

Ashida, S., Robinson, E. L., Gay, J., Slagel, L. E., & Ramirez, M. R. (2017). Personal Disaster and Emergency Support Networks of Older Adults in a Rural Community: Changes after Participation in a Preparedness Program. Disaster Medicine and Public Health Preparedness, 11(1), 110–119. https://doi.org/10.1017/dmp.2016.197

Australian Government. (2018). National Risk Reduction Framework,. (Department of Home Affairs, Ed.). Canberra, Australia: Department of Home Affairs. Retrieved from https://www.homeaffairs.gov.au/emergency/files/national-disaster-risk-reduction-framework.pdf

Australian Institute for Disaster Resilience. (2018). Australian Disaster Resilience Handbook Collection: Community Recovery. Retrieved from https://knowledge.aidr.org.au/resources/glossary-about/

Balamir, M. (2002). Painful steps of progress from crisis planning to contingency planning: Changes for disaster preparedness in Turkey. Journal of Contingencies and Crisis Management, 10(1), 39–49. https://doi.org/10.1111/1468-5973.00179

Bloom, M. J., & Menefee, M. K. (2006). Scenario Planning and Contingency Planning. Public Productivity & Management Review, 17(3), 223. https://doi.org/10.2307/3380654

Bromley, E., Eisenman, D. P., Magana, A., Williams, M., Kim, B., McCreary, M., & Wells, K. B. (2017). How Do Communities Use a Participatory Public Health Approach to Build Resilience? The Los Angeles County Community Disaster Resilience Project. International Journal of Environmental Research and Public Health, 14(10). https://doi.org/10.3390/ijerph14101267

Chaiken, S. (1980). Heuristic versus systematic information processing and the use of source versus message cues in persuasion. Journal of Personality and Social Psychology. https://doi.org/10.1037/0022-3514.39.5.752

Chandra, A., Williams, M., Plough, A., Stayton, A., Wells, K. B., Horta, M., & Tang, J. (2013). Getting actionable about community resilience: The Los Angeles county community disaster resilience project. American Journal of Public Health. https://doi.org/10.2105/AJPH.2013.301270

Chaney, P. L., Weaver, G. S., Youngblood, S. A., & Pitts, K. (2013). Household Preparedness for Tornado Hazards: The 2011 Disaster in DeKalb County, Alabama. Weather, Climate, and Society. https://doi.org/10.1175/wcas-d-12-00046.1

Chapple, R., Blignault, I., & Fitzgerald, A. (2017). Communicating bushfire risk in the Blue Mountains: A case study of the Fire Stories film. Australian Journal of Emergency Management, 32(3), 58–66.

Coles, A. R., & Quintero-Angel, M. (2018). From silence to resilience: prospects and limitations for incorporating non-expert knowledge into hazard management. Environmental Hazards, 17(2), 128–145. https://doi.org/10.1080/17477891.2017.1382319

Committee, N. E. M. (2009). National strategy for disaster resilience: building our nation's resilience to disasters. (Emegency Management Australia, Ed.), http://Www.Coag.Gov.Au/Coag_Meeting_Outcomes/2011-02-13/Docs/National_Strategy_Disaster_Resilience.Pdf. Canberra, Australia: Australian Government. Retrieved from https://knowledge.aidr.org.au/media/2153/nationalstrategyfordisasterresilience.pdf

Conrad, C., Serlin, R., & Harwell, M. (2014). Research Design in Qualitative/Quantitative/Mixed Methods. In The SAGE Handbook for Research in Education: Pursuing Ideas as the Keystone of Exemplary Inquiry (pp. 147–164). https://doi.org/10.4135/9781483351377.n11

Cretikos, M., Eastwood, K., Dalton, C., Merritt, T., Tuyl, F., Winn, L., & Durrheim, D. (2008). Household disaster preparedness and information sources: Rapid cluster survey after a storm in New South Wales, Australia. BMC Public Health. https://doi.org/10.1186/1471-2458-8-195

Curato, N., & Calamba, S. J. (2018). Surviving Disasters by Suppressing Political Storms: Participation as Knowledge Transfer in Community-Based Disaster Governance. Critical Sociology. https://doi.org/10.1177/0896920518796167

Daniels, M. (2017). Why people won't act in their own best interests - and what to do about it. Paper presented at the EMPA 2017: Communicating to influence behaviour in emergencies, Sydney, Australia.

de Vet, E., Eriksen, C., Booth, K., & French, S. (2019). An Unmitigated Disaster: Shifting from Response and Recovery to Mitigation for an Insurable Future. International Journal of Disaster Risk Science, 1–14. https://doi.org/10.1007/s13753-019-0214-0

Dean, R. J. (2017). Beyond radicalism and resignation: The competing logics for public participation in policy decisions. Policy and Politics. https://doi.org/10.1332/030557316X14531466517034

Deloitte Access Economics. (2017). Building resilience to natural disasters in our states and territories. (Australian Business Rounbd Table for Disaster Resilience in Communities, Ed.). Sydney, Australia: Deloitte Australia. Retrieved from http://australianbusinessroundtable.com.au/assets/documents/ABR_building-resilience-in-our-states-and-territories.pdf

Department of Environment Land Water and Planning. (2011). Planning and building for bushfire protection. Retrieved from https://www.planning.vic.gov.au/__data/assets/pdf_file/0017/101834/Fact-Sheet_Planning-and-building-for-bushfire-protection.pdf

Department of Housing and Public Works. (2019). MP 2.4 – BUILDINGS IN BUSHFIRE-PRONE AREAS. Brisbane, Australia. Retrieved from http://www.hpw.qld.gov.au/SiteCollectionDocuments/qdc-mp2-4-bushfire-standard.pdf

Dunlop, P. D., McNeill, I. M., Boylan, J. L., Morrison, D. L., & Skinner, T. C. (2014a). Preparing ... for what? Developing multi-dimensional measures of community wildfire preparedness for researchers, practitioners and households. International Journal of Wildland Fire. https://doi.org/10.1071/wf13141

Dunlop, P. D., McNeill, I. M., Boylan, J. L., Morrison, D. L., & Skinner, T. C. (2014b). Preparing...for what? Developing multi-dimensional measures of community wildfire preparedness for researchers, practitioners and households. International Journal of Wildland Fire, 23(6), 887. https://doi.org/10.1071/wf13141

Eisenman, D., Chandra, A., Fogleman, S., Magana, A., Hendricks, A., Wells, K., & Plough, A. (2014). The Los Angeles county community disaster resilience project - A Community-Level, public health initiative to build community disaster resilience. International Journal of Environmental Research and Public Health. https://doi.org/10.3390/ijerph110808475

Eriksen, C. (2014). Gendered risk engagement: Challenging the embedded vulnerability, social norms and power relations in conventional australian bushfire education. Geographical Research, 52(1), 23–33. https://doi.org/10.1111/1745-5871.12046

Every, D., Reynolds, A., Clarkson, L., Bearman, C., Matthews, R., Haigh, L., & Dawson, D. (2015). Capturing community experiences in the 2015 Sampson Flat fire: report for the South Australia Country Fire Service. Retrieved from Bushfire and Natural Hazards Co-operative Research Centre website: http://www.bnhcrc.com.au/publications/sampsonflat

Faupel, C., Kelley, S., & Petee, T. (1992). Impact of Disaster Education on household Preparedness. International Journal of Mass Emergencies and Disasters. https://doi.org/10.1177/0013916593252004

Foster, H. (2013). Interactive hazard preparation strategy efficacy: Considerations for future community engagement programs. Australian Journal of Emergency Management, 28(1), 8–14.

Frandsen, M., Paton, D., & Sakariassen, K. (2011). Fostering community bushfire preparedness through engagement and empowerment. Australian Journal of Emergency Management, 26 (2), 23–30.

Gaillard, J. C., Monteil, C., Perrillat-Collomb, A., Chaudhary, S., Chaudhary, M., Chaudhary, O., & Cadag, J. R. D. (2013). Participatory 3-dimension mapping: A tool for encouraging multi-caste collaboration to climate change adaptation and disaster risk reduction. Applied Geography, 45, 158–166. https://doi.org/10.1016/j.apgeog.2013.09.009

Gibbs, L., Sia, K. L., Block, K., Baker, E., Nelsson, C., Gilbert, J., & MacDougall, C. (2015). Cost and outcomes associated with participating in the Community Fireguard Program: Experiences from the Black Saturday bushfires in Victoria, Australia. International Journal of Disaster Risk Reduction, 13, 375–380. https://doi.org/10.1016/j.ijdrr.2015.07.016

Glik, D. C., Eisenman, D. P., Zhou, Q., Tseng, C. H., & Asch, S. M. (2014). Using the Precaution Adoption Process model to describe a disaster preparedness intervention among low-income Latinos. Health Education Research, 29(2), 272–283. https://doi.org/10.1093/her/cyt109

Goodchild, M. F. (2007). Citizens as sensors: The world of volunteered geography. GeoJournal. https://doi.org/10.1007/s10708-007-9111-y

Grewal, A., Kataria, H., & Dhawan, I. (2016). Literature search for research planning and identification of research problem. Indian Journal of Anaesthesia. https://doi.org/10.4103/0019-5049.190618

Grillos, T. (2018). Women's participation in environmental decision-making: Quasi-experimental evidence from northern Kenya. World Development, 108, 115–130. https://doi.org/10.1016/j.worlddev.2018.03.017

Haworth, B., Whittaker, J., & Bruce, E. (2016). Assessing the application and value of participatory mapping for community bushfire preparation. Applied Geography, 76, 115–127. https://doi.org/10.1016/j.apgeog.2016.09.019

Heagele, T. N. (2016). Lack of evidence supporting the effectiveness of disaster supply kits. American Journal of Public Health. https://doi.org/10.2105/AJPH.2016.303148

Hemingway, Pippa; Brereton, N. (2009). What is a systematic review ? Retrieved from https://campbellcollaboration.org/research-resources/writing-a-campbell-systematic-review/systemic-review.html

Hémond, Y., & Robert, B. (2012). Preparedness: The state of the art and future prospects. Disaster Prevention and Management: An International Journal. https://doi.org/10.1108/09653561211256125

Hiatt, J. F. (1986). Spirituality, medicine, and healing. Southern Medical Journal, 79(6), 736–743. https://doi.org/10.1097/00007611-198606000-00022

Hong, Q. N., Gonzalez-Reyes, A., & Pluye, P. (2018). Improving the usefulness of a tool for appraising the quality of qualitative, quantitative and mixed methods studies, the Mixed Methods Appraisal Tool (MMAT). Journal of Evaluation in Clinical Practice. https://doi.org/10.1111/jep.12884

Hopewell, S., McDonald, S., Clarke, M. J., & Egger, M. (2007). Grey literature in meta-analyses of randomized trials of health care interventions. Cochrane Database of Systematic Reviews. https://doi.org/10.1002/14651858.MR000010.pub3

Hung, L. S. (2017). Married couples' decision-making about household natural hazard preparedness: a case study of hurricane hazards in Sarasota County, Florida. Natural Hazards. https://doi.org/10.1007/s11069-

017-2809-3

Jamshidi, E., Majdzadeh, R., Namin, M. S., Ardalan, A., Majdzadeh, B., & Seydali, E. (2016). Effectiveness of Community Participation in Earthquake Preparedness: A Community-Based Participatory Intervention Study of Tehran. Disaster Medicine and Public Health Preparedness, 10(2), 211–218. https://doi.org/10.1017/dmp.2015.156

Johnson, R. B., & Onwuegbuzie, A. J. (2007). Mixed Methods Research: A Research Paradigm Whose Time Has Come. Educational Researcher. https://doi.org/10.3102/0013189x033007014

Johnston, K. A. (2010). Community engagement: Exploring a relational approach to consultation and collaborative practice in Australia. Journal of Promotion Management, 16(1), 217-234.

Jurjonas, M., & Seekamp, E. (2018). Rural coastal community resilience: Assessing a framework in eastern North Carolina. Ocean and Coastal Management, 162, 137–150. https://doi.org/10.1016/j.ocecoaman.2017.10.010

Kohn, S., Eaton, J. L., Feroz, S., Bainbridge, A. A., Hoolachan, J., & Barnett, D. J. (2012). Personal disaster preparedness: An integrative review of the literature. Disaster Medicine and Public Health Preparedness. https://doi.org/10.1001/dmp.2012.47

Lam, R. P. K., Leung, L. P., Balsari, S., Hsiao, K. hsun, Newnham, E., Patrick, K., & Leaning, J. (2017). Urban disaster preparedness of Hong Kong residents: A territory-wide survey. International Journal of Disaster Risk Reduction. https://doi.org/10.1016/j.ijdrr.2017.04.008

Levine, A. S., & Feinholz, C. L. (2015). Participatory GIS to inform coral reef ecosystem management: Mapping human coastal and ocean uses in Hawaii. Applied Geography. https://doi.org/10.1016/j.apgeog.2014.12.004

Lindell, M. K., & Perry, R. W. (2007). Planning and preparedness. Emergency Management: Principles and Practice for Local Government. Online: ICMA Press. pp. 113–139.

Lindström, J., Samuelsson, S., & Hägerfors, A. (2010). Business continuity planning methodology. Disaster Prevention and Management: An International Journal, 19(2), 243–255. https://doi.org/10.1108/09653561011038039

Lucini, B. (2014). Disaster Resilience from a Sociological Perspective. Online: Springer. https://doi.org/10.1007/978-3-319-04738-6

Mackie, B., McLennan, J., & Wright, L. (2013). Community understanding and awareness of bushfire safety: January 2013 bushfire. Melbourne, Victoria.

McConnell, A., & Drennan, L. (2006). Mission impossible? Planning and preparing for crisis. Journal of Contingencies and Crisis Management, 14(2), 59–70. https://doi.org/10.1111/j.1468-5973.2006.00482.x

McLennan, J., & Elliot, G. (2011). Checklist items for researchers: Householder preparations for bushfires. Retrieved from https://www.bushfirecrc.com/sites/default/files/managed/resource/checklist_items_for_researchers_occasional_report_2011.pdf

McLennan, J., Paton, D., & Beatson, R. (2015). Psychological differences between south-eastern Australian householders' who intend to leave if threatened by a wildfire and those who intend to stay and defend. International Journal of Disaster Risk Reduction. https://doi.org/10.1016/j.ijdrr.2014.11.008

McNeill, Boldero, J., & McIntosh, E. (2016a). Household preparedness for bushfires - The role of residents' engagement with information sources. Unpublished.

McNeill, Boldero, J., & McIntosh, E. (2016b). Household preparedness for floods - The roles of residents' engagement with information sources. Unpublished.

McNeill, C. C., Alfred, D., Mastel-Smith, B., Fountain, R., & MacClements, J. (2016). Changes in Self-Reported Household Preparedness Levels among a Rural Population after Exposure to Emergency Preparedness Campaign Materials. Journal of Homeland Security and Emergency Management, 13(1), 113–135. https://doi.org/10.1515/jhsem-2014-0096

Meyer, M. A. (2013). Social capital and collective efficacy for disaster resilience: Connecting individuals with communities and vulnerability with resilience in hurricane-prone communities in Florida. ProQuest Dissertations and Theses.

Miller, A. N., Sellnow, T., Neuberger, L., Todd, A., Freihaut, R., Noyes, J., & Gamhewage, G. (2017). A Systematic Review of Literature on Effectiveness of Training in Emergency Risk Communication. Journal of Health Communication. https://doi.org/10.1080/10810730.2017.1338802

Nous Group. (2013). Community led planning demonstration project. Retrieved from: https://www.cfa.vic.gov.au/documents/20143/50918/CLP-project-evaluation.pdf/dd1a3736-9605-e3ef-ad90-561df1d447f2

Pace, R., Pluye, P., Bartlett, G., Macaulay, A. C., Salsberg, J., Jagosh, J., & Seller, R. (2012). Testing the reliability and efficiency of the pilot Mixed Methods Appraisal Tool (MMAT) for systematic mixed studies review. International Journal of Nursing Studies. https://doi.org/10.1016/j.ijnurstu.2011.07.002

Paton, D, & Johnston, D. (2006). Disaster Resilience: An Integrated Approach. Springfield, Illinois: Charles C Thomas.

Paton, Douglas. (2003). Disaster preparedness: A social-cognitive perspective. Disaster Prevention and Management: An International Journal. https://doi.org/10.1108/09653560310480686

Paton, Douglas, & Johnston, D. (2001). Disasters and communities: Vulnerability, resilience and preparedness. Disaster Prevention and Management: An International Journal. https://doi.org/10.1108/EUM0000000005930

Perry, R. W., & Lindell, M. K. (2003). Preparedness for emergency response: Guidelines for the emergency planning process. Disasters, 27(4), 336–350. https://doi.org/10.1111/j.0361-3666.2003.00237.x

Phillips, R., Cook, A., Schauble, H., & Walker, M. (2016). Can agencies promote bushfire resilience using art-based community engagement. Australian Journal of Emergency Management, 31(4), 51–55.

Pluye, P., Gagnon, M. P., Griffiths, F., & Johnson-Lafleur, J. (2009). A scoring system for appraising mixed methods research, and concomitantly appraising qualitative, quantitative and mixed methods primary studies in Mixed Studies Reviews. International Journal of Nursing Studies. https://doi.org/10.1016/j.ijnurstu.2009.01.009

Redshaw, S., Ingham, A. P. V., Hicks, P. J., & Millynn, J. (2017). Emergency preparedness through community sector engagement in the Blue Mountains. Australian Journal of Emergency Management, 32(2), 35–40.

Sattler, D. N., Preston, A. J., Kaiser, C. F., Olivera, V. E., Valdez, J., & Schlueter, S. (2002). Hurricane Georges: A cross-national study examining preparedness, resource loss, and psychological distress in the U.S. Virgin Islands, Puerto Rico, Dominican Republic, and the United States. Journal of Traumatic Stress. https://doi.org/10.1023/A:1020138022300

Schmidt, J. (2018). Notes on national earthquake education programs in Israel. In Procedia Engineering (Vol. 212, pp. 1265–1272). https://doi.org/10.1016/j.proeng.2018.01.163

Shrivastava, P. (2008). Principles of Emergency Planning and Management. Risk Management (Vol. 5). Oxford, England: Oxford University Press. https://doi.org/10.1057/palgrave.rm.8240152

Simpson, D. M. (2008). Disaster preparedness measures: A test case development and application. Disaster Prevention and Management: An International Journal, 17(5), 645–661. https://doi.org/10.1108/09653560810918658

Soane, E., Schubert, I., Challenor, P., Lunn, R., Narendran, S., & pollard, S. (2010). Flood perception and mitigation: The role of severity, agency, and experience in the purchase of flood protection, and the communication of flood information. Environment and Planning A, 42(12), 3023–3038. https://doi.org/10.1068/a43238

Tadele, F., & Manyena, S. B. (2009). Building disaster resilience through capacity building in Ethiopia. Disaster Prevention and Management: An International Journal, 18(3), 317–326. https://doi.org/10.1108/09653560910965664

Tanwattana, P. (2018). Systematizing Community-Based Disaster Risk Management (CBDRM): Case of urban flood-prone community in Thailand upstream area. International Journal of Disaster Risk Reduction, 28, 798–812. https://doi.org/10.1016/j.ijdrr.2018.02.010

Tran, P., & Shaw, R. (2009). Enhancing Community Resilience Through Information Management: Flood Risk Mapping in Central Viet Nam. Geoinformatics for Natural Resource Management.

UN News. (2011). Three cities win UN-backed award for innovation in disaster risk reduction. Retrieved from https://news.un.org/en/story/2011/05/374872

Urbis. (2015). Protecting the North: The benefits of cyclone mitigation. (Urbis, Ed.). Brisbane, Australia: Suncorp Insurance. Retrieved from http://www.suncorp.com.au/insurance/sites/default/files/fm/campaigns/protect-the-north/pdfs/urbis-cyclone-mitigation-report.pdf

Uscher-Pines, L., Chandra, A., Acosta, J., & Kellermann, A. (2012). Citizen preparedness for disasters: Are current assumptions valid? Disaster Medicine and Public Health Preparedness, 6(2), 170–173. https://doi.org/10.1001/dmp.2012.23

Van Manen, S., Avard, G., & Martínez-Cruz, M. (2015). Co-ideation of disaster preparedness strategies through a participatory design approach: Challenges and opportunities experienced at Turrialba volcano, Costa Rica. Design Studies, 40, 218–245. https://doi.org/10.1016/j.destud.2015.06.002

Wallemacq, P., & Below, R. (2018). Economic losses, poverty & disasters: 1998-2017. (Centre for Research on the Epidemiology of Disasters, Ed.). Geneva, Switzerland: United Nations Office for Disaster Risk Reduction. Retrieved from https://www.unisdr.org/files/61119_credeconomiclosses.pdf

Webber, D., Gissing, A., Dufty, N., & Bird, D. (2017). Community participation in emergency planning: NSW State Emergency Service case study. Australian Institute for Disaster Resilience, 32(2), 28–34.

Western Australian Planning Commission. (2017). Guidlines for planning in Bushfire prone areas. Perth. Retrieved from https://www.dplh.wa.gov.au/getmedia/a60c819d-eedf-4518-9817-a6e27e7a671c/GD-BF-Bushfire_Guidelines_Version_1-3_Dec2017

Williams, M. V., Chandra, A., Spears, A., Varda, D., Wells, K. B., Plough, A. L., & Eisenman, D. P. (2018). Evaluating community partnerships addressing community resilience in Los Angeles, California. International Journal of Environmental Research and Public Health. https://doi.org/10.3390/ijerph15040610

Yusuf, J.-E. (Wie), Rawat, P., Considine, C., Covi, M., St. John, B., Nicula, J. G., & Anuar, K. A. (2018). Participatory GIS as a Tool for Stakeholder Engagement in Building Resilience to Sea Level Rise: A Demonstration Project. Marine Technology Society Journal, 52(2), 45–55. https://doi.org/10.4031/mtsj.52.2.12