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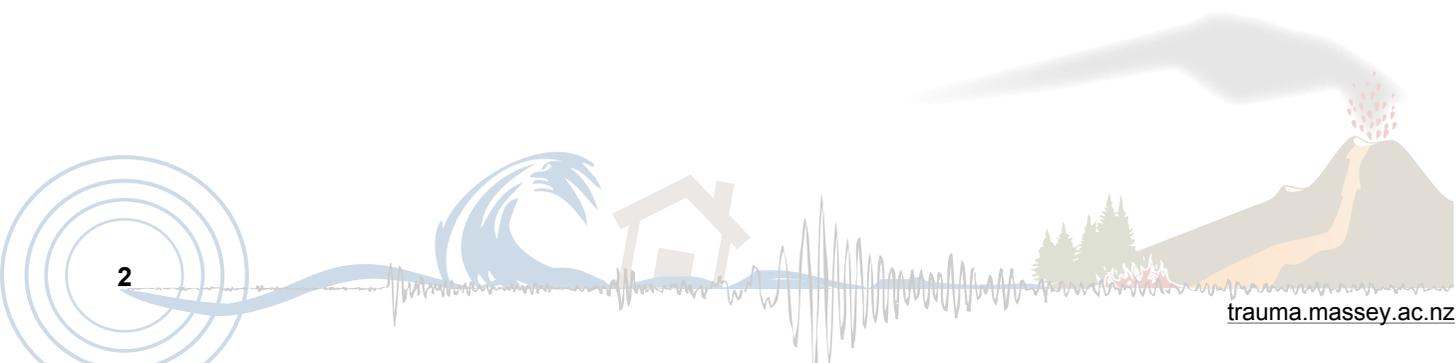


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The importance of theory, analysis and practice to integrated disaster research: Introduction to the IRDR Conference Special Issue

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Abstract

The Second Integrated Research on Disaster Risk Conference was held in Beijing, China, on the 7th to 9th of June, 2014. This event gathered a diverse international combination of researchers, policy makers, practitioners, funders and disaster risk reduction agencies, to discuss the applied integration of disaster risk research. The current special issue consists of papers with an explicitly social focus which were presented at this conference. These papers are discussed in terms of vital elements for integrated disaster risk science, namely: analysis, theory and links to practice. The special issue papers include a landmark case study of community-led disaster recovery, amongst indigenous Māori affected by the earthquakes of 2011 and 2012 in Canterbury, New Zealand. Another paper takes an international approach, to analysing the use of the term 'disaster' in English speaking contexts. A paper on vulnerability and response to disasters provides a detailed account of needs for disaster risk reduction in low-income countries, such as Ghana. Vulnerabilities are also explored in a paper about the challenges faced by people with disabilities during an earthquake. The special issue concludes with a thought-provoking paper on concepts of modernity, which takes an expansive and historical view of the disaster risk domain. In sum, special issue authors have produced relatively unique combinations of disaster risk analysis, theory and links

to practice. This special issue therefore represents an important illustration of integrated disaster risk research.

Keywords: *disaster risk, analysis, theory, practice, social dimensions, integrated research*

The Second Integrated Risk on Disaster Research (IRDR) Conference was held in Beijing, China, between the 7th and 9th of June, 2014. This conference gathered “researchers, politicians, practitioners, funding agencies and disaster risk reduction-related organisations to discuss and develop ways to better integrate disaster risk science into policy, practice and sustainability” (Rovins, Doyle, & Huggins, 2014, p. 332). According to Rovins et al. (2014), the conference included over 200 delegates, from over 50 different countries. A wide range of papers were presented at the conference. These papers were grouped into topics ranging from empowering local government, to interactions between science and central body politics, to data, technology, and meteorological issues (Rovins et al., 2014).

The current special issue consists of papers delivered at the conference which had an explicitly social dimension. The social focus of these papers meant they fit the established scope of the Australasian Journal of Disaster and Trauma Studies, in which this special issue was being published. To be considered for the special issue, papers needed to be submitted in an extended format which was then peer reviewed as a piece of academic scholarship. Peer reviewers were reminded of the practical scope of the second IRDR conference, which involved delegates from research, policy, and practice backgrounds (see Rovins et al., 2014). This more practically integrated focus is generally reflected in the diverse papers which have progressed through the entire publication process for this special issue. These papers also illustrate combinations of detailed analysis and theory, which do not always form the focus of applied research. This introduction discusses the importance of detailed analysis and links to theory, using the special issue papers as examples.

Analysis

It is often assumed that research which is truly responsive to pressing real world issues must be substantially simplified, to the point of being instantly transparent for all potential audiences. The current authors have witnessed a range of calls, amongst disaster risk researchers, policy makers and practitioners alike, for substantially simplifying disaster risk research. These calls have often referenced the need to tell a straightforward story, as part of the drive to make sure that every aspect of research is rapidly understood by any given member of the audience.

It is not hard to question these calls for simplicity. According to commentary from Taleb (2010) and research by Huggins and Jones (2012), complex interactions between multiple dynamics, such as human and natural systems, cannot be usefully examined in terms of simple, linear story-telling. Even without delving into theories of complex dynamic systems, it is important to consider the issue of analysis, which is essential to any piece of research.

The concept and importance of analysis may be opaque in the domain of disaster risk reduction. For example, an official glossary of terminology produced by the United Nations Strategy for Disaster Risk Reduction (2009) does not define any form of disaster-related analysis. This glossary does not even define the most specific term of *risk analysis*. The definition of analysis may also be opaque for research in general. For example, notable glossaries of research terminology, including Thomson Reuters (2015) and the Colorado State University (2015) Glossary of Key Terms do not define the term. It seems useful to return to a generic etymology of analysis:

“resolution of anything complex into simple elements” (opposite of synthesis), from Medieval Latin analysis (15c.), from Greek analysis “a breaking up, a loosening, releasing,” noun of action from analyein “unloose, release, set free; to loose a ship from its moorings,” in Aristotle, “to analyze,” from ana “up, throughout” (see ana-) + lysis “a loosening,” from lyein “to unfasten”

Harper (2014, p.1)

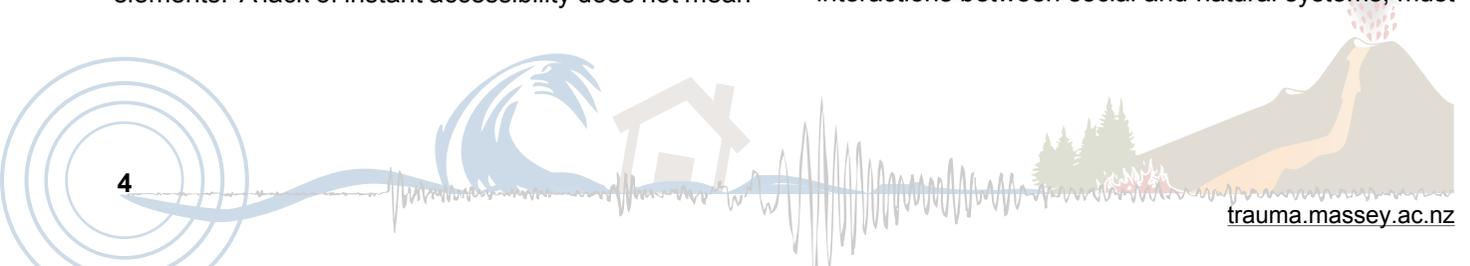
Papers in the current issue help illustrate the value of analysis for disaster risk reduction, by taking a detailed approach to extending understandings of relevant elements. A lack of instant accessibility does not mean

these papers are not transparent, or useful. For disaster-related research, researchers with unique skills often enter a disaster-affected domain to meet particular analytical needs. Professional researchers provide a detailed level of analysis which they have been trained to perform as a unique craft. For example, research by Kenney, Johnston, Paton, Reid and Phibbs (2015) was made possible through their unique skills and experience which enabled a team of researchers to complete a detailed analysis of particularly local issues. This does not mean the population of interest did not have their own capacities. In fact, the researchers recognised these capacities by taking a uniquely participative approach which involved treating interview respondents as partners, not research subjects. The researchers' uniquely analytical skills and other resources provided an avenue for Ngāi Tahu research partners to tell their story of community-led recovery, in ways that share their learnings with a range of academic and other professional audiences.

Phibbs, Good, Severinson, Woodbury and Williamson (2015) used an analysis of interview and survey data to share how a major earthquake had been experienced by people with disabilities. The clarity of analytical structures used by Phibbs et al. (2015) make it clear that the experiences analysed *may* exist in many other earthquake-affected contexts, or contexts affected by other natural hazards. The findings of this research are clearly outlined, alongside issues of generalising from a limited sample of participants. Mayner and Arbon (2015) took a broader, international lens, to the domain of disaster terminology. Like Phibbs et al. (2015), their analysis of glossary texts has included a clear description of the research limitations. Their analysis of single words, drawn from English language sources, can now be improved in further electronic analyses of disaster risk terminology.

Theory

Although his own theories of organisational change have been substantially revised over a number of decades, Kurt Lewin (1951, p.169) is often quoted as saying, “There is nothing so practical as a good theory.” While this quote represents a potentially amusing paradox, critically examined theory plays a particularly important role for disaster risk reduction. Any robust prediction of interactions between social and natural systems, must



have a background model, i.e. theory, upon which to make those predictions.

Certain scientific disciplines have traditionally held a sharp division between practice, observations, analysis and theory (see for example, Steen, 1971). However these understandings of theory are not necessarily reinforced by more contemporary definitions of theory, used by a range of social science disciplines. Research-related theory is more than an abstract set of concepts. It is inseparable from a range of structured observations and analysis. For one example, Fearon (1991) defined political science theory as both the source, and result, of testing observable hypotheses. The example of abductive research, as outlined by Levin-Rozalis (2004), shows that not all social science theory is developed through a deductive analysis of hypotheses. This latter approach to research represents an explorative approach to structuring observations, without being limited to initial assumptions, i.e. hypotheses, which are fully formed. There are many other theories of knowledge to support a range of ways to gather and interpret theoretically-relevant research. This domain, of epistemology, deserves a whole special edition of its own. It is discussed in more detail in the special issue article by Barrios (2015). In sum, there is an entirely substantial quantity of robust social science theory which has been produced through accumulated tests and other structured observations. Research-related theory is often therefore a structured set of concepts, based on rigorous observations which can be fundamentally relevant to pressing practical problems.

Perhaps the importance of research-related theory would be easier to digest at a glance if scientific theories were simply fixed and not subject to change. While considering the economic impacts of disasters many assume, or believe, that theory from *The Wealth of Nations* has not changed in the centuries since it was published. However, like most theories, Adam Smith's (1776) economic theory has been heavily adapted and re-interpreted over time, through observations, political drivers, and occasional rounds of more ethical re-framing.

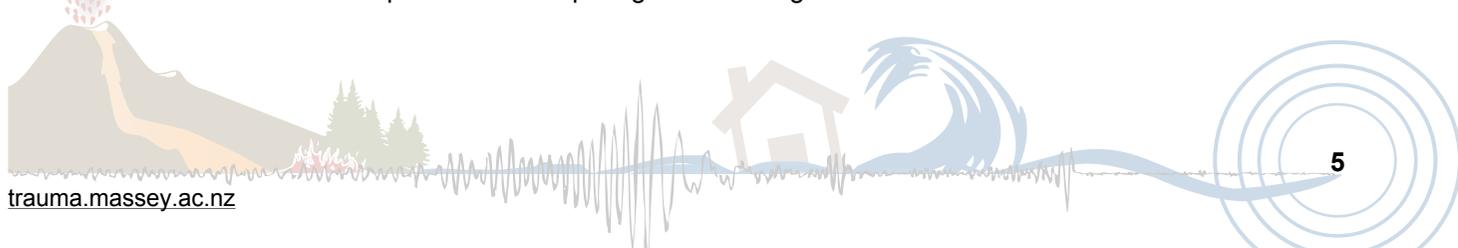
Theoretical revisions can be facilitated by breaking theories down into falsifiable hypotheses. Taking another leaf from his philosophy of science, more fundamental re-framing can occur through what Popper (1970, p.57) referred to as the "critical comparison of competing

theories" and/or simply increasing the content of a theory. Social science theory can change in many other ways besides, depending on the analysis being applied. The way that social science theory is particularly apt to change over time has been referred to as "social and historical contingency" by Arfken (2015, p.24), for example. That is, societies and the people within them change. In the current special issue, Barrios (2015) reminds us of just how historically contingent many of our theories of disaster risk may be. He points out how many historical assumptions about development and disaster risk in the developing world, and elsewhere, may urgently need to be challenged.

Theory does not always adapt through direct challenges, against arguably defunct assumptions. Instead, the continuity of theory could be compared to the continuity through adaptation, of disaster affected communities. Deeming and Fordham (2012) describe this in terms of the fluid, but nonetheless coherent identities, of communities affected by disaster risk. Theories can likewise be identified as an extension of the original, regardless of changes over time. Kenney et al. (2015) provide a good example of this kind of continuity. Their paper outlines traditional theories of resilience which have been bolstered by centuries of testing against lived experience. Theories outlined in Kenney et al. (2015) are now being extended, to help guide thinking outside of the original indigenous context. It remains vital, however, to acknowledge where, and how, those theories came into being.

Links to Practice

Even assuming that analysis and theory have been addressed, there would be no integration of disaster risk science unless research findings are being implemented. Research cannot be responsive to pressing real-world issues when there is no link between analysis and actual solutions to complex problems. Among the papers included in the current special issue, Yawson Adu, Armah, Kusi, Ansah, and Chiroro (2015) provide a particularly direct example of linking research to practice. Their paper summarises a practical vulnerability analysis, based on a large body of prior research literature. Practical recommendations drawn from this analysis illustrate how particular findings are being applied to the acutely practical problems of flooding in Northern Ghana.



Papers by Kenney et al. (2015), and Phibbs et al. (2015) have also taken a distinctly integrated approach to their subject matter. Phibbs et al. (2015) outlines very clear considerations for emergency management agencies working with people with disabilities. As with other papers in this special issue, Phibbs et al. (2015) have outlined clear linkages with the Hyogo Framework for Action (HFA), which was under review at the time of writing. Kenney et al. (2015) clearly outline a range of efforts to deliver their research findings to both practice and policy audiences. Findings from Kenney et al. (2015) appear to have been delivered in a way which will help a range of agencies improve collaborations with indigenous peoples, while improving agencies' own approach to disaster resilience.

Conclusion

The Second IRDR Conference aimed to bring a wide range of disaster risk reduction stakeholders together, to discuss a more applied and integrated role for disaster risk science. This special issue provides a selection of papers presented at the conference. They have been included in this particular special issue due to their explicitly social approach to integrated research into disaster risk. All papers included in the special issue were peer reviewed, in addition to their initial acceptance for the conference.

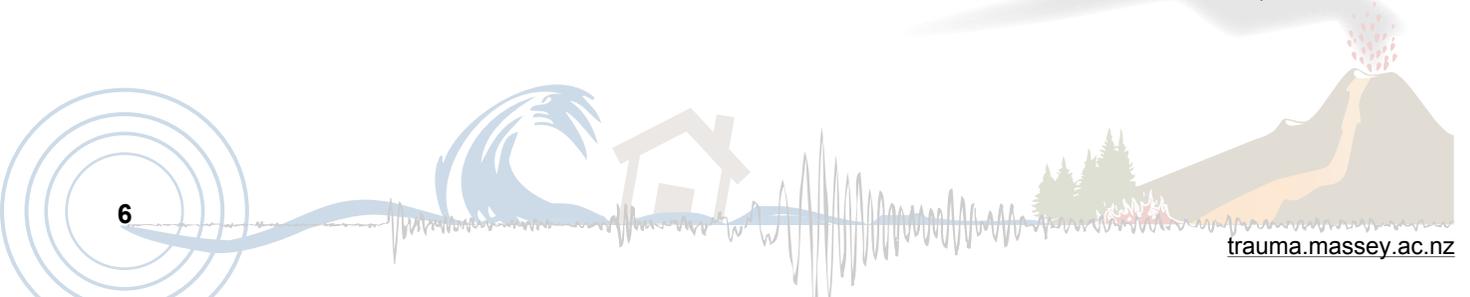
A much smaller set of papers emerged from the peer review process. Nonetheless, these papers address a diverse range of social dimensions of disasters. Topics covered range from: indigenous knowledge; disabilities and earthquakes; vulnerability analyses; terminology; and conceptual assumptions about modernity. These papers represent contributions to vital dimensions of integrated disaster risk science: analysis; theory; and links to practice, including the HFA. The current combination of these dimensions helps to illustrate responsively integrated disaster risk research - as an epitome of what IRDR and their many partners aim to achieve.

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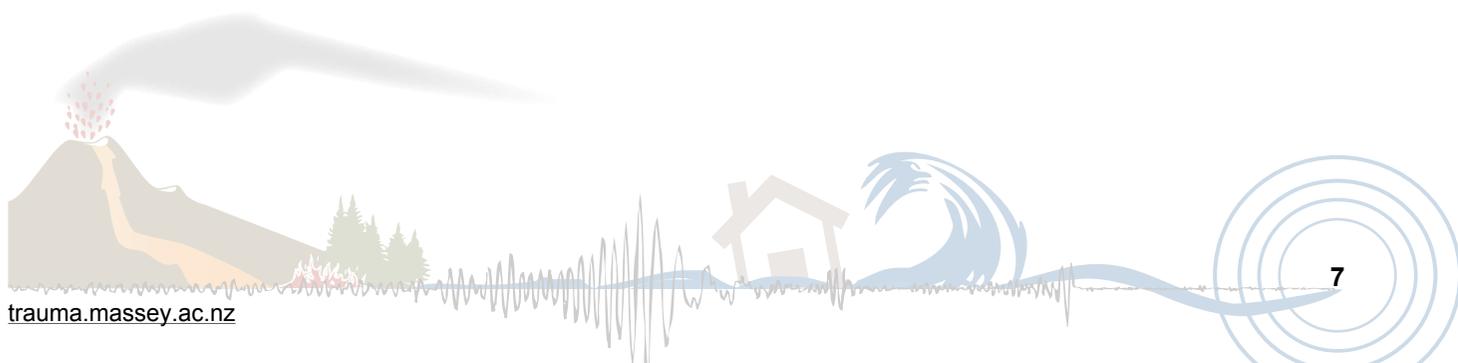
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Community-led disaster risk management: A Māori response to Ōtautahi (Christchurch) earthquakes

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Abstract

Since September 2010, a series of earthquakes have caused widespread social, financial and environmental devastation in Christchurch, New Zealand. Anecdotal evidence suggests that local Māori responded effectively to facilitate community recovery and resilience. Cultural technologies that are protective in times of adversity have previously been noted in Māori communities, but rarely documented. An ongoing research project conducted in partnership with the local Christchurch Iwi (tribe) Ngāi Tahu, has been identifying, and documenting the ways Māori cultural factors have facilitated disaster risk reduction and management in response to the earthquakes.

A qualitative research methodology (Te Whakamāramatanga), based on Ngāi Tahu values, and practices has shaped the community-based participatory research design. Māori research participants were recruited purposively and through self-selection. At the time of writing, the researchers had conducted semi-structured interviews with 43 Māori research participants. Culturally relevant (dialogical and narrative) interviewing approaches have been used to gather

research information and facilitate trusting relationships between researchers and local Māori communities. Community engagement has been fostered, as well as a capture of Māori understandings and practices associated with risk reduction and mitigation, disaster preparedness, response and recovery. Data analysis draws on social and risk theories as well as indigenous epistemological concepts. Initial data analysis suggests that within the New Zealand context, Civil Defence and Emergency Management policies and disaster risk reduction practices may be enhanced by the respectful integration of pertinent Māori knowledge and strategies.

Ngāi Tahu has a statutory governance role in the Christchurch rebuild as stipulated in the Canterbury Earthquake Recovery Authority Act (2011) and relational links with the New Zealand government and local authorities. Accordingly, information arising from data analysis, tribal knowledge, and Māori emergency management practices documented during this project is shaping development of contextualised risk reduction and disaster management strategies at urban and regional levels. Upon project conclusion, research results and recommendations will be disseminated to Iwi (tribes) and key stakeholders, to facilitate Māori disaster management capability, and disaster preparedness, risk reduction, and recovery planning throughout New Zealand. The researchers anticipate that lessons learned from this research may have relevance for other small island states and/or countries with indigenous populations that have similar value systems and bodies of traditional knowledge.

Keywords: Integrated, Risk, Governance, Indigenous, Management

On the 4th of September 2010 an earthquake measuring 7.1 occurred in Canterbury, New Zealand. The earthquake heralded the commencement of a cycle of major earthquakes which caused widespread urban devastation, injury to over 8000 inhabitants and ultimately the loss of 185 lives (Canterbury Earthquake Royal Commission, 2012). The Eastern side of Christchurch was the area most significantly impacted by the earthquakes and was primarily comprised of

communities with limited socioeconomic resources. The urban Māori community (25,725) which at the time constituted 7.3% of the urban population (Statistics New Zealand, 2014a) was also concentrated in the Eastern suburbs (Statistics New Zealand, 2014b). The geospatial concentration of Māori in the severely impacted areas suggested that in comparison to the wider community, Māori were disproportionately affected in terms of reduced financial resources, access to basic necessities, sanitation, power, transport and support from frontline responders. However, anecdotal stories of Māori resilience in Eastern Christchurch inferred that the local Māori had drawn on cultural values and practices to institute effective earthquake response initiatives.

The application of Māori values and practices to facilitate community recovery following disasters, although noted by Hudson and Hughes (2007) and Proctor (2010), has been relatively neglected within disaster research literature. The lack of documentation regarding the nature of Māori cultural attributes and the ways in which they may be implemented to facilitate community recovery following disasters, potentially poses a challenge to the generalised applicability of existing models of resilience (Boulton & Gifford, 2011). The Joint Centre for the Disaster Research in conjunction with the leadership of the local Christchurch Māori tribe (Te Rūnanga o Ngāi Tahu) share the perspective that knowledge, principles and practices embedded within the Māori approach to coping with the Christchurch earthquakes might be contextually relevant for disaster recovery policy development. A research partnership was established to examine the potential value of cultural attributes for informing and innovating disaster preparedness and integrated risk management strategies. Māori residing in the wider Christchurch region who had experienced the Canterbury earthquakes, as well as Māori frontline responders and other tangata whenua (Māori people belonging to a particular locality) engaged in the Earthquake response, were invited to participate in the research. The project commenced with the premise that Māori emergency management and disaster recovery practices were backgrounded by past history and

experience. This article considers how Māori resilience¹ is facilitated through traditional approaches to disaster risk reduction. It presents a framework for addressing adversity and explores how cultural values embedded in traditional approaches to disaster risk reduction were enacted in the Ngāi Tahu response to the Christchurch earthquakes. It is argued that the cohesive Māori community led response² has relevance across the continuum of hazard mitigation, preparedness, response and recovery.

The Maori Recovery Network Response to the Christchurch earthquakes was characterised by co-operation and unity. This article deliberately provides a positive story about the Māori response to the Christchurch disaster as a political act as too many articles that focus upon Māori are over-determined by a deficit thinking approach Reid, Robson & Jones(2000) provide a fuller discussion of deficit thinking. For an opinion on tensions within the Maori Recovery Network and the mainstream emergency response see Lambert (2014).

Māori approaches to Disaster Risk Reduction: A Historical Lens

As the indigenous people of New Zealand, Māori are familiar with discrete hazardous events (tsunamis, episodic flooding) as well as ongoing adversity resulting from disasters and have developed adaptive strategies to minimise disaster-related risks (King, Goff & Skipper, 2007). Māori knowledge, values and cultural practices

- 1 As indigenous researchers we believe that it is not appropriate to locate culturally embedded communitarian understandings of resilience (Boulton & Gifford, 2011; Paton, Gregg, Houghton, Lachman, Lachman et al 2007) which focus upon cultural strengths as well as collective agency as outlined in this article and elsewhere (see: Kenney, Paton, Johnston, Reid & Phibbs, 2012; and Paton, Johnston, Mamula-Seadon & Kenney, 2014) within the broader western literature on resilience. The rationale for this decision is because current resilience literature tends to provide a universalised focus upon individuals that is culturally and geographically dislocated from its origins in Europe and North America (Connell, 2007). Validating indigenous knowledges and practices through locating, and therefore subsuming them, within an authoritative western academic literature also prevents indigenous peoples from developing their own knowledges and in becoming experts on their own lives and realities (Smith, 1999).
- 2 The Māori Recovery Network Response to the Christchurch earthquakes was characterised by co-operation and unity. This article deliberately provides a positive story about the Māori response to the Christchurch disaster as a political act, as too many articles that focus upon Māori are over-determined by a deficit thinking approach. For example, Reid, Robson & Jones (2000) provide a fuller discussion of deficit thinking in relation to Māori. For an opinion on tensions within and between Māori and the mainstream emergency response see Lambert (2014).



are inter-related and co-constitutive actants³ (Latour, 2005) that shape tangata whenua behaviours and actions at the iwi (tribal) hapū (community) whānau (family) and individual levels to ensure community well-being. Collectively informed by experience, these cultural attributes, create unfinalised assemblages (Latour, 2005) which operate as highly adaptable technologies to facilitate coping with daily challenges, including disasters.

Within the disaster context these cultural technologies⁴ constitute an emergency response framework (see Figure 1) that may be adapted and applied to manage disaster-related risks, mitigate the social and environmental impacts of disasters as well as facilitate community recovery and sustainability. The first of the three core components of the Māori adaptive framework for addressing adversity is *Mātauranga Māori* (Māori knowledge). Māori knowledge and understanding of natural hazards, is crafted from physical knowledge ascertained from the senses, perceptual knowledge created through the interpretation of experience and theoretical knowledge developed in response to the evaluation of subtle environmental patterns. These forms of knowledge collectively comprise all information pertaining to aspects of the environment, for example geophysical, marine and ecological knowledge that may be used to shape Māori community responses to disasters.

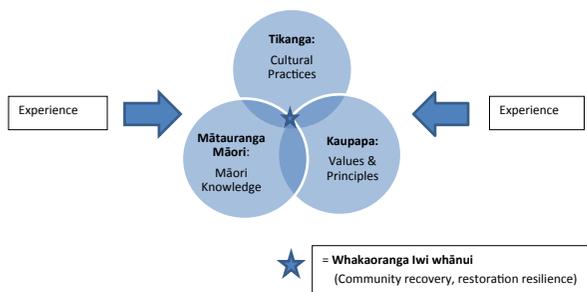


Fig 1: Conceptualisation of Traditional Māori Approach to Disaster Risk Reduction (Kenney and Phibbs, 2015)

3 *Actant* is a term applied by Bruno Latour (2005) to denote artefacts, concepts or practices that influence human behaviour.

4 In this context we suggest that Māori cultural technologies bring together both Foucauldian and Latourian conceptualisations of technologies. Physical as well as metaphysical cultural technologies, such as whakapapa, manaakitanga, land, or marae, may be conceptualized as heterogeneous relational and material entities that achieve durability through linkages created by the actions of actors (Latour, 1999; Callon, 1987). These cultural technologies also function as technologies of the self, production, domination and signification (Foucault, 1972, 1976). Kenney (2009) provides a fuller discussion of linkages between indigenous knowledges and Foucauldian and Latourian technologies.

Kaupapa (Māori values and/or principles) effectively constitute a set or moral rules that are relationally implemented to address natural hazard risk and mitigate the impact of natural disasters. Foundational values include *whakapapa* (genealogy) and *whānau* (family). Within the Māori world, families are the core units of cultural capital so genealogies shape social infrastructure on Māori marae (community centres). Emergency management roles are delegated to specific families and in some instances individuals in times of adversity. The intergenerational transmission of these roles has ensured that emergency response training commences at an early age and incorporates observational learning of future responsibilities. Other key values also shape Māori approaches to natural hazards management. *Kaitiakitanga* (guardianship, protection) underpins a social obligation to provide a safe environment for the wider community. *Manaakitanga*, which encompasses extending hospitality, respect and support to all community members during a disaster, is enacted through the provision of basic necessities (shelter, food) and psychosocial support. *Whakawhanaungatanga*, meaning the process of building and maintaining relationships, includes the operationalisation of intra and extra-tribal relationships to mobilise resources and activate social support networks.

Tikanga (cultural practices) are the physical manifestation of Māori knowledge and values. Traditional environmental risk mitigation practices such as land mapping and settlement fortifications protected communities by preventing land slippage from episodic flooding as well as ensuring that settlements were developed on stable bedrock. Coastal *marae* (community centres) were situated so inhabitants could identify early indicators for tsunami and/or king tides and respond accordingly. Inland settlements were located in proximity to rivers to facilitate food security, with secondary sites established as flood evacuation centres. Food security was enhanced by the application of resource management practices. The implementation of traditional conservation practices ensured sustainable hunting and fishing. Eel and fish traps for example, were designed to capture limited numbers of mature stock. *Mahinga kai* (traditional gardens) were seasonally planted and harvested. Food security was also facilitated through food preservation (smoking/drying) and storage practices. *Pataka* (raised stores) protected food resources from foraging birds and floods. *Rua kumara* (ground storage pits) ensured root vegetables did not get affected by frosts. When natural

disasters occurred it was understood that skills and material resources, such as food and accommodation, would be made available to ensure the needs of the entire community were addressed.

Within the contemporary setting of Christchurch, the Māori community have reported acting in accordance with cultural values and implementing cultural practices in order to support community well-being and encourage community recovery following the earthquakes. As one tribal manager stated:

Immediately it [the September earthquake] struck home that hey, we've got a responsibility to a whole community of people, that we need to ensure they know that we're here for them, and available to assist. (JR)

Research into how these traditional values and practices are utilised to support community resilience in times of adversity has relevance for contemporary emergency preparedness and response initiatives.

Research Design

The Joint Centre for Disaster Research is leading a large research programme that is identifying factors which build resilience in rural and urban communities of New Zealand. A component of this programme has focused on capturing Māori experiences and perspectives of the Christchurch Earthquakes and was conducted by Māori members of the research team in partnership with the local Iwi (tribe) Te Rūnanga o Ngāi Tahu. Traditional cultural attributes that facilitated Māori community recovery have been identified and the ways in which they were applied to sustain community resilience in response to the earthquakes are being documented.

The Māori community-based participatory research project drawing on the Christchurch context has addressed existing gaps in the disaster research literature relating to how cultural technologies promote and sustain indigenous resilience following earthquakes. Community-based (and directed) Participatory Research (CBPR) is a research approach that facilitates relationships of trust with community research partners, and is an effective method for promoting the wellbeing of Indigenous communities (Israel, Schulz, Parker, & Becker, 1998) - in this instance the Ngāi Tahu and wider Māori communities of Christchurch. The community-based qualitative research has been designed and implemented in accordance with Kaupapa Māori research principles. This approach

ensures that research is designed by and for Māori, addresses Māori concerns, is implemented by Māori researchers and conducted in accordance with Māori values (Smith, 1999). The Māori research methodology Te Whakamāramatanga (Kenney, 2009) shaped the establishment of a research partnership between the Joint Centre for Disaster Research and the tribal administrative body as well as the implementation of a culturally appropriate and contextually relevant approach to conducting the research. Māori values and principles constituted methodological concepts, which included genealogy, building relationships, protection/ensuring safety, creating trust, respectful negotiation, equity, advocacy, self-determination, empowerment, and agreement.

Ethical approval to conduct the project was received from the Massey University Human Ethics Committee and Te Rūnanga o Ngāi Tahu Research Services. Ngāi Tahu elders also provided ethical oversight, offering cultural advice for the duration of the research project. Te Rūnanga o Ngāi Tahu and other local Māori stakeholders subsequently facilitated participant recruitment. As the cultural practices of *kanohi ki kanohi* (face to face communication) and the oral tradition of passing down Māori knowledge, values and practices through stories are highly valued aspects of Māori culture. Both practices were employed during the data collection phase of this project. Information gathering was also enhanced by the adoption of a conversational or dialogical (see Frank, 2005) approach to interviewing that disrupts the social power differentials between researchers and research participants (Freire, 1967, 2000; Sonn & Green, 2006). Interview topics were collaboratively determined, covering: Iwi (tribal) and organisational responses; the concerns and unmet needs of Māori communities; the ways in which cultural beliefs, values and practices build organisational and community resilience; how distinctive cultural and geographical knowledge may inform urban and civil defence planning; as well as recommendations for disaster preparedness planning within Māori organisations and communities.

The research partnership collaboratively agreed on the process for dissemination of research results. Public reporting has been a gradual process with representatives of Te Rūnanga o Ngāi Tahu and the Joint Centre for Disaster Research regularly negotiating the level of information accumulated as well as the process, mediums and venues for information disclosure. Knowledge dissemination to the Māori community has

been ongoing as the research project has progressed. As part of that process, and with participants' approval, a percentage of interview tapes will be securely stored in the Te Rūnanga o Ngāi Tahu archive for posterity. Te Rūnanga o Ngāi Tahu will also determine the degree to which the distinct cultural information generated by the research may be made publically available. Ngāi Tahu has, for example, reviewed and endorsed the contents of the current article prior to publication in the journal. General results, including recommendations around setting priorities for embedding civil/ system resilience, are being disseminated through diverse methods such as Māori *hui* (meetings), conference presentations, and peer-reviewed publications. The researchers anticipate that Te Rūnanga o Ngāi Tahu and the Joint Centre for Disaster Research will collectively draw on research findings to advocate for improvements to urban, civil defence, emergency services and disaster preparedness planning throughout New Zealand in the longer term.

Research Results: The Māori Community-led Response to the Ōtautahi (Christchurch) Earthquakes

The Māori community-led response to the earthquakes in Canterbury was the impetus for the creation of a Māori Recovery Network. This network linked with the mainstream emergency management infrastructure to ensure the inclusion of, and accessibility to resources and support for the diverse communities in Christchurch. The Māori Recovery Network constituted a culturally and contextually relevant disaster management system that was based on Māori values and operationalized to support community resilience.

Māori Emergency Management: Establishing Governance

Although Te Rūnanga o Ngāi Tahu tribal members comprise a minority group within the Canterbury Māori community (Statistics NZ, 2014b), the tribe bears the responsibility of guardianship for the region and has a cultural obligation to protect and ensure the wellbeing of the Canterbury environment and the wider population. Immediately following the February 22, earthquake in 2011, this Iwi (tribe) undertook a leadership role in developing the co-ordinated Māori response to the earthquakes. The Chairman of Te Rūnanga o Ngāi Tahu Board, Sir Mark Solomon, invited Māori tribal leaders, as

well as Māori representatives from central government and private organisations, to an earthquake response strategy development meeting held at Rēhua marae on February 23, 2011. The meeting was also attended by representatives from Te Rūnanga o Ngā Maata Waka, (Christchurch Urban Māori Authority), Te Puni Kōkiri (Ministry of Māori Development), the Te Tai Tonga (Southern Māori) electorate, the New Zealand Police, and the Ōtautahi Māori Wardens Association (Marae Investigates TVNZ, 2011). The Māori Recovery Network was collaboratively established within 24 hours of the February 22, 2011 earthquake, and according to tribal leader Sir Mark Solomon:

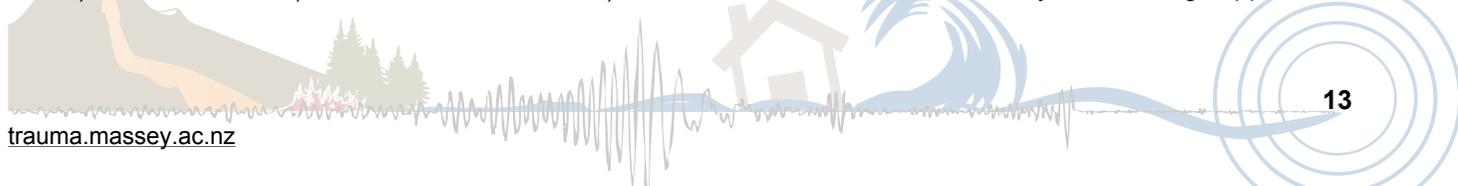
It took us around 15 minutes to get a unanimous agreement that all the Māori groupings would work together. In fact, I put it right down to one man – (names CEO) of Ngā Maata Waka Urban Māori authority. He simply looked at me and he said 'Mark no me no you, just us,' I said 'Yes!'

Attendees agreed that the Māori response to the earthquake sequence would be led by Te Rūnanga o Ngāi Tahu, and that Sir Mark Solomon would act as the media spokesperson. Ngāi Tahu negotiated communications and collaborative decision making with Government ministries, local authorities, NGOs and various Northern iwi (tribes), to facilitate a coordinated response to managing urgent disaster-related concerns (Te Puni Kōkiri, 2011a). Effective leadership was perceived by community responders as a key component in ensuring a well organised emergency management response. Research participants characterised the Māori response leaders as follows:

Ngāi Tahu..., it's got leaders and they're not only real life-savvie they're just smart strategic thinkers as well... (Marae volunteer)

What was neat too was... Mark Solomon the Kaiwhakahaere (Chairperson) leading by example... they (the managers) weren't asking ...all their staff ...to do anything they wouldn't do themselves... (Rūnanga Employee)

In addition to effective leadership, regular communication between key stakeholders ensured that logistical arrangements, including the consolidation of social and material resources, were carefully coordinated. National inter-tribal networks were operationalised to facilitate the storage and transport of goods to Christchurch, for distribution to the community. Resourcing support was



rapid and comprehensive as the following interview extract demonstrates:

Container loads arrived here at Wigram from Pipitea marae in Wellington, it was loaded with canned food, blankets, napkins, baby formula, baby bottles, ah everything you could think of - three container loads, and just three days after the earthquake. (JR)

Attendees also agreed that the Māori response would be driven by Māori values. A community responder described the creation of the initial mission statement: "On the first day the leaders adopted a theme - 'aroha nui ki te tangata' love to all people - so it didn't matter who we come up against, we helped them" (MW). Community enactment of the Māori value *aroha nui ki te tangata* signalled that local Māori intended to provide support to the entire community not just the local Māori community, and this message was reinforced in media releases from the Māori Recovery network as follows:

We are collectivised we have brought the Māori providers together to table a stock take of what they can offer so that we can link in with other services to help out in the community... I asked the community if we could include the Asian and migrant communities to which I got immediate agreement... This disaster has hit everyone and our response is for the people of Christchurch... You ride it out you survive you get on with rebuilding and the way to do it is that you do it together as a community.

Sir Mark Solomon, in Marae Investigates interview (2011)

In addition to media and telecommunications, the Māori Recovery Network leadership used other mediums, including personal contact and social networks to inform the Māori community about the agreed upon cultural approach to managing the earthquake disaster. According to Paton, Johnston, Mamula-Seadon & Kenney, (2014), message dissemination was effective and the Māori community responded accordingly.

Māori, Communities, Emergency Management and Disaster Risk Reduction

The Māori Community-led response to the Christchurch earthquakes exemplifies the ways in which traditional Māori knowledge values and practices are inter-related and actioned as cultural technologies to facilitate disaster risk reduction and community resilience. Research participants have identified various cultural values including *kotahitanga* (unity); *whānau* (family); *whakapapa* (genealogy); *whakawhanaungatanga*

(building /maintaining relationships); *marae* (community centres); *manaakitanga* (respect/support/hospitality), and *kaitiakitanga* (guardianship) as key actants in shaping responders' actions. The resulting behaviours of disaster responders were in turn culturally framed by research participants as inter-generational practices that facilitated the *whakaoranga* (restoration and resilience) of the community. Extracts from participants' talk showcase the ways in which values and practices interacted, as detailed below.

The Ngāi Tahu city marae Rēhua was designated an Earthquake Recovery Assistance Centre on the 23rd of February 2011, followed a week later by the national urban marae Ngā Hau E Wha, which became an outreach hub for displaced government agencies, the banking sector and various community organisations (Te Puni Kōkiri, 2011b). Within the Māori world, marae are considered *kaupapa* (a place where traditional principles are observed), enacted values that constitute both a physical place for the community to gather and a spiritual space of safety that is framed by the value *whakapapa* (genealogy). Marae therefore support a sense of connectedness that reinforces Māori identity and well-being. As safe havens they may be rapidly mobilised support centres for communities impacted by natural disasters. Following post-quake building inspections, Ngāi Tahu opened their 12 marae in Canterbury as shelters for displaced residents and extended hospitality and support to the entire community.

...we had to turn to one of the cultural mechanisms of support we know, so obviously we turned to our marae (community centres) because they are right there when a storm hits, there for everyone, pakeha (non- Māori New Zealanders) and Māori. (TO)

Enactment of the value *whanaungatanga* (relationships) through drawing on inter-tribal connections, ensured that a week after the February 22, 2011 earthquake all tribal marae in the South Island and several in the North Island were hosting evacuees (Te Puni Kōkiri, 2011c). Expressions of *whanaungatanga* (relationships) took various forms, inter-tribal, inter-agency and tribal/government communication linkages enhanced the coordination of resources and reduced the duplication of services to the community. As one recovery assistant remarked:

The communication between our staff and other services was good. We kept in touch with Te Puni Kōkiri (Government agency responsible for Māori

affairs), they are friends as well as relatives so... we knew if the whānau (families) weren't getting the assistance that was needed they would contact us... (SO)

Whanaungatanga (relationships) also manifested in the deployment of human resources. Several iwi (tribes) fielded teams of registered health professionals to address the health needs of residents in Eastern Christchurch. Community access to health and well-being services in the eastern suburbs was limited as a result of liquefaction, fractured roading and the traumatisation of healthcare personnel (Sullivan and Wong, 2011). Sir Mark Solomon conceptualised this act as an expression of whanaungatanga in that:

...as part of their koha (gift of support), Te Arawa sent down a group of nurses, Tainui sent down doctors and nurses, and Raukawa also sent down doctors and nurses.

The 13 Māori doctors, 18 Māori nurses and counsellors mobilised from Rēhua marae as barefoot medical teams⁵ providing primary health care services to the most inaccessible suburbs including Aranui, Dallington and Bexley.

An earthquake information and advice service was established by Te Rūnanga o Ngāi Tahu. This service relisted the tribal organisation telephone number as an emergency contact centre for accessing assistance the day after the February 22nd earthquake (Sharples, 2011). During the immediate period after the earthquake and in keeping with the kaupapa (principle) aroha nui ki te tangata (extend love and support to all), Māori telephonists provided 24 hour coverage to ensure information and support were constantly available to the wider community. The telephonists worked extended shifts willingly and often, as one research participant stated:

We had a mobile phone that was going 24/7...We would be getting calls at 2 in the morning, 3, 4am just people wanting to talk, because the shakes were constantly going... it was just knowing that someone else was up with them and we were happy to do that...we rotated the phone around the five of us... worked all day, then we would be on the phones all night. (PO)

5 In this context barefoot medicine refers to a group of health professionals who deliver outreach services through providing door to door health care, needs evaluation and support in communities that are isolated, disadvantaged and/or impacted by disasters. An overview of the history of barefoot doctors is provided by The World Health Organisation (Weiyuan, 2008).

Other local responders engaged with the community directly. After the February earthquake, many families struggled to obtain basic necessities such as food, water and shelter. Local Māori wardens enacted the kaupapa (principle) of manaakitanga (hospitality) extending respectful support to address households' immediate needs. Sir Mark Solomon commented that:

Our (Christchurch based) wardens they got out into the community - they door knocked on close to 10,000 homes, they delivered around 1600 food packages, they delivered water, anything that people asked for, we delivered.

Although the New Zealand Police had requested that the national Māori wardens' would be operationalised to provide security services in the Eastern Suburbs, the 160 wardens who were deployed to Christchurch initiated delivery of basic necessities from Rēhua marae to on average 4,800 people per week until late April, 2011 (Te Puni Kōkiri, 2011c). The Māori Recovery Network also initiated a door knocking campaign, and used the traditional practice of kanohi ki te kanohi (face to face engagement) to conduct direct assessments of community members' levels of well-being, resources and accommodation circumstances. As one Ngāi Tahu manager remarked:

It was about getting out to the people, engaging face to face and offering support. (DA)

Logistical administration, including the reception, storage and distribution of gifted resources, was managed from the Ngāi Tahu base of operations at Wigram. Volunteers from the local Māori community unpacked goods from various containers and shipping crates then repacked the resources for delivery. Material resources offered as koha (gifts of respect) through the inter-tribal support network, were carefully chosen and comprehensive, as one Wigram-based volunteer notes:

We had care parcels arrive in from Tauranga Iwi (tribes)...There was a lot of baby stuff which was great because a lot of the mothers had lost stuff and there was real thought given to a lot of these parcels. (MA)

Resources were also often accompanied by written expressions of support for the community as the following interview extract demonstrates:

We'd get containers in from the Kohanga (kindergarten) in Wellington and they would leave

little notes with the kai (food) and clothing for people and it was primo! (SH)

This provision of support to Christchurch families by Māori pre-school children based in Wellington may be regarded as an example of the way in which intergenerational learning about emergency preparedness and value driven responses is facilitated within Māori communities.

Allocation of resources was determined daily in response to updated information regarding community concerns. For example, debriefing meetings were regularly held at Rēhua marae to ensure that community needs and issues as well as alterations to logistical arrangements were communicated to responders. The wider Māori community was also regularly updated about response initiatives via marae connections, emergency support networks including texting trees, tribal websites and facebook links. Te Rūnanga o Ngāi Tahu staff have estimated that the Māori recovery network delivered food, water and other necessities to approximately 18,000+ households in Christchurch (Solomon, 2012). The Māori collective approach to disaster management, which may be characterised as both community-led and community-centred, constitutes an enactment of the Māori value kotahitanga (unity) and is described by one research participant as follows:

In the end everyone came to our house..., there was 18 to 20 people living in our house with us for 8 weeks. And that is what you do as Ngāi Tahu, as Māori you come together..., you take in whoever needs somewhere to stay..., you offer support. (PO)

Unity is a characteristic of Māori whānau (families), which in acting as the key unit of social capital within Māori communities, equally constitutes a core value supporting Māori health and wellbeing. During disasters, whakapapa links (family networks) are drawn on for support and family members who have access to resources will offer them willingly, for example:

I've still got my son and a granddaughter and her partner and a baby living in my house... One came in from the first earthquake in September, the other one after November, and they haven't left... you have to look after whānau..., we put tents in our back yard... (Ngāi Tahu Employee)

In most participants' stories the principles of kotahitanga (unity), whānau (family) and whakapapa (genealogy) were interrelated and facilitated a level of social

connectedness that enhanced community recovery. A tribal employee explained the value of Māori familial social cohesion within the disaster context as follows:

When they (the Government) want to encourage people to respond well to disaster..., they encourage them to make connections to their neighbours their family... Well that already naturally occurs with an Iwi (tribe); and that is their first advantage... an advantage that you can't underestimate... That whānau (family) and that connectedness-base, underpins why Ngāi Tahu performed so well during the earthquake. (LA)

The social obligations imposed by Māori kinship structures to support relatives in times of adversity are not confined to extended family. Viewed through a Māori cosmogonical lens, kinship ties are extended to include the tribal homeland. The whenua (land) is understood to be the original progenitor of human life, and recognised as Papatuanuku, the earth mother (Marsden, 1992). Relational connection to the land is underpinned by a responsibility to protect the both the physical and social elements of the Canterbury environment through enacting kaitiakitanga (guardianship). Ngāi Tahu has operationalised this value by engaging as partners with Environment Canterbury in developing new environmental initiatives (Environment Canterbury, 2012). The Mahanui Iwi Management Plan addresses Iwi (tribal) resource protection in the Christchurch region while a broader partnership between Ngāi Tahu and Environment Canterbury called Tuia brings together cultural conservation practices and statutory responsibilities to help ensure the sustainability of natural resources. Another measure for enacting guardianship of the social environment is Ngāi Tahu participation in urban rebuild planning (CERA, 2012). As one community responder stated:

We have a responsibility as kaitiaki (guardians) of our land to work with CERA (the Canterbury Earthquake Recovery Authority) and the others to plan for the future. One of the ways we can help is by using our cultural knowledge to inform the redesigning and rebuilding of Christchurch. (TN)

Additional measures have included fostering Māori workforce development by providing tribal support for He Toki ki te Rika (the Māori Trade Training Scheme) (Te Rūnanga o Ngāi Tahu 2012a) and developing social housing initiatives to ensure that the wider community will have access to affordable accommodation (Te

Rūnanga o Ngāi Tahu 2012b). Te Rūnanga o Ngāi Tahu owns substantial tracts of land within Christchurch and the surrounding areas that were already under development prior to the Earthquake sequence. Despite soaring market prices, the tribe has fixed land purchase prices at pre-September 2010 rateable values, because: "Profiteering from the misery caused by the earthquake does not fit well with our tribal values" (CEO Te Rūnanga o Ngāi Tahu Holdings).

Research participant's comments underpin the notion that Māori share a collective '*ensemble identity*' (Kenney, 2009) that is genealogically linked across social communities, tribes and land. Relational connectivity imposes obligations on Iwi *whānui* (tribal members) regardless of social position, to ensure the well-being of the environment, land and people following natural disasters. The Christchurch earthquake sequence has acted as a catalyst for the revitalisation of traditional values and practices in the Māori community which, reframed as moral and relational technologies (see Kenney, 2009), have facilitated disaster management and community recovery following the Canterbury earthquakes. Collectively, these technologies constitute a dynamic cultural framework for ensuring urban recovery, social resilience, and regional sustainability.

Māori Cultural Technologies: A Valuable Addition to Integrated Disaster Risk Reduction

Within the context of Aotearoa, New Zealand

Research into community-led disaster management is relevant across the continuum of hazard mitigation, preparedness, response and recovery, and to wider themes of sustainable development (Paton, 2007). Moreover, community-based programmes are an effective tool for building disaster resilience in communities (Johnston, Becker & Paton, 2008; UNISDR, 2005). To date Māori resources and cultural strengths have not been integrated into pre-disaster planning and emergency response strategies at the national level in any meaningful way. The prompt and effective Māori response to the Christchurch quakes has acted as the genesis for increased engagement and collaboration between Iwi (tribes), local authorities and government. In addition, Te Rūnanga o Ngāi Tahu has used their legislated authority as guardians of the land and natural resources within Canterbury to secure a statutory governance role in the Christchurch rebuild,

as stipulated in the Canterbury Earthquake Recovery Authority Act, (2011). This public private partnership has helped ensure that findings from this research are being communicated directly to the Crown via established links between Te Rūnanga o Ngāi Tahu, the New Zealand cabinet and relevant government agencies. The relationship between Ngāi Tahu and the Crown has ensured that key information arising from the research informs national disaster preparedness policies. Ngāi Tahu historical and epistemological knowledge is also shaping integrated risk management strategies developed in collaboration with other local stakeholders (Crown, Canterbury Earthquake Recovery Authority/ CERA, Christchurch City Council) who are engaged in civil/disaster preparedness planning and in rebuilding Christchurch (CERA et al, 2012). As an exemplar, Ngāi Tahu geological strata information, including intergenerational knowledge about land composition and stability as well as the location of underground water courses has been ascertained and used to develop a digitised geo-physical index. In the longer term, this information will inform urban and rural planning, facilitate environmental sustainability and contribute to community resilience throughout Canterbury and the South Island of New Zealand.

The Global Context: Considerations for the Hyogo Framework for Action

The Community-led Māori response to the Canterbury earthquake sequence, through showcasing the value of Māori cultural attributes to disaster risk reduction strategies, has facilitated key activities designed to address priorities stipulated in the Hyogo Framework for Action 2005-2015 (UNISDR, 2005). Institutional recognition of local risk patterns, and the need to decentralise disaster risk reduction resources to relevant local authorities has been illustrated. The Canterbury emergency management infrastructure has been enhanced through promoting Māori community participation in disaster risk mitigation planning and civil disaster management within the region. The use of knowledge and resources to build a culture of safety and resilience is a key concern (Paton & Johnston, 2006). Within the Christchurch context, relevant information has been managed in ways that have strengthened linkages between public and private sector stakeholders and enabled local authorities to act to build resilience. In this instance, the capture and tailoring of Māori cultural heritage, in the form of contextualised values, environmental protection knowledge, traditional

resources and disaster mitigation practices has important implications for emergency management and response. Collectively, these attributes have supported capacity building through the development of holistic integrated disaster risk monitoring and management across the region.

Disaster management networks including intra- and extra-tribal relationships have been strengthened and cross-sectorial dialogues have been encouraged. The Hyogo Framework for Action asserts that promoting a coordinated regional response enhances policy, technical and institutional capacities in disaster management at local regional and national levels while advocating for the active participation of relevant stakeholders. The statutory role undertaken by Te Rūnanga o Ngāi Tahu in regards to the urban rebuild provides a case in point and ensures the engagement of Māori, in strategizing for regional sustainability. Within Aotearoa, New Zealand, there is growing government acknowledgement of the contextual relevance of Māori approaches to disaster risk reduction that are founded on traditional values, forms of knowledge and practices. In keeping with the Hyogo Framework for Action recommendation that cultural diversity should be taken into account when planning for disaster risk reduction (UNISDR, 2005), the current research partnership is optimistic that appropriate mechanisms will eventuate for the wider integration of cultural risk reduction technologies into mainstream disaster management strategies. The researchers also anticipate that such technologies and the Aotearoa, New Zealand exemplar may have relevance for other small island states and nations with indigenous populations that have a history of value framed practices for addressing disaster risk and recovery. Applying the Hyogo Framework for Action to findings from the Christchurch research is timely given that this international framework is currently being reviewed and is due for renewal in 2015.

Conclusion

The Māori community-led recovery network linked with mainstream emergency managers, government agencies and other responders to ensure that resources and support were readily available to the culturally diverse communities of Christchurch. Māori response initiatives have demonstrated how cultural knowledge, values and practices may be utilised to respond to disasters and support community resilience. Foundational values including genealogy, family,

guardianship, hospitality and respect interweave with cultural practices such as the operationalising of marae in order to provide broad-based support for communities in times of adversity. Human and organisational disaster risk reduction capacity is strengthened through intra- as well as inter-tribal linkages. Collectively, Māori actors and cultural actants, in this instance values, bodies of knowledge as well as practices, create assemblages that function as dynamic technologies of disaster risk reduction and resilience. The researchers anticipate that lessons learned from this research may have relevance for other small island states and/or countries with indigenous populations that have similar value systems and bodies of traditional knowledge.

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Defining disaster: The need for harmonisation of terminology

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Abstract

There is a need to harmonise the definitions for disaster terms from a wide range of glossaries and other sources, to build a more unitary foundation for further research, policy and practice. As a first step in a wider programme of research, we present an analysis of the term disaster. Definitions for disaster were obtained from glossaries found in books, reports and internet sites. One of these sources was the National Library of Medicine (NLM), USA which contained 62 disaster related glossaries. A total of 110 glossaries were found containing disaster terminology however, only 52 identified contained definitions for the word disaster. Leximancer software was used to analyse consensus between the different definitions identified, by mapping the connectivity of words and associated concepts. 128 different disaster definitions were identified and included in the analysis, which detected main themes of: disruption; ability; widespread; event; outside; damage; property; and overwhelm. Hence the most consistent definition for disaster appeared to be 'the widespread disruption and damage to a community that exceeds its ability to cope and overwhelms its resources'. This paper reports on only one term, namely disaster, for which there seems to be little consensus throughout the research and wider community. A number of other limitations are outlined, which are being considered for the ongoing analysis of over 100 disaster-related terms.

Keywords: text analysis, disaster, terminology, definitions, glossary

Disasters have traditionally been classified as natural or man-made and more recently other categories have been used, such as: toxicological; technological; major; complex; foreign; and catastrophic. Almost on a daily basis, there are reports in the media of a disaster or an extreme event. Disasters appear to be becoming more frequent and are thus having a greater impact on people, systems and structures which are exposed to the destruction released in such situations. Further, events seem to be more likely to impact on people and surroundings given where people live and how they live - thus causing even more disruption and damage.

There are many glossaries of disaster and related terms. A number of publications exist that have focused on collating key disaster related terms such as work by Thywissen (2006, 2010) and more recently, Marre (2013). These publications have shown how many definitions can exist for one word such as *disaster*. Al-Madhari & Keller (1997) and the earlier work of Quarantelli (1985) emphasised that without an accurate and consensual definition for the word disaster, research in this area becomes difficult. They also listed the many definitions available for the word disaster, which they have grouped under respective professional backgrounds. Although these authors did not offer a universal definition for the word disaster, given differing professional requirements, they did stress the need for standardisation of definitions to provide a consistent framework from which to report events, collect data and plan.

There is, therefore, a need to better harmonise the definitions for many disaster terms, to build a more consolidated foundation for both research and practice. The current research aimed to collate as many English language definitions of the word disaster as could be found and use text analysis software to produce a *consensus* definition; based on the descriptive words used most often in the available glossaries. This paper provides a first step in a programme of research which aims to establish greater consensus and improved harmonisation of wider, disaster-related terminology.

Methods

The information on disaster terminology presented below is the result of an extended study which commenced

in 2009. This initial and ongoing work has involved collecting numerous glossaries from a wide range of sources, dealing with many aspects of disasters.

Data collection

There were two principal sources of information. Firstly, the current research used the Disaster Information Management Research Centre (DIMRC) – Disaster Glossaries site from the National Library of Medicine (NLM) in Washington, USA, which now lists 55 disaster related glossaries. A number of glossaries that were previously listed by NLM but which are no longer listed on their site were also included in the analysis. In total, there were 62 English language glossaries used from the NLM collection.

The second main source was an independent search related to disaster which identified 54 available English language glossaries. Sources included: scientific literature databases, including Medline and others; books; published papers; manuals; and publications from emergency organisations; alongside any relevant publications from the World Health Organisation (WHO) and the United Nations International Strategy for Disaster Reduction (UNISDR). All of these documents contained at least one glossary of disaster related terminology.

Of the 54 glossaries, five had also been identified from the DIMRC and one was the DIMRC site itself. Hence a total of 48 glossaries were found in non-NLM sources. A number of books had been totally devoted to disaster terminology while other books on topics related to disasters also contained smaller glossaries, with definitions for selected disaster related words. In the latter case, only words that were referenced back to a dictionary were included into our study. All internet, NLM collection and other sources used for this analysis were re-checked and updated on an annual basis. In sum, although 110 glossaries were available for this study, only 52 contained applicable definitions of the word 'disaster'.

Text analysis

Once the definitions of disaster had been collected, several selection processes were applied to this research data. Disaster related definitions were categorised into three groups, being: the word itself; disaster types; and disaster-related terms. A number of document authors had included contextual or other comments that were

not clearly definitional in their definitions of the word. These comments were removed before further analysis.

A software program called Leximancer (version 4, 2011), was used to analyse the collated definitions. Leximancer is a text analysis program which helps analyse the textual content of documents by combining the analysis of semantic structures, such as synonyms and antonyms, with syntactical linkages, i.e. how different words are positioned together in text. The program produces two sets of information: *concepts*, which semantically group all words from the text; and *themes* which in turn group concepts by the way they are placed throughout the text. Smith & Humphreys (2006) have outlined the way that concept mapping research utilising Leximancer works and have demonstrated the validity of this approach. According to Angus, Rintel, and Wiles (2013), other researchers have used Leximancer to analyse polling and political commentary, evaluate incident reporting and explore communication strategies. Leximancer has also been used as a powerful tool for developing evidence-based analyses of international trends (Angus, Rintel, & Wiles, 2013).

Leximancer output includes an analytical display that can be presented both graphically and in table format as the analysis progresses. This is how Leximancer displays the main concepts and themes from the text and how these are related. The output of Leximancer analysis can be set at different percentage levels for both concepts and themes. For the analysis presented in this paper, the level for concepts was set at 100%, which provided a greater body of information for the analytical display. The higher the theme percentage, the more the information is grouped on the display. The lower the theme percentage, the less grouped information hence, displaying a more finely grained analysis. Theme analysis was set at 20, 33 and 50% levels for the current analysis.

All data was cleaned prior to entering the original Microsoft Word (2010) file of data into Leximancer. Duplicate definitions, all numbers referring to dates or page numbers, all names of authors or places and all abbreviations were removed; none of which were part of the definitions. As the word being analysed, 'disaster' was also removed from the definition. This left only key descriptive words and relevant surrounding text as data for the analysis. After entering the data, the program produced a graphical display and table of the main concepts and themes associated with all definitions. This output was then used to produce a unitary, computer-

generated definition, which was checked against existing definitions for an identical match.

Results

Existing definitions for the word disaster

Of the 52 glossaries that had definitions for the word 'disaster', only 39 glossaries were actively used because the remainder (13) contained duplicate definitions. Most glossaries had between 1 to 3 definitions while three glossaries had from 4 to 14. One glossary had 57 different definitions. An overall total of 197 definitions were found, of which 69 were exact duplicates. This left 128 different definitions available to be analysed.

Strong differences and similarities were noted during analysis. Similarities tended to be found when definitions were discipline specific. Differences tended to be found when definitions appeared to be general or generic in the disaster field. Examples of the variety of definitions are shown in Table 1.

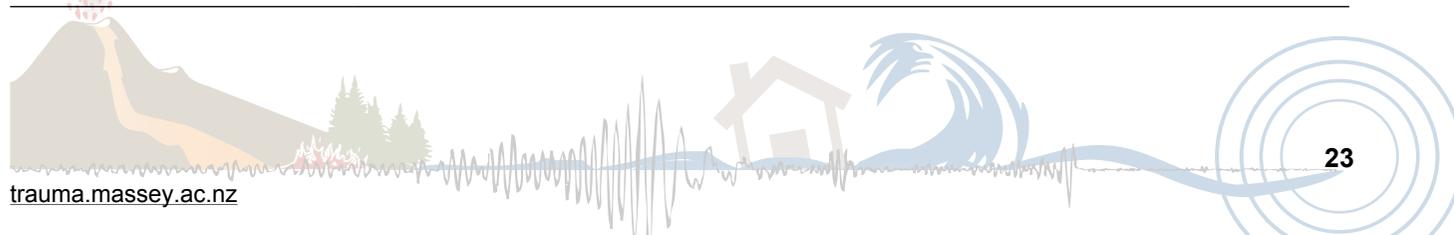
Table 1
Examples of definitions for the word disaster

Author / Source (year)	Definition
Australian Emergency Management Institute (2011)	A condition or situation of significant destruction, disruption and/ or distress to a community.
Biby (2005) cited in Blanchard (2008)	Any natural or man-made event that negatively impacts people, property, or critical resources. Disasters do not cause effects. The effects are what we call a disaster. (Dombrowsky, 1998) A disaster is a normatively defined occasion in a community when extraordinary efforts are taken to protect and benefit some social resource whose existence is perceived as threatened. (Dynes, 1998) An occurrence that has resulted in property damage, deaths, and /or injuries to a community (FEMA, 1990)
IPCC (2012)	Severe alterations in the normal functioning of a community or a society due to hazardous physical events interacting with vulnerable social conditions, leading to widespread adverse human, material, economic, or environmental effects that require immediate emergency response to satisfy critical human needs and that may require external support for recovery.
O'Leary (2006)	A state or condition of severe destabilization but not complete failure of a social system or its parts.
Oxford English Dictionary (2015)	A sudden accident or a natural catastrophe that causes great damage or loss of life
Sundnes & Birnbaum (2003) cited in Thywissen (2006)	A serious disruption of the functioning of society, causing widespread human, material or environmental losses which exceed the ability of affected society to cope using only its own resources. "For a disaster to be entered into the database of the UN's International Strategy for Disaster Reduction (ISDR), at least one of the following criteria must be met: – a report of 10 or more people killed – a report of 100 people affected – a declaration of a state of emergency by the relevant government – a request by the national government for international assistance" (IRIN/OCHA, 2005, p.23)
UNISDR (2009)	A serious disruption of the functioning of a community or a society involving widespread human, material, economic or environmental losses and impacts, which exceeds the ability of the affected community or society to cope using its own resources.
Washington State Department of Health (2009)	A large emergency event that is beyond the community's ability to address within its own and mutual aid resources.
World Health Organization (2011)	Situation or event, which overwhelms local capacity, necessitating a request to national or international level for external assistance.

Concepts and themes

Leximancer displays a list of ranked concepts, where more frequently occurring words and their synonyms are given a higher ranking. The most frequently occurring word, 'community' was marked as having 100% relevance. 'Event', 'social', 'disruption', 'society', 'ability', 'human', 'life affected', 'damage', 'resources' and 'loss' all appeared in the top 50%. This concept list did not change as the theme percentage, detailed below, was adjusted.

Results grouped by theme were displayed as percentages, showing that 40% of themes had little connectivity. There were however some differences between the three levels tested. Several themes were consistent throughout the three levels for the word 'disaster' and were above a 40% threshold. Themes showing the greatest connectivity were 'community', 'ability', 'event', 'society', 'affected' and 'damage'.



Discussion

The following is an initial attempt to produce a universal English definition from the current analysis, using main concepts and themes produced through the Leximancer analysis. A possible definition for the word *disaster*, based on key concepts and structural patterns identified amongst a wide range of available, pre-existing scientific and professional glossaries could be: 'the widespread disruption and damage to a community that exceeds its ability to cope and overwhelms its resources.' Given that the key terms appearing in this draft definition are related to the majority of glossaries sampled, it is likely that a majority of scientists and policy makers would agree with this definition.

The definition presented here closely resembles many that already exist. However, a number of these definitions have three additional words at the end: 'requiring outside assistance'. This concept was not included in proposed consensus definition because it had been implicitly identified amongst many other definitions surveyed. Many existing definitions reflect the definition proposed in this study and state that a disaster 'causes losses that overwhelm the local ability to cope'. When communities are unable to cope, it could be assumed that outside assistance will be required so we argue that the phrase 'requiring outside assistance' is generally redundant.

The initial definition produced in the current research may not satisfy all disciplines and professions. The definition remains specific to a particular point in history, and may also be too general to be used in some contexts and situations. However, we argue that it has the advantage of being produced by an empirical analysis of the most commonly used definitional words in professional and scientific glossaries available over an extended period. This analysis has removed many potential biases and preferences, while emphasising components of disaster definitions which many experts would agree upon.

The current definition very closely matches an existing UNISDR definition: "a serious disruption of the functioning of a community or a society involving widespread human, material, economic or environmental losses and impacts, which exceeds the ability of the affected community or society to cope using its own resources" (UNISDR, 2009, p.9). The current, research-based definition was arrived at in a much less politically complex context than the UNISDR iteration. However the

similarity between the current and UNISDR definitions suggests that the UNISDR may have used particularly egalitarian processes to arrive at their definition. It also appears, with reference to the current analysis, that the UNISDR was able to incorporate a rich foundation of scientific and practical knowledge, within which a range of relevant definitions have been documented.

Conclusion

As outlined in the introduction, the argument that there is a need for a consensus definition for the word 'disaster' is not new. Quarantelli (1985) and Al-Madhari & Keller (1997) have previously highlighted the need for harmonisation of this word and of disaster terminology in general - in order to progress scientific research and international guidance for disaster management. There are many glossaries of disaster terms which cover a wide range of disciplines, but offer little consensus about the definition of the word disaster. A number of other authors have also collated many definitions for the word disaster, highlighting the fact that there have been many definitions and little consensus.

We have therefore presented a computer generated definition for the word disaster based on over 120 pre-existing definitions: 'the widespread disruption and damage to a community that exceeds its ability to cope and overwhelms its resources.' In contrast to similar definitions, the need for outside assistance appears to be implicit and was not included in the current definition. The definition produced through analysis nonetheless bears a striking similarity to an existing definition used by the UNISDR (2009). This similarity with the current, analytically produced definition may be interpreted in terms of the quality of the UNISDR definition.

Although the current research was developed over an extended period of time, there is a possibility that some definitions have been left out from the analysis. An extensive search has been carried out, to access all possible glossaries related to disaster and include all definitions of the word disaster identifiable to date. Care was taken to include all definitions and not to exclude any information. However, only glossaries in English were collected and used for this research. Although it was beyond the scope of the current research, the authors recognise that there are valuable disaster related glossaries in other languages. Likewise, the program used for analysis could only be used for the English language, with an analysis at the level of single

words, rather than phrases and more tacit, linguistic and discursive dimensions of those phrases.

Only one key term has been analysed and discussed in this initial work. The next phase of our programme of research on terminology consists of analysing over 100 other terms related to disaster and generating further definitions through software text analysis. Like the term disaster, many related terms have numerous definitions. In this way, the current research has paved the way for other terms to be analysed, including: 'risk'; 'risk reduction'; and 'disaster risk reduction'. Each of these terms have their own unique definitions and sets of glossaries which are being analysed using the same method. We hope that software generated definitions will help eliminate duplication and confusion regarding the definition of such key words which are used frequently in the area of disaster. We hope that these analyses will also help to emphasise the definitional words used by a majority of our expert colleagues. This approach is therefore likely to provide a form of consensus based on scientific and expert publications and documents which, at the very least, will highlight common elements being discussed and put into practice in our field.

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A needs-based approach for exploring vulnerability and response to disaster risk in rural communities in low income countries

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Abstract

Vulnerability assessment and reduction are now central to developing a holistic and integrated approach to disaster risk reduction, including mitigating the effects of a disaster. Pre-existing frameworks for mapping vulnerability and planning response to disasters do not completely fit the realities of rural communities in low income countries where most people informally organize their own livelihoods, resources, space, security and response to disasters according to their needs and capacities. Livelihood activities are undertaken to satisfy needs. Hence, understanding needs of people and communities in this context can help unravel vulnerability and response capacity to disaster risks. This paper therefore applied a needs-based approach to explore and analyze the vulnerability of two rural communities in northern Ghana to flood risk. A survey was done, using a semi-structured questionnaire, to collect data immediately after the flood in 2007. Based on ranking of needs, the results show that survival and security needs (mainly food, housing, education and reliable income) were dominant before and after

the flood. During the flood, however, survival and empathic needs were more important. The results also show the disconnection between institutional frameworks for disaster management and the needs of the communities and, therefore, show a scope for policy and research in disaster management. However, in the context of sustainability, economic needs (dominated by income) were slightly greater than environmental needs (dominated by drainage, water and sanitation and relocation) which, in turn, were higher than social needs (dominated by health and education). Interestingly, most respondents indicated that a reliable source of income was a prerequisite for satisfying social needs in the short term and environmental needs in the long-term. It is concluded that the approach used in this research is simple, intuitive and easy to apply to map vulnerabilities to disaster risk across multiple scales. It is also easy to integrate into policy and management decisions about disaster risk reduction.

Keywords: *vulnerability, flood risk, disaster response, needs-based approach, northern Ghana, low income countries*

The need to build resilient systems and societies in response to disaster risk is now a global priority. The effect of disasters can be reduced by reducing the vulnerability of societies or increasing their response capacities. The capacity of communities to prevent, manage and respond to disasters is contingent on the economic, social and environmental conditions, as well as access to information and technology (IPCC, 2007). The International Strategy for Disaster Reduction (UNISDR, 2004, p.7) defines vulnerability as: "the conditions determined by physical, social, economic and environmental factors or processes, which increase the susceptibility of a community to the impact of hazards". The United Nations Development Program (UNDP, 2004, p.11) defines vulnerability as: "a human condition or process resulting from physical, social, economic and environmental factors, which determine the likelihood and scale of damage from the impact of a given hazard". Hazard refers to: "a dangerous phenomenon, substance, human activity or condition that may cause loss of life, injury or other health impacts, property damage, loss of livelihoods and services, social and economic

disruption, or environmental damage” (UNISDR, 2009, p.17). These definitions suggest that active hazards interact with the vulnerability context or coping capacity of communities to produce disasters. Disaster is the manifestation of a hazard through extensive disruption of the normal functioning of a community or society, with losses or damages to human lives, livelihoods, properties, infrastructure, socio-economic activities and the environment (UNISDR, 2007). According to the former UN Secretary-General Kofi Annan, disasters occur when hazards destroy the lives and livelihoods of people and communities (Annan, 2003). In other words, disasters occur when communities exposed to given hazards have preexisting vulnerabilities or inadequate capacity to reduce or cope with the adverse effects of the hazard (UNISDR, 2007). Hence, the assessment of vulnerability has become central to developing holistic and integrated approaches to disaster risk management and response (Kasperson *et al.*, 2005).

Even though there are several definitions and frameworks for determining vulnerability (see for example: Adger, 2006; Pelling *et al.*, 2005) and planning response to disasters, they do not completely fit the realities of rural communities in low income countries where the bulk of citizens informally organize their own livelihoods, resources, space, security and response to disaster according to their needs and capacities. Often, data required for vulnerability frameworks are unavailable. Because vulnerability is determined by the social, economic and environmental conditions of people or communities (UNISDR, 2004; 2009; Kasperson *et al.*, 2005), an understanding of the socio-economic and environmental needs of people and communities can be used to explore their vulnerability to a target disaster risk. The objective of this paper was to apply Maslow's hierarchy of needs to explore the vulnerability of two rural communities in northern Ghana.

Theoretical Context and Conceptual Framework

Maslow's theory of human motivation (Maslow, 1943; 1970) describes human endeavours as an attempt to fulfill a hierarchy of needs, in order of prepotency:

1. *Survival Needs*: are fundamental to survival and existence. They intertwine with survival instincts to drive motivated behavior, such as livelihood activities or human-environment interactions (Yawson *et al.*, 2009). Examples include need for food, water, health, clothing, and shelter. Individuals who have not satisfied their survival needs will
2. *Safety or Security Needs*: relate to need for protection from harm. Safety needs are the next most obsessive needs of individuals when their physiological needs are partly or wholly satisfied. Safety needs emerge and become stronger because they are psychologically (not physiologically) perceived to threaten life, survival, livelihood or wellbeing. Thus, these needs relate to safety from existential stresses or the capacity to cope with such stresses should they occur. They also include secure access to resources, opportunities, privileges and tools required for maintaining life and livelihood. Perceptions of safety or livelihood security in relation to extreme events have been shown to be a major determinant of coping or adaptation measures adopted by farming households (Mubaya *et al.*, 2012).
3. *Empathic Needs*: relate to need for affection and emotional support. Apart from kinship ties, individuals tap opportunities to build social resilience against some stresses (e.g. in times of disaster) by building social networks or joining groups that can be religious, political, social or economic for the purpose of receiving affection, sympathy and a range of support when there is a crisis. Social networks, thus, become instrumental for self-protection of both the individual and the social collective and satisfying the emotional and psychological need for belonging.
4. *Esteem Needs*: consist of need for self-respect (characterized by desire for confidence, self-worth, competence, achievement, mastery, and independence) and need for respect from others (characterized by the desire for social recognition of one's achievement, prestige, status, fame or power).
5. *Self-actualization*: this is the capstone of the hierarchy. It is a peak experience referred to as transcendence by Maslow. Self-actualization here is the ability to maintain or recover well-being after a crisis or disaster. It is at this point where the individual can be truly independent and functional in interdependent relationship. This level of needs is referred to as *being needs* by Maslow while those at the bottom of the hierarchy are *deficit needs*.

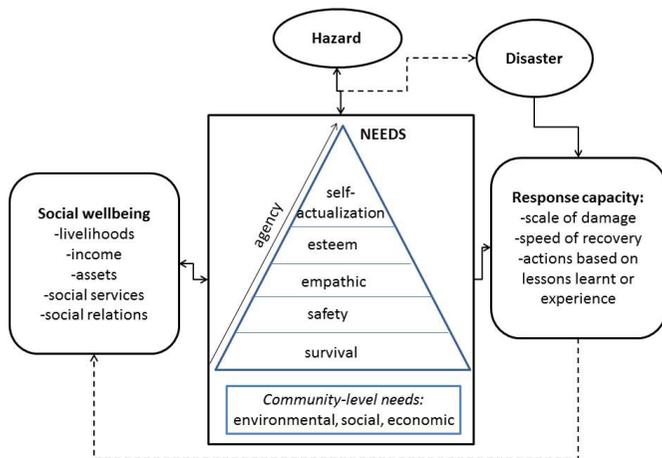


Figure 1: Conceptual framework for needs-based analysis of vulnerability to disaster.

Figure 1 shows the conceptual framework for the needs-based approach for analyzing vulnerability to disaster. In this framework, the state of social wellbeing produces needs (vulnerability context), and a hazard interacts with these needs to produce a disaster. The hierarchical level of needs determines people’s capacity to reduce disaster risk or cope with disasters. In the event of a disaster, a response capacity is evoked and tested. The outcomes of disaster, indicated by the scale of damage, speed of recovery and actions taken based on lessons learnt, will feedback into social wellbeing. The *damage* in this context encompasses both physical and non-physical (e.g. psychological) damages.

Method

Study location

This study was conducted in two rural communities, Daboya and Boinya, in the West Gonja Municipality in the northern region of Ghana (Figure 2). The study area is part of the Guinea Savanna agro-ecological zone, the driest agro-ecological zone in Ghana. The climate is characterized by a unimodal rainy season from May to September, with the peak in August-September, alternating with a dry period from October-November to March-April. Annual rainfall is about 1100 mm with high spatial and temporal variability (Rademacher-Schulz *et al.*, 2014). Communities participating in the current research have a gentle topography, with mean slopes of 7%. The study area is drained by the White Volta River, which extends beyond Ouagadougou in Burkina Faso. It is dominated by grasslands interspersed with drought-tolerant tree species such as acacias, baobab, and

dawadawa. The three northern regions are described as the poorest in Ghana, accounting for about 50% and 80% respectively of the poor and extremely poor people in Ghana (Rademacher-Schulz *et al.*, 2014). Subsistence farming, animal rearing and fishing are the most dominant livelihood activities and about 80% of the population in Northern Region engages in small-scale farming, with low external inputs.

In August and September 2007, heavy rainfall combined with the discharge of excess water from the Bagre Dam in Burkina Faso to cause widespread, devastating flooding in Northern Ghana. The flood caused considerable damage to life, properties, infrastructure and facilities and disrupted essential social services (Armah *et al.*, 2010). Farms, animals and food storage and processing facilities were damaged and 20 human lives were lost. What made this flood unique was that it was preceded by a prolonged dry spell. An initial estimate by the Ministry of Food and Agriculture indicated that about 70,500 hectare of farmlands were affected, with a production loss of 144,000 tons of food crops and 50,000 people at risk of prolonged food insecurity (UNOCHA, 2007). Daboya and Boinya were among the worst-affected communities.

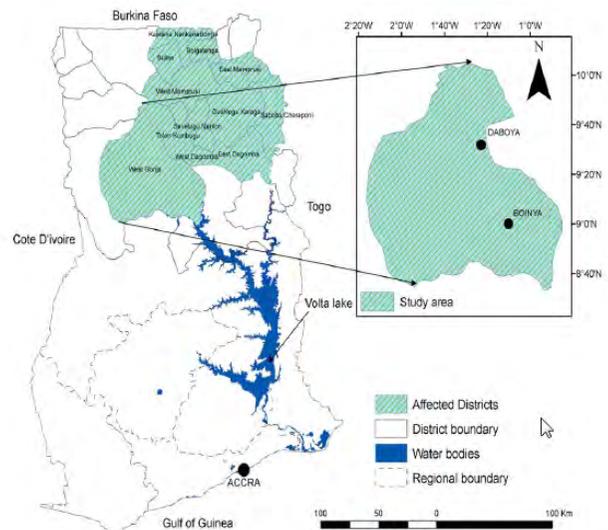


Figure 2: Map showing the locations of the communities where the study was conducted.

Data collection

A survey was conducted between November 2007 and November 2008 in the study communities. A total of 220 people (110 from each community) were randomly selected and interviewed using a semi-structured questionnaire. The interviews were conducted by the authors with the aid of an interpreter where necessary.

Of the respondents, 75% were males. While women play crucial roles in agricultural production or provision of labour in rural Ghana, women in northern Ghana usually prefer that men respond to interviews - except for female-headed households. Most of the respondents (97%) had lived in the communities for more than five years.

Application of a needs-based approach

The questionnaire elicited demographic information, and a range of needs at the individual, household and community levels, before, during and after the flood. The respondents were asked to state no more than 10 needs at the levels of individual or household and community. Respondents were asked to state whether these needs were crucial in the way community members were affected or in the way they responded to the flood event. The respondents were asked to state their personal or household needs before, during and immediately after the flood. Next, they were asked to consider the needs of their community in the same manner as the individual/household needs. The respondents were then asked to rank the enumerated needs in order of importance or priority using values ranging from 1 (low importance) to 10 (extremely important). They were not allowed to assign a value more than twice to the needs. However, they were allowed to repeat a particular need before, during or after the flood.

The data was tabulated and analyzed in Microsoft Excel. The frequencies of needs were compiled. The averages of the ranking values of each need were calculated as the sum of the ranking values divided by the frequency after the flood. Based on these average rank values, the stated needs were assigned to the appropriate hierarchy on the Maslow's hierarchy of needs and ranking was done for each hierarchy. However, the community level needs were grouped into social, environmental and economic. Needs with average rank values above 5 are reported in this paper.

Results

Demographic information

The demographic characteristics of respondents have been published in Armah *et al.* (2010). Most of the respondents, about 67%, had no formal education. Of those who had had formal education, 24% had only basic education, 8% had either a secondary or vocational education, while 1% had a tertiary level education.

Eighty percent of the respondents had dependents, ranging from 1 to 20 dependents. The average number of dependents was five. Farming was the predominant occupation among respondents (66%), followed by fishing (17%). There were other livelihood activities such as trading, teaching, and artisans. Some of the respondents earned income from both farming and off-farm sources.

Most of the respondents (70%) had been farming for 10 years or more. The main farming activities of respondents were animal husbandry (71%), crop production (41%) and mixed farming (52%). Forty five percent of respondents had farm sizes ranging from 2.4 to 4 ha and about 2% of respondents had farm sizes ranging from 6.4 to 8 ha. A substantial number of respondents farmed for commercial and subsistence purposes while 16% engaged in only subsistence farming. The maximum annual income from farming was 850 Cedis, where 1 Cedi was equivalent to 0.9 USD at the time of data collection. However, average annual income for all respondents was 795 Cedis. Sixty-six percent of the respondents earned off-farm income, of which 72% earned that income from their communities.

The total annual income for respondent households ranged from 60 to 2,500 Cedis. The majority of respondents lived in mud- and thatch-houses situated in a bare, dusty surroundings. Only 9% lived in houses made of cement blocks. Forty five percent of respondents lived in their own houses and 53% lived in houses owned by a relative.

Individual and household needs

Respondents listed a wide range of needs at the individual and household levels. Needs with average rank values greater than 5 are reported in Table 1. Survival and safety needs were dominant. Food was ranked as the number one need, with average ranking value of 9.6, followed by shelter, healthcare and water. The general trend in this category of needs is that the frequencies increased from before, during and after the flood. For example, the number of respondents who indicated food as a need increased from 194 before the flood, to 211 and 202 during and after the flood respectively. Hence, the importance of these needs is indicated not only by their relative rankings, but also by their increasing frequencies from before, during and after the flood. With safety or security needs, education and skills training ranked 1st, followed by employment and

Table 1:
Components, frequencies and rankings of individual/household-level needs.

Need Category	Components	Frequency			Avg. rank value	Ranking by need category
		Before	During	After		
Survival	Food	194	211	202	9.6	1
	Water	78	203	137	8.1	4
	Shelter	156	187	202	9.2	2
	Sanitation	179	201	214	6.8	7
	Healthcare	109	216	193	8.2	3
	Land	53	-	81	7.7	5
	Tools, implements, machines	91	-	131	6.7	8
	Farm inputs	115	-	126	7.4	6
	Labour	71	-	113	6.2	9
	Clothes & shoes	31	101	94	5.3	10
Safety/Security	Employment or good, reliable income	131	149	168	9.3	2
	Education & Skills training	193	-	206	9.4	1
	Market for produce	81	-	94	7.5	5
	Land tenure security	96	-	127	7.8	4
	Support and protection against flood	192	218	194	8.3	3
Empathic	support from government	43	182	58	5.6	2
	support from other networks	32	204	193	7.1	1
Esteem	Respect, dignity and confidence	14	86	194	6.2	1

reliable income, support and protection against flood and land tenure security. Again, the frequencies increased from before the flood to after the flood. A total of 206 respondents indicated that education and skills training were paramount after the flood.

For empathic needs, 204 and 193 respondents stated that support from other networks were more important than state support for citizens during and after the flood respectively. Non-state support networks included relatives, friends, social groups (e.g. religious groups) and non-governmental organizations. Even though support from government had a relatively low average ranking value, the respondents felt strongly about it. For example, one respondent, stated that “we too are Ghanaians so the government must do for us what it does for those in the cities when they are in crises”. Another respondent stated that “the government must do for us what other governments do for their citizens during flood”. For esteem related needs, few (14) respondents indicated a need for self-esteem (indicated by respect, confidence and dignity) before the flood. However, 194 respondents stated the need for self-esteem after the flood. This marks an increased need for self-esteem following the flood event.

Community-level needs

Community-level needs were classified into economic, environmental and social needs. As shown in table 2, income and job opportunities ranked 1st and 2nd respectively, under economic needs. A number of respondents stated that this need increased from before the flood to after the flood. Even though 187, 201 and 196 respondents stated that transport system was a community need before, during and after the flood, this need ranked lower than income and job opportunities. Interestingly, agricultural extension services had the lowest ranking within the economic needs. Environmental needs, drainage and water and sanitation ranked highest and had higher frequencies, followed by relocation and flood protection. During the flood, the majority of respondents indicated that drainage, water and sanitation and safe zones were an important need. After the flood, a substantial number of the respondents felt that flood protection and relocation were important. With socio-cultural needs, education and skills training ranked highest, followed by healthcare. Community level disaster awareness and response plan ranked 3rd, while evacuation, rescue and relief service at community level ranked 4th. Apart from credible source of information and communal support, which had higher frequencies during

Table 2
Components, frequencies and rankings of community-level needs.

Need Category	Components	Frequency			Avg. rank value	Ranking by need category
		Before	During	After		
Economic	Good income	132	143	179	8.7	1
	Job opportunities	151	-	187	8.2	2
	Transport system	187	201	196	7.1	3
	Agricultural extension services	61	-	32	6.6	4
	Safe zones	31	187	98	7.1	5
Environmental	Drainage	121	203	197	8.4	1
	Water and sanitation	81	198	151	8.1	2
	Relocation	31	-	122	7.9	3
	Flood protection	137	-	193	7.7	4
	Organization & leadership	17	41	54	5.2	7
Socio-cultural	Evacuation, rescue & relief services	19	198	203	7.3	4
	Education & skills training	190	-	207	7.9	1
	Healthcare	110	210	189	7.7	2
	Non-formal learning opportunities	12	-	17	5.4	6
	Credible source of information	161	204	152	6.9	5
	Communal support	23	121	68	6.4	6
	Disaster awareness and response plan	186	-	202	7.5	3

the flood, all socio-cultural needs appeared to increase from before the flood to after the flood.

Discussion

Maslow's theory of human motivation, the hierarchy of needs, can form a framework for understanding actions and resource mobilization in response to existential stimuli. It may better suit this purpose, rather than forming a rigid explanation of all human activities (Tanner, 1995; Yawson *et al.*, 2009). Needs assessment based on this hierarchy can be used to explore the vulnerabilities or response capacities of households and communities to disaster, shown in figure 1. The prevalence and the ranking of needs can give an idea about the conditions or risk factors that render the communities vulnerable to flood risk. The needs stated in this study suggest that if these needs had been considerably addressed, respondents may have coped better with the flood.

Individual/household-level need

At the individual or household level, survival and safety needs were dominant, as shown in table 1. Food was the most important survival need. It was also the most important need across all needs at individual or household levels. This suggests that, although the communities are predominantly agricultural, access to food remains problematic. Problems with food, water,

healthcare and shelter threaten life or survival itself and, as expected, those affected will devote their efforts and resources in addressing these problems to the detriment of higher level needs. The importance of these needs, at a higher level of the hierarchy, is also shown by their respective rankings and increasing frequencies before, during and after the flood. For example, as most of the residents lived in mud and thatch houses, the flood washed away a substantial number of houses (UNOCHA, 2007; Armah *et al.*, 2010). This suggests that the flood worsened the pre-existing survival needs of residents in the communities. Individuals, households or communities grappling with survival needs are invariably coping with multiple socio-economic and environmental stresses that render them vulnerable to disaster event. Difficulties with access to food, water and shelter only become magnified during a disaster. People and communities at this level of need require coping information (Norwood, 1999) amongst a range of other potential supports.

Education and skills training ranked highest among safety or security needs, followed by employment and reliable income. A number of respondents indicated the importance of these needs increased substantially after the flood. This suggests an increasing awareness of such safety or security needs over time, especially after the flood. Education, skills and income appear to be critical

for minimizing vulnerability and increasing the capacity to respond to disaster, by increasing individual and communal agency. It is plausible that the respondents considered education and skills training as an avenue for livelihood or income diversification and, for that matter, a better life. Similarly, most of the respondents believed that employment and good, reliable income can make them resilient to flooding. Support and protection from flood also ranked high and had high frequencies, showing how a substantial number of the respondents considered that this safety need was very important. It is also important to note that there were no flood defenses in the communities studied.

With reference to empathic needs, support from non-state networks ranked higher and had higher frequencies than state support. This might be partly due to the poor response and support the communities received from the state compared to non-state actors. Most of the respondents felt the government had neglected or let them down and this may have strengthened preferences for non-state support networks such as family and friends, religious bodies and non-governmental organizations (NGOs). One respondent commented that, "it is an NGO that is helping us to rebuild our houses and re-organize ourselves and not the government". Most of the respondents received material and non-material support from relatives, friends, NGOs and some religious organizations. In times of existential distresses, empathic needs appear to have surfaced. Social networks became instrumental in enabling the individuals to satisfy survival needs at the very least. Community development groups, farmers associations, religious associations, political connections, and professional networks became instrumental in providing insurance against external stresses. This result suggests that the government needs to rebuild the confidence and trust of the communities in state support mechanisms in times of disaster.

Community-level needs

Income and job opportunities dominated economic needs, whose rankings were slightly higher than environmental needs. This is not surprising, given the low income levels and the predominance of farm-based livelihoods in the communities studied. There appears to be a widespread desire for income and livelihood diversification in these communities. Possibly, the respondents believe that improvement in their economic conditions can make them resilient to flooding. While the communities are predominantly farming based, it

is surprising to see that needs for extension services had low frequencies and rankings. This might suggest an erosion of interest in farming and erosion of confidence in these services after the flood. Interestingly, all environmental needs reported in this study are related to flooding, underscoring how the communities believe that the perennial problem of flooding can be addressed. Sociocultural needs have been largely reflected at the individual or household levels, including the predominance of education and skills training and healthcare. However, the ranking and frequencies of disaster awareness and response planning, especially after the flood, suggests that the communities desire self-organization. In the least, they appear to appreciate their role as first line responders to disaster, including evacuation, rescue and relief services.

Needs in the context of vulnerability to disaster risks

The Hyogo Framework for Action 2005-2015 emphasized the need for methods for the assessment of social, economic and environmental vulnerabilities at varying scales to enable the reduction of disaster risk and promotion of disaster-resilient societies (UNISDR, 2005). The vulnerability-based disaster risk reduction approach integrates the susceptibility of social units and their economic, socio-cultural and environmental capacity to deal with potential damage (Cardona, 2004; Hilhorst and Bankoff, 2004). Multi-level interactions among system components (livelihoods, socio-economic and environmental conditions, institutions and policies) produce vulnerability. Thus, the social, economic and environmental needs of individuals, households and communities can reveal both their susceptibility and coping or response capacity for a particular disaster risk in a manner consistent with the definitions of vulnerability from the UNISDR (2004; 2009) and UNDP (2004).

Although the current research grouped needs according to a hierarchical order and rankings within each hierarchy, survey results collectively point to the social, economic and environmental susceptibility and coping ability related to floods. In the context of social vulnerability, as defined by Cannon *et al.* (2003) and Cutter *et al.* (2003), and in the context of figure 1, high rankings and frequencies for food, shelter and water suggest that the wellbeing of the respondents was poor before the flood and even worse afterwards. The importance of safety or security needs suggests that the livelihoods of the respondents are largely precarious and there is low opportunity for self-protection and income or

livelihood diversification due to low level of education, skills and income. It also suggests some of the assets they have and their ability to use these assets to cope with disaster. The relevance of empathic needs suggests weak social protection and institutional arrangements for responding to flood disaster in the communities. This is highlighted by the higher ranking of non-state support or social networks over state support. The relevance of esteem needs suggest the importance of rebuilding the self-confidence, respect and dignity of the respondents especially after the flood. This indicates a weakening of mental wellbeing and self-confidence and the need for less tangible, non-material support during and after the flood. Thus, the current results suggest that poor and slow response and recovery might weaken the will and capacity of the communities to effectively respond to subsequent disaster events, creating secondary or reinforced vulnerabilities. Identifiable community-level needs underscore a need for the investment of effort in physical and land use planning and the provision of infrastructure such as water and sanitation, drainage and flood defenses.

Needs and rankings highlighted in this study encompass several dimensions of social vulnerability because they indicate the socio-economic and environmental conditions that render the respondents and their communities vulnerable to flood (Cutter *et al.*, 2003). They also represent susceptibilities to physical environmental and socio-economic influences on coping capacity, which respectively lead to first and second order impacts (Carreno *et al.*, 2005; Cardona and Hurtado, 2000; also shown in figure 1). Needs outlined in the current study also indicate *revealed* vulnerabilities which can be used to geographically map potential vulnerabilities to future flood events. Revealed vulnerabilities also help to show the asset base and the deployment of assets in response to disaster event (mainly flood and drought), which is applicable to several frameworks for mapping vulnerability (for example, by: DFID, 1999; Chambers & Conway, 1992). The needs of individuals, households and communities can therefore be mapped to understand actions necessary for reducing vulnerability to a target disaster risk. By addressing these identified needs, policy makers and disaster reduction planning by the National Disaster Management Organization (NADMO) can reduce vulnerability of the communities to future floods.

The current research illustrates how a multi-level approach is required to address different levels of

vulnerability at the household and community levels. Incidentally, as the needs of people and communities are addressed hierarchically, communities, families and individuals can be shifted towards greater agency, for responding to disaster and building resilience. For example, the satisfaction of survival needs will allow people to think about, and direct efforts to satisfy, their safety needs. Addressing these safety needs will require important actions to improve social services, livelihoods, infrastructure and environmental management. The satisfaction of safety needs will also allow disaster affected populations to perform empathic roles, individually and collectively, during a crisis. To this end, community-based organizations and other social networks become strengthened. Once individuals reach this stage, they are more likely to strive to consolidate self-esteem, by seeking to be independent and building a stronger or resilient community.

Implications for integrated research and policy on disaster risk

Integrated disaster risk research must focus on simultaneously reducing vulnerabilities and disaster risks. To this end, the socio-ecological context becomes critical. Human needs drive livelihood activities and interactions with the environment. Thus, by understanding human needs at varying scales, it is possible to understand the processes and factors that predispose people and communities to disaster risk. Needs-based assessment of vulnerability has, to date, not been given sufficient attention in literature on disasters. However, progress in understanding the impact of vulnerability factors on proximal disaster outcomes (e.g. loss of property and life) and distal disaster outcomes depends on gaining a better understanding of the vulnerability factors themselves. This is especially true in terms of the needs of affected groups. Several questions become pertinent for research and policy. For example:

1. What do the individuals who are part of the community affected by floods identify as their key needs?
2. What needs are not being met by policy makers and disaster relief agencies before, during or after the disaster?
3. How can these needs be addressed effectively and progressively to reduce vulnerability to future floods?

Thus, research efforts should be directed towards understanding, characterizing and prioritizing the needs that motivate or constrain livelihood activities, human-environment interaction and wellbeing, in relation to an identified disaster risk. This is particularly relevant for communities where people use largely informal means to organize their lives and livelihoods. Resulting understandings can substantially contribute to effective policy and disaster management decisions. Thus, in low income countries where there is scant data on components of some indicators of vulnerability, the social, economic and environmental needs of people and communities ought to be coupled with disaster management, which includes research, preparedness and response at the local level. To this end, the approach proposed in this paper becomes crucial. This needs-based approach will highlight macro- and micro-scale issues that need to be integrated in research on disaster risks, to inform policy and management decisions.

Conclusion

The effects of disasters such as floods are mediated by the material and non-material conditions of the people affected. Understanding the needs of individuals, households and communities is therefore crucial for integrated research and policy on disaster management. A needs-based approach was applied to explore the vulnerability of individuals/households and rural communities to flood events. The study results showed how survival and safety needs largely predisposed the communities to a 2007 flood event and how these needs intensified after the flood. At the community-level, there is a need for infrastructure and economic opportunities to increase incomes.

The results of this study remain limited in terms of spatial-temporal coverage and number of respondents. An extended study will be required to validate or consolidate the findings into theory and practice and to make it applicable in other jurisdictions. The needs-based approach applied in this study nonetheless includes the strength of incorporating established concepts and frameworks for mapping social vulnerability, especially for rural communities in low income countries.

We conclude that the approach illustrated in the current research is both intuitive and simple. Using this approach makes it easier to map both revealed and potential vulnerabilities to a target disaster risk across multiple scales. It also becomes easier to integrate these maps

into disaster-related research, policy and management decisions. Disaster management organizations and policy makers can thereby direct effort to reducing vulnerability or increasing community-level response to disaster by progressively addressing the identified needs of target communities.

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Emergency preparedness and perceptions of vulnerability among disabled people following the Christchurch earthquakes: Applying lessons learnt to the Hyogo Framework for Action

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Abstract

Internationally there is limited research on the experiences of people with disabilities during and following a major disaster. The overall aim of this research was to explore how the Christchurch earthquakes impacted upon disabled people. This paper reports on findings from the research relating to emergency preparedness and perceptions of vulnerability among disabled people who were living in Christchurch over the extended period in which the earthquakes occurred. Qualitative inquiry was carried out, involving purposive sampling and face to face interviews with 23 disabled people and four agency representatives living in Christchurch during the earthquakes. The qualitative research was followed by a pilot quantitative survey involving 25 disabled people living in Christchurch during the earthquakes and 10 people who work in the disability sector. Qualitative interview material was analysed using thematic analysis while quantitative data was analysed using descriptive statistics. All findings are related to sections of the Hyogo Framework for Action. The research identified that prior to the September earthquake, disabled people were not prepared for an emergency. Following the earthquake most people took steps to ensure that they were better prepared. However, few disabled people were able to prepare for an emergency without support. Vulnerability was discussed by participants in relation to personal safety, communication, housing, transport and financial hardship. A lack of community preparedness alongside

insufficient structures to assist disabled people in the disaster response or recovery phases increased exposure to risk. It was relevant to discuss findings with reference to the Hyogo Framework for Action's emphasis on vulnerable communities, given that this international document was under review at the time of writing. Our research suggests that disabled people are more likely to be impacted in a civil emergency and are less likely to be prepared. Emergency preparedness management needs to engage with disabled people in the community and have specific policies to assist disabled people prior to and in the event of a disaster.

Keywords: *disaster, disability, preparedness, vulnerability, risk*

On September 4, 2010 a non-fatal 7.1 magnitude earthquake struck the Canterbury region of New Zealand. This was followed by a fatal 6.3 earthquake centred under the city of Christchurch on February 22, 2011. Two more earthquakes measuring magnitude 6.4 and 6 respectively were centred close to the city in June and December of 2011, causing further damage to city infrastructure. Two years after the first earthquake on the 4th of September 2010, the Government monitoring agency, Institute of Geological and Nuclear Sciences (GNS Science), had recorded more than 11,200 aftershocks in the Canterbury region (Otago Daily Times, 4/09/2012). People with disabilities constitute 17-20 per cent of the total New Zealand population (Human Rights Commission, 2013) making them a significant group in an emergency situation. This paper links findings from research conducted in Christchurch, that explored the reported experiences of disabled people related to the 2010-2011 Christchurch earthquake series, to action strategies within the 2005 Hyogo Framework for Action (HFA) on disaster risk reduction.

Background

Disaster risk reduction, involving promoting awareness, increasing knowledge, facilitating better preparedness and creating sustainable economic development for communities and nations, were objectives of the 2005 World Conference on Disaster Reduction in Kobe,

Hyogo, Japan. The resulting HFA has since been adopted by 168 countries, including New Zealand, as a plan to build resilience to disaster from natural, environmental and technological hazards. Central to the plan is the aim of reducing human, social, economic and environmental losses. Building on the 1994 Yokohama Strategy, the HFA is a layered model for disaster risk reduction, ranging from macro level interventions, such as creating legislative frameworks to mitigate natural hazard risk, to micro level actions, aimed at encouraging individual preparedness. The five key areas identified for development were: ensuring disaster risk reduction is a national and local priority; identify, assess and monitor disaster risks and enhance early warning; use knowledge, innovation and education to build a culture of safety and resilience at all levels; reduce the underlying risk factors; and strengthen disaster preparedness for effective recovery and response at all levels (UNISDR, 2005). The HFA identified that in all action areas, vulnerable groups should be taken into account when planning for disaster risk reduction.

Implementation of the five action strategies within the Hyogo Framework in New Zealand also needs to be cognisant of national and international policy and legislation protecting the rights of disabled people. In September 2008 the New Zealand Parliament ratified the UN Convention on the Rights of Persons with Disabilities (the Convention). Article 11 of the Convention relates to situations of risk and humanitarian emergencies. The article requires that all necessary measures are taken "to ensure the safety of persons with disabilities in situations of risk including situations of armed conflict, humanitarian emergencies and the occurrence of natural disasters" (United Nations, 2006. p.10). The New Zealand Ministry of Social Development as well as government departments, state owned enterprises and local government have responsibilities for ensuring disabled people are not discriminated against, as expressed in the New Zealand Bill of Rights 1990 and the Human Rights Act 1993. The strategic direction and goals for health and disability services are set out in the New Zealand Public Health and Disability Act 2000. The framework for the provision of health and disability services is outlined in the New Zealand Disability Strategy (Minister for Disability Issues, 2001). These Acts and the Disability Strategy need to be taken into account when planning, developing and implementing disaster preparedness planning and recovery responses for disabled people. Research into the experiences of disabled people following the Canterbury earthquakes

provides an opportunity to incorporate lessons learnt into more appropriate responsive emergency management, preparedness, planning and response.

Methods

The following methods were reviewed and approved by the Massey University Human Ethics Committee. The research involved qualitative inquiry using purposive sampling and face to face interviews with 23 disabled people living in Christchurch during the earthquakes, together with four agency representatives. Initial interviews took place with 12 vision impaired participants in January 2011 who were recruited through the Christchurch branch of the Association of Blind Citizens. Eight of the vision impaired participants were re-interviewed in February 2012, about how a year of earthquakes had impacted upon their lives. In April 2011 four representatives from the same disability support agency were interviewed about how the earthquakes had impacted upon their organisation and clients.

In March 2012, the qualitative research was extended to any disability, resulting in a further 11 research participants being interviewed in April of 2012. These participants were recruited through contacts provided by the Office for Disability Issues within the Ministry of Social Development and through cold calling disability advocacy groups and inviting them to nominate a spokesperson to contribute to the research. None of the individuals or organisations approached declined to participate in the research.

In total, 12 of the people interviewed were male and 15 female. Respondents' ages ranged between 20 to over 80 years of age with the most common groupings in 40-49 year old ($n = 9$) and 70-79 year old brackets ($n = 6$). Five of the people interviewed had more than one impairment. Audio-taped interviews lasting up to 90 minutes took place in participants' own homes. The same interviewer conducted all of the interviews, reviewed the information sheet, explained to participants their rights and answered any questions. All participants signed a consent form. Interview transcripts were transcribed verbatim and participants given pseudonyms to ensure confidentiality.

The qualitative research was followed by a pilot quantitative survey conducted in May 2012. This involved a further 25 disabled people living in Christchurch during the earthquakes and 10 people who worked in the disability sector. Prior to administration, the survey

was peer reviewed by staff from the Office for Disability Issues within the Ministry of Social Development. Survey respondents were recruited at a symposium on disability inclusive emergency preparedness and response, which was organised by the Ministry of Social Development and held in Christchurch on the 28-29 of May, 2012¹. Surveys were accessible in large print format and electronically. One disabled person chose to complete the survey electronically. A Christchurch-based reader/writer was also available to help respondents to complete the survey with three disabled people taking up this option. Participants who used a reader/writer signed a consent form after being taken through the information sheet attached to the front of the survey.

The survey included forced response, 5 point Likert scale and short answer questions. Thirteen of the survey respondents were male and 20 female. The average age of the survey respondents was 48 with the range between 21 and 64 years of age. Five people stated that they had more than one impairment and five surveys had missing data relating to the gender and stated disability questions on the survey.

Qualitative interview material was analysed using thematic analysis (see Braun & Clarke, 1996) and quantitative data was analysed using descriptive statistics. Comments written in the short answer sections of the survey, as well as notes written in survey margins by the participants, were included as additional data for qualitative analysis. These data were manually coded alongside interview transcripts and arranged into themes. Themes were then analysed in relation to literature concerning disability and disaster response and recovery. Although meaningful and capturing the important issues for this population of disabled people, the sample cannot be said to be representative of the larger population of those with disabilities.

Results and Discussion

The Hyogo Declaration is used in Aotearoa/New Zealand as one of the key frameworks for disaster risk reduction. The framework encompasses five action areas and a

¹ The symposium was organised to discuss how to develop disability inclusive emergency preparedness and response initiatives through learning from the Christchurch earthquakes. The symposium was attended by over 150 people, participants included members of the disability community, NGOs, Civil Defence Emergency Management, the Accident Compensation Corporation, the Canterbury District Health Board, the Christchurch City Council and the Fire Service (Office for Disability Issues, 2012a). The Office for Disability Issues within the Ministry of Social Development took responsibility for issuing invitations and publicising the symposium among disability groups within Christchurch.

range of priorities aimed at mitigating natural hazards including promoting awareness, increasing knowledge, facilitating better preparedness, and creating sustainable economic development for communities and nations. The following sections consider issues that are relevant to disabled people in relation to each of the action strategies within the Hyogo Framework for disaster risk reduction.

1. Policy, legislative and institutional frameworks

A focus on policy, legislative and institutional frameworks sets the context for all other action strategies within the 2005 Hyogo Framework for Action. Based on an all of government approach, this requires policy makers to be aware of the consequences of their decisions for disaster risk reduction and mitigation and encourages coordinated action across a range of sectors including for example: emergency management; public planning; infrastructure investment; health; education; employment; housing; transport; welfare; defence; justice; and finance (UNISDR, 2012; 2005). Disaster risk reduction is supported through adopting new, or strengthening existing, legislation, developing both organisational and human capacity and integrating mechanisms for natural hazard mitigation into policy and planning at all levels of government. Political will as well as adequate resourcing is required if legislation governing policy development and implementation in the area of disaster risk reduction is to be effective. This action strategy should recognise the need for organisational change within government so that barriers to promoting and implementing effective disaster risk management policies for policy makers are removed (UNISDR, 2012). Ensuring that disaster mitigation is both a national and local priority requires empowering local authorities and communities to manage and reduce disaster risks by having access to information, resources and the authority to implement actions.

Aspects of the HFA related to coordinated action across sectors, to develop legislation to mitigate disaster risk for vulnerable groups were identified in the inclusion of disability in the Canterbury Earthquake Recovery Act 2011. Parliament passed this 2011 Act, which expires on the 18th of April, 2016, as a temporary response to the greater Christchurch earthquakes. The Canterbury Earthquake Recovery Authority (CERA) was established on the 29th of March 2011 under the State Sector Act 1988 with its functions and responsibilities mandated in accordance with the Canterbury Earthquake Recovery Act 2011. CERA is tasked with leading coordinated

response and recovery in Christchurch (Ministry of Justice, 2014). In July 2011 Cabinet agreed to the incorporation of cross-government initiatives in the Disability Action Plan on the Canterbury recovery for the next 18 months. This document states that the development of the recovery plans, as required in the Canterbury Earthquake Recovery Act 2011, will have regard to the New Zealand Disability Strategy (Office of the Minister of Disability Issues, 2011).

Between 2011 and 2012, Cabinet identified four priority areas for ensuring disabled people were included in the Canterbury recovery (Office of the Minister for Disability Issues, 2011; 2012). The first priority area involved reviewing the design of government service delivery, considering changed individual, community and business circumstances following the Christchurch earthquakes. Identifying and addressing how changing conditions increase vulnerability for disabled people following the earthquakes links with the HFA's focus on recognising and responding to local risk patterns and trends through mitigating conditions that create additional risks for vulnerable people (UNISDR, 2005; 2012). Attention to legislative support for policies that focus on disaster risk mitigation aligned with the Hyogo Framework may be identified in the second priority area within the Disability Action Plan, which focuses on improving the accessibility of the built environment. Initiatives included ensuring that the repair and rebuild of public buildings, houses, roads, footpaths and urban spaces, to enhance safety and accessibility for disabled people and older family members (Office of the Minister for Disability Issues, 2011).

Reducing underlying risk factors through incorporating poverty reduction strategies into policy and planning also forms a key action area within the Hyogo Framework (UNISDR, 2005; 2012). Priority three of the Disability Action Plan addresses high unemployment rates among disabled people through supporting access to employment opportunities in recovery related work. Priority four within the Disability Action Plan recommends using lessons learnt from the Canterbury response to improve emergency preparedness for people with disabilities (Office of the Minister for Disability Issues 2012). This initiative relates to a key objective of the Hyogo Framework which focused upon sharing good practices and lessons learnt in order to improve disaster risk reduction.

The Disability Action Plan may be considered an example of best practice in relation to key objectives in the HFA

which focus upon using legislation to reduce underlying risk factors and to support vulnerable populations. The Building Act 2004 is recognised as a key mechanism for managing hazard risk (Hamilton, 2011). Likewise, The Christchurch Central Recovery Plan requires that all state funded anchor projects, buildings, open spaces, streets and facilities are accessible (Human Rights Commission, 2012). However at the time of writing, it is unclear whether the Christchurch rebuild will deliver a disability accessible city. The New Zealand building code does not mandate disability accessible design standards and the current consents process only encourages developers to adopt generally accessible standards (Human Rights Commission, 2013; Rhodda, 2013). The Human Rights Commission (2012, 2013) has acknowledged that examples of infrastructure rebuilds and repairs that do not meet accessibility standards exist and that there is private sector resistance to providing accessible facilities. Disabled people have also found that some of the new developments within the city are not disability accessible (Rhodda, 2013; Stylianou, 2012). Rebuilding a city that is not fully disability accessible is a wasted opportunity to mitigate hazard risk by avoiding conditions of vulnerability for disabled people that existed prior to the earthquakes.

2. Risk assessment and early warning

The second area of action for disaster risk reduction within the Hyogo Framework focuses upon identifying, assessing and monitoring disaster risks. National and regional risk assessment involves developing indicators of vulnerability to disaster, as well as updating and disseminating natural hazard maps to communities at risk. People-centred early warning systems for those at risk need to be timely and take into account diverse population needs (UNISDR, 2005). Aspects of this action strategy that are relevant to findings from our Christchurch research relate to knowledge of the way in which vulnerabilities change over time as well as developing emergency preparedness information that takes diverse population needs into account.

Following the February 22, 2011 earthquake, environmental conditions altered the range of factors that were creating vulnerability among disabled people. Conditions identified in our research relating to increased earthquake vulnerability include: disruption to infrastructure; inability to access support workers; responding agencies that were not set up to cater for the needs of disabled people; as well as temporary housing and public information that was not disability accessible

(Phibbs, Woodbury, Williamson & Good, 2012). The Canterbury earthquakes have created opportunities for regional emergency management teams to capitalise on increased public awareness of local hazard risks as well as motivation to prepare for an event (Hamilton, 2011). Lessons learnt following the Christchurch earthquakes suggest that increased effort is required to ensure that disaster preparedness planning, response and recovery continues to take into account the needs of disabled people (Phibbs, et al. 2012). These efforts may run against established precedents. For example, Spence, Lachlan, Burke and Seeger (2007) note that the information, and disaster preparedness needs for people with disabilities has been generally overlooked in the literature. Furthermore, disaster preparedness and emergency response systems, public warning systems and advice tend to be designed for people who are able-bodied (Sullivan & Hakkinen, 2006).

For those disabled people who did respond to the September earthquake by thinking about how to prepare themselves for future emergencies, some found that the advice provided by Civil Defence was not appropriate to their situation, because it was too general or made assumptions about people's bodies or lives that did not apply to them. Shane, who has profound hearing loss, made the following comment about Civil Defence emergency preparedness information:

...Round about November [2010] we started preparing ourselves... I found Civil Defence completely useless... because it's not designed for people with a disability (Shane, 2012).

Following the February 22, 2011 earthquake, 17 survey respondents agreed that adequate information was provided by Civil Defence. 15 respondents indicated that the information was inadequate. Twenty respondents agreed that emergency information was easy to access, however responses to a different survey question suggested that this information was not disability accessible. Twenty-six pilot survey respondents either strongly disagreed (10) or disagreed (16) that emergency information took into account the needs of disabled people. Disruption to electricity supply, resulting in an inability to watch television or charge cell phones were cited as key reasons for not being able to access emergency information. Text messaging was a key source of information for people who were deaf while vision impaired people needed to be able to access up-to-date verbal information. Response categories relating to the format and type of information that was

made available to the general public were cited as the next most common barriers to accessing emergency information.

Disabled people also found it hard to find disability accessible local information about changes to bus routes, shop closures or public meetings which would have sign language interpreters. Survey respondents were motivated to write additional comments relating to this question in the margins of the survey including: "Too many phone numbers, no emails" (Disabled Person); "Lack of information written in accessible format" (Disabled Person); "Not easy to access written material" (Disabled Person); "It is OK if you can use a computer" (Agency Representative); "Information on back of phone book for normals" (Disabled Person); "Found it hard to receive advice from someone who understands my mobility issues" (Disabled Person). Identifying this range of barriers to accessing emergency information is instructive for people involved in disaster preparedness planning and response prior to a natural hazard event.

3. Information management, education and training

A third area for action identified within the HFA is the use of knowledge, innovation and education to build a culture of safety and resilience at all levels. Encouraging individuals and communities to take action to prepare for a disaster can be achieved by developing local risk reduction plans, providing clear information to people in high risk areas and ensuring trainers are equipped to disseminate information to a range of different users. Improving the knowledge base for disaster risk reduction requires evidence based research, the use of a consistent language around disaster risk reduction, as well as exchanging information about good practice and lessons learnt from previous events. The impact of disasters can be substantially reduced if people are well informed and motivated towards a culture of disaster prevention and resilience. Creating a culture of disaster risk reduction involves targeting school curricula, fostering community development initiatives as well as embedding awareness of disaster risk reduction within government and non-government agencies. It is important to consider that vulnerable communities are entitled to expect equitable access to appropriate disaster preparedness training and educational opportunities (UNISDR, 2005). Findings from our Christchurch research suggested that for the majority of disabled people personal emergency preparedness planning was inadequate.

Preparedness can be an effective indicator of post-disaster resilience (Canterbury Earthquake Recovery Authority, 2014; Paton and Johnston, 2001). Quantitative data from our May 2012 survey supports international research findings that has identified a lack of disaster preparedness among disabled people (Eisenman, Zhou, Ong, Asch & Glik 2009; Rooney & White, 2007). Five of the 25 disabled people that filled out the survey indicated that they had adequate emergency equipment in place prior to the 7.1 earthquake on September 4, 2010. Three out of 25 people indicated that they had developed a workable emergency plan. These results are similar data from a 2008 survey of Canterbury residents which identified that only 13 per cent of the general population had all the items needed for basic preparation² (Canterbury Earthquake Recovery Authority, 2014). The people that we interviewed nonetheless described taking action to ensure that they were better prepared following the September earthquake. The following interview extract gives the example of how Grace, who is vision impaired, reflects on her ability to fend for herself now compared to September, 2010:

[After September] I only had a little round barbeque thing and I had a terrible accident with it because I tried to use it to cook, because didn't have anything to cook with and I put ...the charcoal in it and lit it and then I was tipping the charcoal bag over it to put more on, it caught alight and the whole bag's all going up in flames. And my next door neighbours came running over thinking I've got a fire over here, so they put that fire out and they said "right well, just give us whatever you want to cook and we'll do it on our barbeque and we'll heat water for you and stuff." You know, because I wouldn't go and ask them even though they're next door ...I've always been terribly independent... I've got a big new gas one [BBQ] out there now... I know how to use it so I can use it if I have to... I'm gonna be self sufficient so that's fine.

Acquiring and having the confidence to use a new gas barbeque was associated with being able to maintain independence and to be self-sufficient should another earthquake occur. After the non-fatal September 2010, earthquake survey respondents reported changes in individual preparedness as well. At the time of filling out the survey 32 participants indicated that they felt more prepared for an earthquake than they were prior to September 2010. The following bar chart provides

² The Canterbury Earthquake Recovery Authority (2014) defined basic preparation as a three day supply of food and water and a household emergency plan.

an overview of the range and type of actions taken to prepare for an emergency following the September earthquake among disabled people who were surveyed in May 2012.

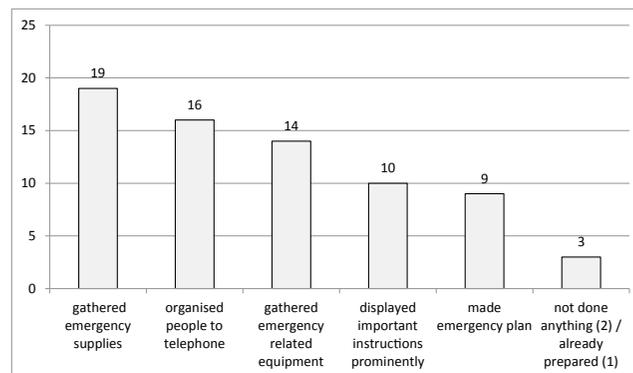


Figure 1. Actions taken to ensure emergency preparedness following the 4 September 2010 earthquake (n = 25)

Most disabled people surveyed (92%) indicated that they had either: put together emergency supplies or equipment (22); organised people to telephone (16); and/or put in place an emergency plan (9). Twelve people had taken one or two actions and 10 people had taken 3-5 actions to ensure preparedness. Twenty two (88%) of the 25 disabled people surveyed in 2012 felt that they were somewhat prepared (11) or well prepared (11) for an earthquake. Seven of the disabled people who had taken four or more actions to ensure emergency preparedness indicated that they felt well prepared for an earthquake. Additional comments written by disabled people in the survey margins, which indicated that they were actively involved in preparing and responding to a disaster, included: "prepared in February but not enough water" and "we had to restock due to [supplies] being used". These figures for post-earthquake preparedness among disabled people compared favourably with 2012 figures for emergency preparedness in Canterbury, from Statistics New Zealand (2013) which identified that 40 per cent of all households met the basic emergency preparation requirements.

Engaging in activities to ensure emergency preparedness would foster resilience (Paton & Johnston, 2001) as well as increase the likelihood of being able to shelter at home following an emergency. Taking action to prepare for an emergency indicates that the majority of participants expected that they would be able to look after themselves in the wake of a natural hazard event. Severe disruption to infrastructure, including roads, shopping facilities and public transport, meant that most disabled people needed help to replenish their

emergency supplies between earthquakes. Disabled people who answered the May 2012 survey reported that cost was the main barrier to accessing emergency supplies. Disabled people are more likely to experience poverty and disadvantage (World Health Organisation, 2003) and this is identified as a key underlying risk factor for exposure to hazard events and for the erosion of resilience in the post disaster period (Mileti & Gailus, 2005).

4. Reduce the underlying risk factors

A fourth area for action within the HFA (UNISDR, 2005) focuses upon reducing the underlying risk factors in three key areas: environmental and natural resource management; social and economic development; and land use planning. Sustainable management of ecosystems is needed, through integrated resource management programmes that are cognisant of disaster risk reduction as well as the impacts of climate change. Incorporating disaster risk assessment into urban planning as well as the design and placement of infrastructure will reduce exposure to future disasters. Hazard mitigation involves strengthening public facilities and infrastructure including schools, hospitals, communication and transport lifelines - so that they are able to continue operating following a disaster. In order for communities to be resilient, a comprehensive social security safety net is needed that protects vulnerable people from poverty and is able to respond appropriately to populations affected by a disaster. Spreading risk through insurance and reinsurance against natural hazards and developing public private partnerships to foster a culture of disaster prevention are also included in this area for action (UNISDR, 2005).

For effective implementation of action strategies two and three within the HFA, an understanding of social, economic and environmental vulnerabilities to disaster is also required (UNISDR 2005; 2012). In March 2011 the New Zealand Government submitted its first report on implementing The United Nations Convention on the Rights of Persons with Disabilities. Ongoing challenges identified in that report include continuing disadvantage and poor outcomes in health, education and employment. Disabled people also experience discrimination, physical and environmental barriers, as well as difficulties accessing services (Office for Disability Issues, 2011b). Health status and socio-economic status are important determinants of earthquake vulnerability but little is known about how these factors increase exposure to hazards or impact

upon recovery needs (Chou, Huang, Lee, Tsai, & Chen *et al.*, 2004). Disabled people are more likely to be poor and to live in low income neighbourhoods, both of which are risk factors for earthquake vulnerability and the erosion of resilience during the disaster recovery phase (Paton, 2000). Financial hardship increases stress, erodes resilience and prolongs dependency. Many disabled people that we interviewed talked about extra expenses incurred that were not recognised or reimbursed, such as replacing medicines or personal items that were lost in the earthquakes and increasing transport costs. Fear of using public transport, in case another major aftershock left them stranded, and closure of local services meant that many disabled people used taxis to travel to appointments and to the supermarket. Rāngimarie, who has cerebral palsy and uses a power chair, stated that having to travel longer distances to access services meant that:

...the cost of transport became horrendous... I had to close my insurance because it got too expensive. So I'm putting money aside for that. I used to have insurance, but now it's too ... expensive (Rāngimarie, May, 2012)

In a situation where several large earthquakes occurred over the course of a year the inability to afford personal insurance potentially increased Rāngimarie's financial exposure to risk. Rāngimarie's home was destroyed in the February 22 earthquake and she was forced to relocate to temporary accommodation in another part of the city. In May 2012 Rāngimarie reported that finding a disability accessible home was still proving difficult:

I'm still waiting for an accessible house, but I'll be waiting for a while... I can't afford market rates... so social housing is my only option.

Rāngimarie's experiences in relation to the Christchurch earthquakes are consistent with international literature which suggests that people who are sick, moderately physically disabled or otherwise vulnerable and/or who live in poverty are more likely to be impacted by a disaster (Chou *et al.* 2004; Klinenberg, 2002). They are also less likely to have access to the social and economic resources necessary for recovery (Klinenberg, 2002). An epidemiological study by Chou *et al.* (2004), for example, identified that people with moderate disabilities, those with mental disorders or who had been hospitalised in the week prior to the 1999 Taiwan earthquake, were most at risk of injury. The degree of vulnerability increased with decreasing monthly wage. Disabled

people are also more likely to have high health care needs, to live alone (Office for Disability Issues, 2011a; Spence, Lachlan, Burke, & Seeger 2007), to be unable to respond quickly during an emergency (Chou *et al.* 2004) and to be reluctant to evacuate, due to concerns that emergency shelters will not be able to meet their needs (Rooney & White, 2007). In our research 32 of the survey respondents also reported that they had reservations about evacuating to a welfare centre. Key concerns included lack of disability accessible buildings, facilities and services as well as other people's attitudes towards disabled people.

5. Strengthen disaster preparedness and response

The fifth and final area for action, strengthening disaster preparedness for effective response at all levels, incorporates the need for coordinated action so that authorities, individuals and communities are well prepared and ready to act. Included in this aim is that individuals, communities and agencies are equipped with knowledge and capacities for effective disaster management. Fostering a holistic approach to disaster risk reduction requires consolidating institutional capacities for local emergency management, evaluation, policy, practice and readiness - both within and between the emergency management sector, local communities, relevant agencies and institutions. Adequate funding, ongoing dialogue as well as regular disaster preparedness exercises are needed to develop capacity among agencies responsible for risk reduction readiness and response (UNISDR, 2005). Within this action strategy the requirement to review disaster preparedness policies and plans with a particular focus on the most vulnerable groups is particularly relevant to the current research.

In 2011 New Zealand submitted an interim report outlining national progress on implementing the HFA between the years 2009-2011 (Hamilton, 2011). The National Civil Defence Emergency Strategy aimed to develop a "resilient New Zealand" with communities understanding, managing and responding to their hazards (Hamilton, 2011. P. 6). Since the Christchurch earthquakes, progress has been made in documenting (Office for Disability Issues, 2012b) and in incorporating lessons learnt into New Zealand's national emergency management frameworks (Ministry of Civil Defence and Emergency Management, 2013). The Ministry of Civil Defence and Emergency Management, for example, now has a disability accessible website, and

Civil Defence has developed a wider range of disability accessible preparedness information (Ministry of Civil Defence and Emergency Management, 2014).

The challenge is to improve risk management and disaster mitigation processes and to maintain capacities for emergency response and recovery for vulnerable groups across all sectors. For disabled people, socio-economic factors are significant drivers of vulnerability, suggesting that an all of government approach to poverty reduction strategies is needed in order to mitigate disaster risk. Across the emergency management sector, human rights and equal opportunities legislation relating to people with disabilities still needs to be taken into account for developing policies and delivering programmes related to emergency preparedness and response. In order for the disabled community to be well prepared and ready to act, further work is needed to develop participatory and collaborative approaches that engage stakeholders within the disability sector in strategies for disaster risk reduction, as well as in emergency management and planning. This requires an ongoing effort to incorporate inclusive disaster mitigation, preparedness and response initiatives across natural, built, social and economic environments that take into account the needs of disabled people.

Conclusion and Recommendations

The HFA for Disaster Risk Reduction includes attention to vulnerable communities and groups. It is timely to consider how disability issues may be relevant to the action strategies and priorities within the HFA, given that this international framework was under review at the time of writing, and due for renewal in 2015. Research into the experiences of disabled people during the Christchurch earthquakes provides information related to disability inclusive emergency preparedness planning and response that has wider relevance to international organisations as well as government agencies both within and beyond New Zealand. Local and international research has identified that disabled people are more likely to experience poverty and disadvantage. Deprivation is a key underlying risk factor for exposure to hazard events and for the erosion of resilience in the post disaster period. Community recovery following the Canterbury earthquakes provides an opportunity to improve pre-disaster conditions, through integrating a disability accessible built environment into the reconstruction of the city. Individuals, communities and responding agencies could learn from the experiences

of disabled people, in order to develop emergency preparation and response initiatives that enhance opportunities for autonomy among vulnerable groups.

This research has identified that additional disaster risk reduction strategies are needed, to enhance opportunities for disabled people to maintain their independence in an emergency situation. Recommendations arising from the current research include:

1. Work with stakeholders within the disability community to identify ways to increase disaster preparedness among disabled people.
2. Review emergency management disaster preparedness and response policies, plans, infrastructure, facilities services and information resources with a particular focus on the needs of disabled people.
3. Address underlying risk factors through implementing poverty reduction strategies and improving accessibility to the build environment for disabled people.

Findings from this research have wider relevance to other groups that are also identified as vulnerable to earthquake hazards, such as the elderly and children. Further research is needed on how disability and socio-economic status increase exposure to hazards and impact upon recovery needs. Additional research is also needed on how disabled people prepare for and respond to disasters, as well as how they are included in recovery related initiatives.

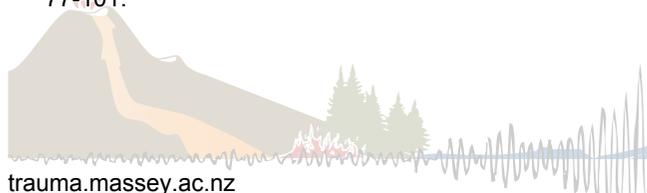
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Environment as trickster: Epistemology and materiality in disaster mitigation

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Abstract

Disasters are processes that take form and magnitude at the nexus of human practice and the agency of the material world. Not all human practices create conditions that enhance the disruptive and destructive capacities of geophysical phenomena, but how are we to distinguish which actions mitigate or engender disasters? Most importantly, why do people, institutions, and governments sometimes insist in engaging in human-environment relations that lead to the latter? In this essay, I consider the epistemological dimensions of practice, that is, the ways actions that engender disasters are legitimized as necessary in the context of neoliberal and modernizing approaches to development. I make the argument that these ways of conceptualizing and justifying disaster-engendering actions are rooted in modernist ways of thinking about and engaging the world's materiality. Environments come to be seen as objects at the disposal and service of humanity, without much consideration to the ways material agency manifests in unexpected ways in the moment of practice. Disaster mitigation, I suggest, requires a reconsideration of the ways we think, speak about, and relate to the material world in which the modern epistemological divide between objects and subjects, nature and culture, can be questioned and undone.

Keywords: epistemology, modernity, disasters, material agency, development

Tricksters, culture, and materiality

A few years ago, I drove from my home in Carbondale, Illinois, to New Orleans, Louisiana, where I have conducted ethnographic research on post-disaster reconstruction since 2006. As I drove through the Mississippi Delta, I was listening to interviews on the radio, with Pueblo people in the US South-West who opposed the use of genetically modified seeds for agricultural purposes. Over the course of one of the interviews, an activist explained his reason for opposing GMO crops, saying, "maize is a trickster." What could he possibly mean by such a statement and what does it have to do with understanding why disasters occur and what we can do to mitigate them?

The trickster in Native American lore is a figure that overcomes challenges through the use of its intellectual abilities and defeats its adversaries by outsmarting them (Tedlock, 1996). Maize, on the other hand, is a crop that is the product of thousands of years of human practices that altered the materiality of wild grasses, with the effect of producing one of the world's principal staple foods (Coe and Koontz, 2013, MacNeish & Eubanks, 2000). Maize, then, is a crop that straddles the line between nature and culture, object and subject. By referring to maize as a trickster, the activist attributed mixtures of materiality and culture that comprise the world we live in with the capacity to outsmart humanity, or at least with the potential to behave in unpredictable ways in response to human actions. In this essay, I reflect on how the trickster figure can help us understand how disasters are engendered and why, despite growing academic knowledge about the social construction of disaster vulnerability, disasters continue to manifest in a variety of ways across the globe.

Agency, human practice, and materiality in disaster vulnerability

The idea that maize is a trickster resonates with the work of a number of anthropologists and sociologists whose research has focused either on human-environment relations or the ethnographic documentation of scientific practice. Scholars like anthropologist Joseph Masco (2006), for example, have shown that nuclear weapons, like maize, can be tricksters as well. The former are

combinations of human intentions, politics, desires, and material agency, which can behave in unexpected ways. When atomic bombs were first devised in the mid-twentieth century, physicists and military leaders believed them to be a superior form of destructive and energy-producing power, whose negative side-effects were negligible. Open air testing of these weapons was common, and US troops were often required to march through explosions' ground zeroes as proof of their relative safety. As testing of these weapons continued, scientists began to notice a key unexpected, unpredictable, and hazardous side effect: radioactive fallout. Atomic weapons had behaved in a way that was out of the full control or predictive capacities of their makers. The recognition of radio-active fallout and its side effects, in turn, had the effect of giving anti-nuclear movements their reason for being, becoming a driver for social change (Masco, 2006).

Masco's work arrives at very similar conclusions as the sociological analyses of Andrew Pickering (1995, 2008), who asserts that the work of scientists (and humans in general) is open ended, meaning that scientists never fully know what the effects of technologies will be on the material world. Furthermore, the way material agency manifests in the moment of practice often has a feedback effect on people's values, as they interpret and attempt to accommodate the ways in which materiality (e.g. environments, atomic elements) respond to their techno-scientific actions.

The case of flood risk in South-Eastern Louisiana is a good example of how such insights from the anthropology and sociology of science inform disaster research. Three hundred years of levee construction practices meant to channel the Mississippi river and protect farmland and property from flooding have led to conditions not originally desired or envisioned by the region's settlers. Levee construction has limited the ability of the river to deposit sediments and build up its delta, leading to shoreline erosion and salt-water intrusion, while the city of New Orleans has been placed increasingly close to the Gulf of Mexico, exposing it to hurricanes and tropical storms at the peak of their destructive capacity (Camillo, 2012, Camillo & Percy, 2004, Pickering, 2008). Levying has also led to sedimentation on the Mississippi River's bed, raising the river level above the city and increasing the risk of catastrophic flooding (Pickering, 2008). Finally, human made navigation canals meant to facilitate the movement of cargo ships from the Gulf of Mexico to New Orleans or its outlying areas have altered the salinity

levels of wetlands, further enhancing coastal erosion. This has led to the loss of land and communities as the shoreline advances. The lower Mississippi River Delta, one could say, is the quintessential trickster, reacting to human practice in unexpected ways that have put the long-term sustainability of three centuries of colonial, modernizing, and capitalist development in question.

These observations reinforce what a number of social scientists focusing on disaster research have been telling us for nearly forty-five years now. Disasters are by no means *natural* events, but instead are processes that manifest at the intersection of human practice and the world's materiality (Bankoff & Hilhorst, 1994, Blaikie et al., 1994, Hoffman and Oliver-Smith, 1999, Oliver-Smith, 2002). Not all human-environment relationships exacerbate the socially disruptive capacities of geophysical phenomena, but how do we discern which practices transform geophysical phenomena into disaster-triggering agents and which do not? Also, why do people and policy makers in certain contexts hesitate or resist adopting the latter? In this brief communication, I want to make the point that these questions require us to consider the cultural and epistemic context within which practice takes place, that is: how do ideas about engaging the world's materiality become possible, to whom, and what historically, socially, and politically situated desires and intentions are realized in practice?

A brief cultural history of the present

When thinking about the above-stated question, I find it relevant to recall Elizabeth Povinelli's (1995, 2002) work, which documents the ways people who are often referred to as *non-modern* speak about and relate to their environment. For many Australian Aboriginal people, for example, the material world is not a landscape full of objects or resources, items supposedly devoid of meaning and sentience. On the contrary, it is a landscape populated by entities that defy the dichotomizing claims of epistemological modernity which attempt to parcel out the world into objects, subjects, nature and culture (Latour, 1993, 1999; Mitchell, 2002). In the Australian instance, inanimate objects and non-humans like rocks and wallabies - and I would also argue, tricksters, are thought to possess sentience and emotions and are connected to the *dreaming*, a mythological force that is more powerful than people and can punish them by denying them access to life-supporting water and food when offended (Povinelli, 1994). In aboriginal

epistemology people must maintain a certain level of reverence and observe ritual taboos when relating to objects and animals, because not doing so may incur the wrath of the dreaming. In this epistemic space, viewing the environment as a collection of natural resources to be exploited for the sake of capitalist development is simply unimaginable.

Aboriginal ways of thinking about, and relating to, the material world are at odds with the way modernists think about human-environment relationships and evaluate the merits of different societies. Because foraging societies make what for Eurocentric observers seem to be minimal modifications to their environments, modernist thinkers like Karl Marx have considered them to be outside of history (Foucault, 1970, Povinelli, 1995). For Marx, history was a telos (or purpose) of development, a linear process in time that led to a known outcome of socio-technological organization (Chakrabarty 2000, Fabian, 1983, Foucault, 1970); namely, one comparable to North Western European states. This development process was driven by labor, which was also thought to be the action through which people modified and appropriated their environment. Hence, the colonization of regions like Australia was often legitimized on the claim that aboriginal and indigenous residents could not claim property rights over the landscape they inhabited as they had not significantly altered it through labor; whereas European colonizers intended to do just that. Labor became the engine of a development process that was allegedly unstoppable, universal, and whose desirability was self-evident. For Dipesh Chakrabarty (2000), Johannes Fabian (1983) and Michel Foucault (1970), Marx's unilineal view of history and development was not an objective appraisal of human history and cultural diversity. It was an ethnocentric perspective that assumed the history of North Western Europe was the history of the world.

The rise of epistemological modernity - which is the claim to be able to objectively see the world, unencumbered by cultural presuppositions, is often attributed to the late 17th century. Historians of science (Shapin & Shaffer, 1995; and Latour, 1993) often associate it with the establishment of a means of ascertaining matters of fact. The *matter of fact* was something that was created in the laboratory space, a space that was supposed to be nowhere in particular and everywhere at once, making the matter of fact something that transcended the particularities of localized cultures. Epistemological modernity, as it was championed by Robert Boyle, would

allow people to see the material world for what it was - unrestricted by the type of cultural lenses that would lead one to imagine maize as a trickster or a waterhole as part of the dreaming. The problem with epistemological modernity, as Donna Haraway (1997) and Bruno Latour (1993) would argue much later, is that it never allowed its wielders to actually see the world as it really was, but only to make claims to a superior knowledge that transcended the ecological particularities of localities and cultures. Other empirical forms of knowledge were dismissed as culture, belief, and superstition. North Western Europeans' own combinations of cultural values and materiality became promoted as universal truth.

The invention of epistemological modernity was intimately intertwined with the development of liberal economics and European colonial expansion. Liberal economics engendered a proliferation of *facts*, and its advocates proposed that the meaning-laden relationships between people and the material world of North Western Europe (i.e. private property, capital), were "principles true in every country" (Mitchell, 2002, p.54). The process of colonization of the Americas and the African continent, in turn, created a condition of hierarchized cultural difference in which colonizers could look upon the adaptations of colonized populations to local environments as irrational, and could therefore impose their own decontextualized practices of production and wealth extraction on new environments (Ferguson, 1994, 1999). The process of colonization initiated a transformation to human-environment relationships that brought about the global arrangements of resource extraction, labor exploitation, and wealth distribution we see today.

The high stakes of modernity and neoliberalism

In the post-colonial era, the hierarchizations that placed Europe at the top of the developmental visions of history shaped the imaginations of emerging national elites across the globe. In Latin America, for example, the period of the late 19th Century Liberal Reforms was distinguished by attempts to transform localized human ecologies into economies geared toward export production for a global capitalist market (Dore, 2006). This policy movement resulted in the dispossession of subsistence farmers, the enhancement of social inequities, and a view of the environment as an object/resource for capitalist production. The dispossession of subsistence farmers has been linked, time and time

again, to the creation of socially produced vulnerability that shapes disasters (Jansen, 1998, Stonich, 1993, Paolisso et al., 1999). Today, Latin America is still struggling with its colonial legacy. In the aftermath of the Cold War, indigenous environmental activists have become a primary target of right wing paramilitary groups that pave the way for mining, logging, and drug trafficking; practices that, among other things, enhance disaster vulnerability in places like Guatemala, Honduras and Colombia (Global Witness, 2014).

At the turn of the 21st century, we are not only experiencing the material and social effects of the assemblages of modernist epistemology, developmentalism, and colonialism I have called attention to. We are also seeing the mutation of economic liberalism into neoliberalism - which is a policy and cultural movement that upholds the idea that market, environmental, and labor deregulation will lead to optimal social ends (di Leonardo, 2008, Povinelli, 2010). South Eastern Louisiana is a case in point. In recent years, a class action lawsuit attempting to hold oil companies liable for coastal erosion caused by navigation canals used to move oil and natural gas throughout the region was opposed by Governor Bobby Jindal. He insisted that energy companies are an indispensable partner in the region's development and that holding them accountable for the environmental degradation caused by their production practices is detrimental to the state's economic health (O'Donnoghue, 2014). This prioritization of capital production as an indicator of social wellbeing demonstrates how the engendering of disasters is a process that ties together epistemological, material, and political dimensions of human existence in the moment of practice.

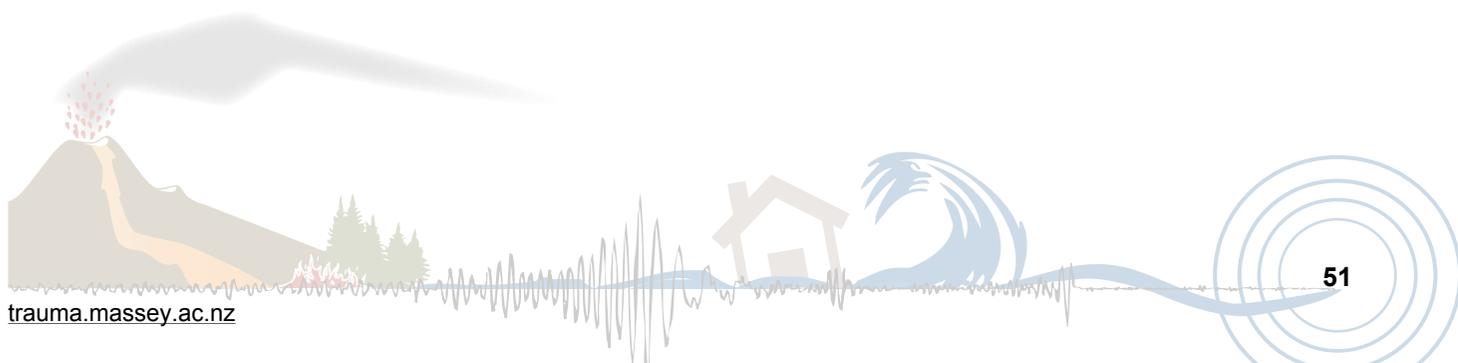
Mitigating disasters, that is, closing the multiple gaps between practice, policy, and academic knowledge involves a profound questioning of some tenets of societal development that seem to hold an unquestioned status as fact and common sense. Narrowing these gaps requires a rethinking of the relationship between the way we think about and relate to other people and things. Environments must not be seen as objects and resources to exploit and sacrifice in the name of development. Instead, they can be seen as entities straddling the divide between object and subject, or as tricksters to be treated with respect and deference - all the while maintaining an observant eye for the ways they react to our actions and a concern with

maintaining a memory of what our previous practices have engendered.

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