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How People Use Earthquake Information and Its Influence on Household Preparedness in New Zealand

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Abstract: Forty-eight interviews were undertaken with residents in Timaru, Wanganui and Napier, New Zealand, in 2008 to explore how people understand and use information about earthquake hazards and preparedness, and how this process affects actual preparedness. Three main types of information were identified as being utilized by people: passive information (e.g., newspapers, brochures, TV, radio, websites), interactive information (e.g., community activities, school activities, and workplace activities), and experiential information (e.g., experiencing a hazardous event, responding to an event, and working in an organization that deals with hazards). People tended to either contextualize hazard and preparedness information around any prevailing beliefs they had or form new beliefs on exposure to information. A number of core beliefs were identified as crucial for helping people consider that preparing is important and motivating actual adjustment adoption. Society also has an influence on how people interpret information and form intentions to prepare. People are often influenced by the opinions of others, and as preparing for disasters is not seen as a societal norm, this can cause people not to prepare. Feeling a responsibility for others (e.g., children) appears to be a major driver of preparedness. Other societal factors such as trust, leadership and sense of community also influence interpretation, dissemination and use of hazards and preparedness information. Finally, a number of resource issues can help or hinder preparedness.

Key words: Earthquakes, preparedness, public education.

1. Introduction

New Zealand is subject to a wide range of geological and meteorological hazards including earthquakes, volcanic eruptions, tsunamis, landslides, storms, flooding and climate related effects. Given the vulnerability of New Zealand's population to such hazards it is important that communities and organisations are prepared for future events. One approach advocated by the Ministry of Civil Defence & Emergency Management is to encourage household residents to prepare for a disaster, by collecting together survival items such as food and water, and undertaking relevant mitigation measures such as retrofitting homes. Despite many years of information campaigns to promote preparedness, levels of

household preparedness are still only modest. The latest national survey figures from the Ministry of Civil Defence & Emergency management indicate that only 23% of New Zealanders reported being prepared for a disaster at home, with only 10% fully prepared at home and work [1]. Additionally more people are likely to gather together survival items, than undertake complicated or expensive actions such as retrofitting buildings. An ongoing challenge exists to better understand how to motivate people to actually take action and get prepared.

A great deal of prior research on disaster preparedness has been undertaken, with a number of key influences of preparedness identified. Key influences include risk perception [2–5], preparedness perceptions such as outcome expectancy [6–11], critical awareness [11–15], optimistic and normalisation biases [16–18], self-efficacy [10,

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19–21], collective efficacy [22], fatalism [3, 21, 23–25], locus of control [3, 20, 24], anxiety [4, 24, 26], previous experience [2, 3, 27–29], societal norms [30], sense of community [31, 32], community participation, articulation of problems and empowerment [33], trust [34], perceived responsibility [2, 7, 9, 27], responsibility for others [14], coping style [10, 19, 35–37], and resource issues [33, 38–40].

2. Method

Despite the amount of research that has taken place, there are still gaps in our knowledge about the socio-psychological processes related to preparing [41]. This knowledge gap is partly due to the fact that many studies have been quantitative in nature, short term, and the questions asked have differed from study to study. In order to understand people's use of information and preparedness motivations better, a qualitative research project was devised, designed to capture details not identified during previous studies. The project involved conducting "grounded theory" interviews with household residents from several towns in New Zealand during April to June of 2008, with the focus being on people's understanding of and preparedness for earthquake hazards. Three urban locations were selected based on their similarities with respect to population size, relative potential geographic isolation, types of facilities present, civic institutions and legislative environment, so that preparedness could not be influenced by major environmental and institutional differences. The urban areas selected were Napier, Wanganui and Timaru. These urban locations have differing levels of earthquake risk (Fig. 1) however interviewees were selected to ensure that they were located within similar levels of risk within the townships themselves. None of the locations had experienced a large earthquake event in recent years. The 1931 Hawke's Bay earthquake (magnitude 7.8) was the most damaging event that had occurred in one of the study locations (Napier) prior to the study. As the study was

undertaken in 2008, the research was also completed prior to the 4 September 2010 and 22 February 2011 Canterbury/Christchurch earthquakes.

A total of 48 interviews were undertaken across the three urban centres, with 16 interviews completed in Napier, 14 in Wanganui, and 18 in Timaru. Interviewees were recruited by advertising in local newsletters and by sending invites to local community groups to participate, thus there was an element of self-selection. A fairly even split of males (27) and females (21) participated, but interviewees were slightly over-represented by older people (with 27 participants over 60 years old). The sample was not intended to be entirely representative of the community as the purpose of the research was to collect details (rather than generalizations) about people's information interpretation and preparedness processes. Future quantitative survey work can investigate whether the findings from the interviews are generalizable across the wider population.

Interviewees were asked to talk freely (with occasional prompting from the interviewer) about their thoughts on earthquakes, preparedness for earthquakes, and hazards and preparedness information. The interviewees were taped with consent, and the interview was transcribed into a word processing programme. Once the transcripts had been approved by the interviewee, transcripts were uploaded into the qualitative software package Atlas-Ti. Content analysis was then undertaken, and themes were extracted. This paper describes some of the key themes that emerged from the analysis including information types, important beliefs, societal influences, and resource issues.

3. Information Type

Participants were asked whether they could recall any information they had seen or heard, either regarding hazards such as earthquakes, or information on how to prepare. Three main types of information were identified during the interviews: passive

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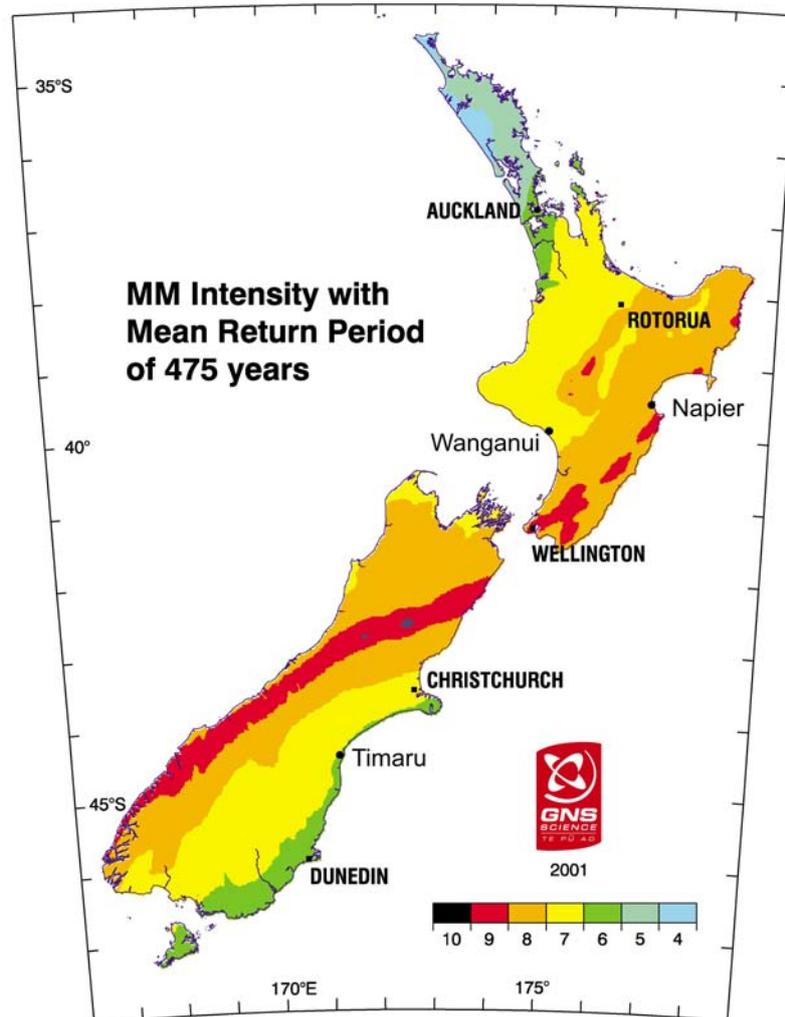


Fig. 1 Map showing the distribution of MM intensity with a current Annual Exceedance Probability of 1/475 derived from the National Probabilistic Seismic Hazard Model (2001). Timaru is situated within MM6 (i.e., falling items, slight damage, e.g., cracked plaster), Wanganui within MM7 (i.e., buildings cracked, bricks and chimneys falling), and Napier within MM8 (i.e., damaged and partially or fully collapsed buildings) (pers. comm. Warwick Smith, GNS Science, 2001; based on data from Stirling et al. [42]).

information (e.g., newspapers, brochures, TV, radio, websites), interactive information (e.g., community activities, school activities, workplace activities), and experiential information (e.g., experiencing a hazardous event, responding to an event, working in an organisation that deals with hazards [43]).

3.1 Passive Information

Passive information tended to predominantly raise awareness and knowledge about earthquakes or preparedness, and sometimes would stimulate people

to discuss what they had seen or heard. People's recall of most passive information was generally poor, except in the instance of information they had seen or heard in the media. Information in the media was also more likely to stimulate discussion with others. Television images from disasters elsewhere were particularly useful as they helped people visualise what disasters such as earthquakes could be like, and thus help them understand what the consequences of an event might be. People mentioned the Indian Ocean tsunami as one example where visual images had

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helped them understand the consequences of a tsunami event. Media coverage helped form beliefs, some of which were useful to understanding and personalizing disasters (e.g., “a disaster like the one overseas could happen here”), and some of which were unhelpful as they contributed to fatalism (e.g., “the disaster overseas was so destructive, there’s nothing I could do if it happened here”).

3.2 Interactive Information

Interactive information plays an important role in helping people understand hazards and encouraging preparedness. Interactive information appears to be the best type of information for stimulating discussion. It is extremely useful for helping people understand the consequences of an event, as they can discuss, expand and evolve their thoughts about the potential impacts. Understanding the consequences is important, as the interviews revealed that many people were not motivated to prepare unless they really understood what an event might be like. Interviewee 13 articulated how she couldn’t imagine what an earthquake might be like, and consequently had not prepared:

“Researcher: What kind of things do you expect might happen after an earthquake?”

Interviewee 13: Well, you see, that is where I do not suppose I let myself go. Because it is so hard to actually comprehend... that sort of thing... until you have been down that track...”

People spoke about a range of interactive information they had been involved with including community meetings and activities, workplace activities, school activities, training, and general discussion with other community members. People involved in interactive activities regarding hazards and preparedness, were more likely to apply any lessons they had learnt during the activity at home as well (e.g., those undertaking preparedness in the workplace often applied this to a home situation). Activities that involved training were particularly useful in building

people’s self-efficacy or their belief that they can do something to deal with the effects of a hazardous event. School activities (projects, exercises and drills) were mentioned frequently during the interviews. People credited their ability to respond to an earthquake to their school education. This training was so engrained in people that they still referred to what they had learnt in school as the most appropriate action (get under a table or doorway) rather than the more recent advice promoted in Ministry of Civil Defence & Emergency Management information (drop, cover and hold) [44]. That advice about what to do in an earthquake was so ingrained shows the effectiveness that interactive training can have, but also reinforces the need for updates every so often.

3.3 Experiential Information

Disaster experience is usually not referred specifically to as an information type, but could be considered as one for future educational strategies. Experience was hugely influential in helping people understand the consequences of a disaster and in forming beliefs. Experience included direct disaster experience (i.e., being impacted by a disaster), indirect disaster experience (i.e., seeing the impacts of a disaster, but not being personally impacted), and indirect event experience (i.e., applying experience of another event or situation to a disaster context). Very few participants had had direct experience of a disaster, and none had experienced a large earthquake within their lifetime. Most participants had experienced small earthquakes. Those that had directly or indirectly experienced a disaster or hazardous event were more likely to realise that disasters “can happen” and understand the consequences if something were to happen in future. People’s experience also helped form other key beliefs useful to motivating preparedness such as, “you could be on your own” or “it could happen anytime”. One downside of experience was that where participants had experienced small or benign events (such as

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on-going small earthquakes) there was a tendency in some people to develop a normalisation bias [16], whereby participants had been okay in a past event and therefore felt they would also be alright in future, thus reducing the motivation to prepare.

3.4 Information Searching

Participants admitted that they did not generally seek out information about hazards or preparedness. Where they did it was usually motivated by: anxiety or concern about hazards; interest or fascination about a topic, or verification of information that had been accessed previously.

4. Important Beliefs

The interviews revealed a number of key beliefs that were important to helping motivate preparedness in participants. Some of these beliefs had been formed by information people were exposed to, with

experiential information being the strongest influence. Other beliefs were already core to people, and hazard and preparedness information was contextualised around these beliefs. For example, Interviewee 9 had no experience of disasters but felt that safety was very important, so she contextualised hazards and preparedness information around this existing core belief, and was motivated to prepare to ensure her safety.

The key identified beliefs can be broken down into three topic areas: hazard beliefs, preparedness beliefs, and personal beliefs. Table 1 shows the different beliefs that were found to be influential in stimulating or hindering parts of the preparedness process.

Some beliefs need to be held concurrently for motivation to occur [45]. For example people needed to believe that a disaster “can happen” and “any time” to feel a need to prepare. If they only thought it “can happen” but it was not imminent then preparedness

Table 1 Key beliefs important to encouraging and discouraging preparedness.

	Encourages Preparedness	Discourages Preparedness
Hazard Beliefs	<ul style="list-style-type: none"> - There is a risk - Can/will/does happen (inevitability) - Any time (imminence) 	<ul style="list-style-type: none"> - Will not happen at all - Will not happen to me (lack of personalization, optimistic bias) - Low risk - Not imminent - There will be warning - Can not do anything about hazards (lack of control, external locus of control)
Preparedness Beliefs	<ul style="list-style-type: none"> - Preparing is important - Safety - Survival - Basics - On your own - Recognise limitations of preparing - Preparing is a “way of life” - Preparing will help me in a disaster (positive outcome expectancy). 	<ul style="list-style-type: none"> - Preparing will not work/make a difference (negative outcome expectancy) - Preparing is “over the top”
Personal Beliefs	<ul style="list-style-type: none"> - I can prepare (self-efficacy) - I can respond/resourcefulness (only if this is linked with the “I can prepare” belief) - I have a personal responsibility to prepare - I have a responsibility for others (e.g., children, family, the community) 	<ul style="list-style-type: none"> - I can respond/resourcefulness (when not linked with the “I can prepare” belief) - I will fare okay - I was okay in a previous event, therefore I will be okay in future (normalisation bias) - Other people or places are more vulnerable than me (optimistic bias) - Others will help in a disaster (e.g., agencies, other community members) - It is not my responsibility to prepare

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might not take place. Another example is related to people's belief in their ability to prepare and respond. If participants only thought that they were resourceful enough to respond in an event ("I can respond"), then they might not prepare. They needed to believe that "I can prepare" and "I can respond" simultaneously to encourage preparedness.

The interviews also revealed a strong focus on preparedness being "a way of life" rather than something that you just undertake for a particular scenario [45]. Many people who had got prepared had tried to build preparedness into their daily lives, both in a mental and physical sense. This might mean thinking ahead about all sorts of hazards and how to avoid them, through to undertaking sensible precautions like making sure you had enough petrol in the car. Interviewee 40 describes his thoughts on preparedness as a "way of life":

"It (preparedness) should be a part of daily living. In the same way as you wash your hands. And you keep things clean. You know that if you do not, you could get sick because things are dirty, just as simple as that."

Finally, it was noted that people had a strong association with preparedness being related to "survival" and the "basics", reflecting the belief of many members of the public that preparedness relates mainly to collecting together survival items such as food, water and other essential items that can help people survive for several days after a disaster [45].

5. Societal Influences

A number of societal influences were evident in influencing the preparedness process [43]. Several participants admitted that preparing was not seen as a societal norm, and therefore they did not prepare. This is seen in the preparedness beliefs in Table 1 where there was a theme of some people thinking that preparedness was an overreaction and was "over the top". Feeling a responsibility for others appeared to be a strong driver of getting prepared. Often people

mentioned that they felt responsible for children, a spouse, or other family members, and this feeling of responsibility had motivated their preparedness. People also felt some responsibility for other community members, and would prepare to "feel like they had done their bit" in the community. There was a moral obligation to know that you had prepared so you could help your neighbours, and hope they had done the same. This is linked to the "sense of community" concept that has been noted as an indicator of preparedness in earlier survey work [31, 32]. A few people took the opposite stance, however, and thought that if other people had prepared in the community then there was no need to prepare, as other community members might look after the interviewee in a disaster.

Trust emerged as a theme during the interviews. Trust is complex and can act as both a motivator and discourager of preparedness. For example, if a person trusted information presented to them (or trusted the source of that information) then they were more likely to take the advice and prepare. However if they distrusted the information, then they were likely not to prepare. If an individual trusted an agency too much then they often transferred responsibility on to that agency, expecting that the agency had any disaster issues covered and that the individual did not need to prepare. Distrust of an agency could aid preparedness because if an individual did not trust an agency to look after the community during a disaster, then they felt motivated to prepare to ensure they could look after themselves. Disaster experience had an influence on whether people trusted agencies or not. If an agency performed well in a disaster then individuals were more likely to trust an agency, if not then trust was often be lost. Disagreement over how hazard mitigation money is spent also reduced trust, as well as disparate views on risk and treatment of that risk.

Community participation and leadership over hazard and preparedness issues were also found in the interviews to assist the preparedness process. These

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aspects both fall under interactive types of information.

6. Resource Issues

Even if people do decide they want to prepare for disasters, a number of resource issues may prevent preparedness taking place [43]. The interviews revealed that such resource issues include: lack of knowledge particularly with respect to knowing what preparedness items to gather, how this should be done and how to make buildings safer; lack of capability in carrying out preparedness tasks; lack of time to actually undertake preparedness; a feeling that preparedness costs too much money, especially with regard to tasks such as retrofitting homes; a focus on other priorities such as work and “just getting on with living life”; and a concern over where to store survival items once they are collated.

7. Conclusions

The qualitative interviews undertaken for this research have allowed a better understanding of how people interpret hazards and preparedness information during a period of relative earthquake quiescence, and how this interacts with other individual, community and societal factors as part of the preparedness process. This paper has described some of the preliminary results of the research. Further analysis of the data has been undertaken to build a complete model of information use and subsequent preparedness actions and is described in Ref. [43].

The interviews revealed that there are three main types of information that people draw upon: passive, interactive and experiential. All three types of information have their uses and need to be considered when devising educational strategies. Passive information is good for raising awareness and knowledge and providing details about the potential effects of disasters. Interactive information encourages discussion and assists people in understanding the consequences of an event. It also allows people to

actually practice aspects of preparedness and assists in building self-efficacy. Experiential information helps people form important beliefs about hazards and preparing and assists with understanding the consequences of an event. Even where people have not directly experienced a large disaster there are other salient “hazard” experiences from daily life that can be utilised to help build an understanding of the need for preparedness.

A number of important beliefs were identified that have an influence on the preparedness process. Of particular note is people’s strong association with preparedness being related to “survival” and the “basics”. This is physically reflected in the fact that people are more likely to prepare by gathering together survival items than undertaking more complicated or expensive actions such as retrofitting their homes. It appears that there is still work to be done to assist people in understanding that the retrofit of buildings and securing of building contents is an important part of earthquake preparedness. Barriers such as knowledge, capability, time and cost also act to prevent people from undertaking these tasks. Future community education strategies should ensure that the beliefs identified during this study are addressed appropriately in any educational information provided. Likewise, ways of addressing societal influences and resource issues should also be factored into programmes involved with developing preparedness and resilience.

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