Assessing research priorities and practices following the 2016 Kaikoura Earthquake

Tracy Hatton[1]
Robert Kipp[1]
Charlotte Brown[1]
Erica Seville[1]

[1] Resilient Organisations Ltd, Canterbury, New Zealand

Author correspondence:
Tracy Hatton
Resilient Organisations Ltd
219 Wyndale Road
RD1 Sheffield 7580
Canterbury
New Zealand
Email: tracy.hatton@resorgs.org.nz

URL: http://trauma.massey.ac.nz/issues/2017-2/AJDTS_21_2_Hatton.pdf

Abstract

A disaster event is an opportunity for researchers to inform recovery efforts and to learn more about disaster impacts, response and recovery. It is also an important time to reflect on how well the research community is working together to inform policy and practice to reduce the impacts of future disaster events. Following the 2016 Kaikoura earthquake, social science researchers and disaster management practitioners gathered from across New Zealand to discuss these issues. Participants identified immediate needs in collecting perishable data related to understanding earthquake impacts, recovery best practice, and collaboration and engagement practices. They also identified the need for the social science community to improve their effectiveness in a post-disaster environment, to maximise impact and minimise community disruption. A set of principles for best practice post-disaster research have been proposed.

Keywords: *Post disaster research; research practice; collaborative research*

Following any disaster event there is a desire by the social science research community to both inform recovery efforts and learn from the event. However, social science researchers may also need to keep their distance from communities and recovery authorities who are under immense pressure to deal with immediate recovery needs. There is also a focusing effect of disasters, where there may be a greater likelihood of collaboration between scientists and policy makers, but also a chance that research may be duplicated due to escalating research efforts (Beaven, Wilson, Johnston, Johnston, & Smith, 2016). When New Zealand was impacted by the 2016 Kaikoura earthquake, a group of New Zealand-based researchers gathered professionals interested in post-disaster social science research, for a workshop to ascertain immediate and ongoing research needs while identifying how research practices could contribute to earthquake recovery. They held the Kaikoura Earthquake Social Science Research Workshop on the 24th of February 2017 in Wellington (NZ). The precise aims of the workshop were to:

1) Bring researchers together to identify potential collaboration opportunities
2) Prioritise and focus immediate and on-going research efforts
3) Reflect on the effectiveness of social science research efforts in informing disaster practice

The current research update begins by describing the Kaikoura earthquake context and the workshop process. Next, research priorities are discussed, followed by a set of principles developed for improving post-disaster research practice.

The Kaikoura Earthquake

The Kaikoura Earthquake is the name given to a M7.8 earthquake that occurred in New Zealand on November 14, 2016. An initial rupture in Culverden triggered a domino effect of sequential of fault ruptures stretching 150km north east of the epicentre (Balfour, 2016).

As illustrated by Figure 1 the effects of this event were felt across a wide area of the upper South and lower North Island of New Zealand. Two people in North Canterbury died as a result and hundreds were injured, with extensive damage to many residential and commercial buildings. Road and rail closures occurred throughout North Canterbury due to a combination of landslips and uplift. These closures cut-off road and rail into Kaikoura, a small coastal, tourist town on the east coast of the South Island, *Te Waipounamu*. They also stranded several hundreds of tourists and locals who were eventually evacuated by sea and air (Young, 2016). Small communities across rural North Canterbury, most

Figure 1. Shaking intensity reported by the public using GeoNet Felt Reports following the Kaikoura earthquake. Reproduced from Felt Reports by GeoNet, 2016, Wellington, New Zealand. Copyright 2016 by the Earthquake Commission and GNS Science. Reproduced with permission.

notably in Waiau and Cheviot, experienced damage to community and residential structures and disruptions to water and electricity supplies.

An estimated 4.1 metre tsunami wave was generated in Little Pigeon Bay on Banks Peninsula immediately south of Christchurch, destroying an unoccupied holiday home (Little, 2016). Although the damage caused by this tsunami was relatively contained, inconsistent evacuation orders issued by local Civil Defence and Emergency Management offices caused confusion among the public (Perry, 2016).

In the North Island, structures in the Wellington city centre and Lower Hutt commercial centre were eventually condemned and then demolished (Cook, 2016). The total of direct costs from the Kaikoura Earthquake event have been estimated at 2-3 billion New Zealand dollars (The Treasury, 2016).

Following the 2010 and 2011 Canterbury earthquakes, the New Zealand research community became familiar with the importance of triaging science priorities, in a similar way to triaging casualties by urgency. In terms of research needs, the geotechnical research community was a notable *first responder* following the Kaikoura events in 2016. Within two days of the Kaikoura earthquake a group of collaborators[1] from within this community had created a Google Drive to collate and share data, reconnaissance reports, and information sheets as they eventuated. Other researchers had begun contributing to an event-specific, geospatial web portal being hosted by the Earthquake Commission (EQC) and Tonkin & Taylor. They had also established the Kaikoura Earthquake Virtual Clearinghouse website, for publishing information relevant to the public and to international researchers (EERI, 2016). This effort met many immediate information needs for decision makers and practitioners attempting to understand the dynamic geophysical environment and its impact on local response and recovery planning. These platforms also allowed scientists to collect large amounts of perishable data that would inform future research efforts.

Lessons from the Canterbury earthquakes had informed the decision among researchers within the four major funding structures for hazards research in New Zealand, GNS science, the New Zealand Centre of Research Excellence for Earthquake Resilience (QuakeCoRE), the Resilience to Nature's Challenge National Science Challenge, and the Natural Hazards Research Platform, to proactively coordinate research in the natural and social sciences. The focus of these early coordination efforts was to:

– minimise the number of transactions with researchers
– minimise requests for information from affected communities and responding agencies
– identify perishable data collection needs, and to
– reduce research duplication.

The Workshop Process

Organising body

The Kaikoura Earthquake Social Science Workshop was enabled by highly networked researchers within the four main natural hazards research funding structures. Funding for organisation, venue, travel support and

1 The collaborators included researchers and practitioners from GNS Science (a New Zealand Crown Research Institute), New Zealand universities working with QuakeCoRE, and the New Zealand Society for Earthquake Engineering (NZSEE) with support from the Earthquake Commission (EQC).

some logistical costs was provided by Quake CoRE[2]. In-kind funding for organisers' time was provided by the Natural Hazards Research Platform[3] and the Resilience to Nature's Challenges[4] programme.

Recruitment of Attendees

Invitations to the workshop were sent to active New Zealand social science researchers with a known interest in disaster recovery. The workshop was also advertised on New Zealand research network websites. Invited individuals were encouraged to forward the workshop details to their networks, to broaden coverage. Workshop organisers also used their personal networks to involve response and recovery practitioners throughout the impacted area, to encourage representation of potential research end-users and practice-oriented stakeholders.

There was a total of 50 workshop participants and two workshop organiser/facilitators. Of those, 40 attendees considered themselves researchers with an interest in Kaikoura's earthquake response or recovery. The 10 attendees that did not fit in this category included representatives from local or regional councils (n = 4), a Government agency (n = 1), civil defence and emergency management personnel (n = 2), iwi[5] representative (n = 1), agricultural industry representative (n = 1), and two researchers with a general interest in post-disaster or social science research but no specific research interest in Kaikoura (n = 2). The 40 attendees that were interested in conducting social science research in Kaikoura were from academia, crown research institutes, government agencies, and private industry.

To facilitate additional participation, an online survey was sent to people interested in Kaikoura-earthquake related social science through the same channels used to invite workshop participants. The survey had 40 responses. Of those, 13 people did not attend the workshop, while 27 both attended the workshop and answered the survey.

Finally, all workshop participants were asked to answer this question via email: What do you think the number one social science research priority is for the Kaikoura earthquakes?

The purpose of this preparatory work was to encourage participants to reflect on research needs and priorities from their own perspectives, before developing a more collaborative set of research priorities.

2 www.quakecore.nz/
3 www.naturalhazards.org.nz/
4 resiliencechallenge.nz/
5 Indigenous Māori population of New Zealand.

Workshop Format

The workshop was divided into five segments: 1) icebreaker and workshop introduction; 2) panel discussions; 3) mixed round-table discussions; 4) interest-aligned round-table discussions; and 5) closing dialogue. This structure was designed to maximise participant interaction, stimulate cross-pollination of ideas, and to expose participants to relevant past and ongoing research. First, participants shared their research priorities as part of a rapid-fire *speed-dating* style icebreaker, adapted from events where single people talk to a series of potential partners in a very short timeframe. This phase was followed by an overview of key research programmes and funders operating in this area, along with the key aims for the workshop as a whole.

The majority of the full-day workshop consisted of two panel discussions and two round-table discussions. The first panel discussion focused on current issues, challenges, and knowledge gaps relating to impacts and recovery from the Kaikoura earthquake. The invited panellists included representatives from: the Kaikoura *Runanga*, the tribal council for the *hapu* (sub-tribe) of Ngāti Kuri; the Wellington Region Emergency Management Agency; Lincoln University; and the Ministry of Primary Industries. The second panel discussion focused on the question: What have we learned from past recovery processes that is relevant to this event? Panellists addressing this question represented Beef and Lamb New Zealand, Christchurch City Council, Wellington City Council, and two Crown Research Institutes. Each panellist brought insights from previous disaster recovery processes in which they had participated as either a researcher or practitioner.

Following each panel discussion, workshop participants separated into seven *round-table* groups, with seating pre-assigned by organisers to ensure a mix of researchers and research users. Each table was asked to discuss their reflections on the panel discussion. After 20 minutes, participants were asked to move to the next set of pre-assigned tables, to commence a further 20-minute discussion on the same topic but with a different group of attendees. This structure allowed participants to engage with other participants with similar research interests and to gain exposure to a variety of research topics. The round-table sessions and the mixing of groups appeared to work well, by promoting

rich and diverse discussion among participants. This was a highlight of the workshop process.

All panellists participated in the round-table discussions and, where relevant, their responses were recorded in the results. The panel discussions were intended to frame round-table discussions including a wider range of perspectives about past and present disaster research. Though the panel discussions were not designed to set a research agenda for Kaikoura Earthquake research, the roundtable discussions did reference points from the panel discussions. It is therefore logical to assume that panellists influenced the direction of the discussions, to a limited extent.

The workshop was concluded with a whole of the room discussion, facilitated by organisers and focusing on the key messages and actions to be taken away. This phase aimed to draw together the many different conversations that had occurred throughout the day, and enable people to reflect on their learnings, observations and experience throughout the workshop. With such a large group, at the end of a long day, this session was not as lively as the round-table sessions had been. However, it was still an important part of the workshop, one that effectively brought the group together and summarised key discussions.

Workshop Findings

Research priorities

During the workshop, participants were asked to write down their answer to the preparatory question, "What do you think the number one social science research priority is for the Kaikoura Earthquakes?" Their answers were collected at the end of the workshop.

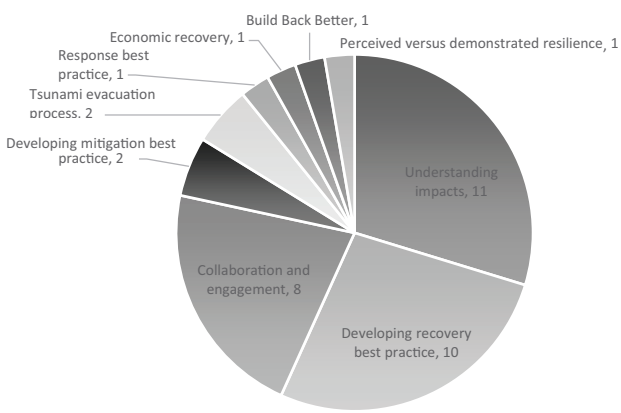

Figure 2. Priority research areas by number of participants identifying research priority

The majority of the research priorities identified by workshop participants fell under three themes, as shown in Figure 2. These themes primarily relate to advancing our understanding of earthquake events, rather than supporting real-time recovery.

The prevalent theme, understanding impacts, included work to describe and understand the social impacts of the earthquake, tsunami, and landslides. The second most common theme included all interests in elements of recovery best practice. The third most common theme covered work on the collaboration and engagement within and between communities, recovery agencies, and experts to better support recovery and future preparedness. Table 1 provides examples of participants' responses, categorised under these three main research themes.

Post-disaster researcher practices

Social science research best practice in post-disaster environments has been covered in depth, in many forums, including by Bevan et al. (2016), Collogan et al. (2004), Gill et al. (2007), and North, Pfefferbaum and Tucker (2002). This body of literature suggests that it is important for best practice to be reinforced through conversation and conscious reflection and engagement. We have identified two main themes from the workshop, relating to practicing research in a post-disaster environment: maximising research impact, and minimising disruption to affected communities. We have reframed these themes into principles for post-disaster social science research that can add to pre-existing literature informing research practice following the Kaikoura Earthquakes, future disaster events in New Zealand, and internationally.

Conclusions

The Kaikoura Earthquake Social Science Research Workshop workshop aimed to: 1) bring researchers together to identify potential collaboration opportunities; 2) prioritise and focus immediate and on-going research efforts; and 3) to reflect on the effectiveness of social science research efforts in informing disaster practice. The icebreaker, roundtables, and group discussions were designed to facilitate researcher connections across a range of institutions and disciplinary focus areas. It can therefore be assumed that the workshop achieved the first objective. However, no information was collected to determine whether the workshop stimulated ongoing collaboration.

Table 1.
Examples of Research Priorities Reported by Workshop Attendees

Theme	Respondents' research interests
Understanding impacts	Social and economic impacts of naming a disaster after a place
	The economic cost of the Kaikoura earthquake in indirectly affected communities.
	The effect on property and rent prices, and implications on urban planning?
	Business disruption in Wellington and what this might mean for a large-scale Wellington event
	The flow on impacts and distribution of these across different sectors of society or business community (e.g., freight transport impacts)
	Spatial behaviour following physical disruption
	The effect of the earthquake on livelihoods and how industries are coping
	Mental health impacts
Developing recovery best practice	Measuring the effectiveness of recovery to inform current practice and future events
	Creating and empowering locally led recovery initiatives
	The effectiveness and efficiency of communication between business, local authorities and government during the recovery
	The contrasting imperatives of centralised and decentralised recovery governance
	Comparison of the different recovery structures developed post-Kaikoura to the Canterbury model
	Developing policies that will get things fixed quickly
	The link between built environment recovery and social recovery
Collaboration and engagement	Shared community/agency planning for future disasters across the '4 Rs'
	Building on experiences of recent events and existing social capital to mitigate and increase preparedness and resilience for future
	Bringing expertise in alignment with community/organisation/business/cultural needs in Kaikoura to support understanding of resilience, what it means, how to achieve it so that it makes sense to Kaikoura people
	Bespoke needs assessment in each community or industry – understanding their priorities

Concerning the second of three workshop objectives, workshop discussions and the follow-up report produced by the facilitators after the workshop and survey were a central component of sharing different researchers' research priorities. Ultimately, these outputs tend to reflect the diversity of research interests, rather than focusing and prioritising research efforts. It does, however, appear that the workshop and subsequent outputs reduced the likelihood of redundant research occurring.

The third workshop objective was discussed generally throughout the workshop, but did not emerge as a central focus for the panel or roundtable discussions. The efficacy of social science research in disaster management could be an important topic for continued consideration. The current workshop did not generate any efficacy metrics. Best-practice guidelines outlined in Table 2 are nonetheless a step towards establishing practices that limit the negative impacts of disaster research while enhance positive outcomes for researchers and affected communities.

Meetings like the Kaikoura Earthquake Social Science Workshop allow researchers and end-users with aligned interests to connect and collaborate. This helps to reduce the risk of duplicating their research-research work and helps prevent over-researching similar populations. It also allows an opportunity to focus efforts on key research priorities, in this case: collecting perishable data related to understanding earthquake impacts, recovery best practice, and collaboration and engagement practices.

Alongside direct research priorities related to the Kaikoura Earthquakes, there was a clear need to improve the practice of post-disaster research: to improve implementation of research learnings, before and during a disaster, and to reduce the impact of research activities on communities. The recent series of large scale natural hazard events in New Zealand has been a learning and growth period for the local social science research community. Researchers now appear to more keenly aware of potential risks and benefits of conducting post-disaster research with affected communities. While lessons have been learnt, there is a clear desire to improve how we collectively respond to disaster events; and to ensure that our research is

Table 2.
Post-Disaster Social Science Research Best Practice Principles

Principle	Discussion point	Suggested Best Practice
Coordinate and collaborate to minimize social disruptions	An influx of people interested in doing research, particularly in the smaller rural communities, can often put further strain on local resources, capacities, and wellbeing.	Researchers should network and coordinate similar projects and share data, when appropriate, to make the most use of resources and of respondents' time. Connecting with NGOs and/or researchers already networks with communities and policy makers is a good way to reduce impacts on communities and improve effectiveness of research efforts.
Triage research needs to minimise social disruption	Engineers and geophysical researchers were directly engaged immediately following the Kaikoura event as a matter of life safety and access to affected areas. Social scientists with established connections to affected communities or responders were engaged to estimate economic impacts or help run community needs' assessments in the early phases of disaster response. In cases, where an immediate request was not made, social scientists were asked to delay research until the situation stabilised.	Research that will inform future mitigation, planning, and recovery actions is important, but should be considered secondary to the immediate needs and wellbeing of affected communities. Researchers should avoid "chasing ambulances" and be realistic about where and when their work will be most useful.
Support the community, don't just investigate them	Researchers can and do often successfully support response and recovery activities. Researchers can also descend on affected communities to collect data through a one-way exchange. This can leave communities feeling that they have been taken advantage of. It is important for researchers to work with communities as much as possible.	Where appropriate and welcomed, researchers can engage with communities as experts providing deep insights into disasters and can serve as a resource in a trusted advisor role. Utilise participatory processes that co-produce knowledge using feedback loops, continuity of process, and balance top-down and bottom-up - without overburdening participants. Be collaborative and output oriented by asking what does your research give back?
Recognise that all disasters and communities are different	While a considerable body of knowledge has been accumulated in New Zealand and abroad on disasters, acceptable practice, risk tolerance, and social and policy environments change over time and between places. This means "lessons learned" from previous experience are not always applicable in the current context.	Situational awareness, foresight, and local expertise have a role to play alongside lessons learned and subject-matter expertise. Research should be a dynamic process.
Capture the heterogeneity of impacts, responses, and recovery trajectories	There are diverse needs and experiences of geographically and demographically unique communities. For example, Maori cultural impacts and values, especially in recovery management, have not been well recognised to this point.	Conduct bespoke needs assessments, support inclusiveness at all stages of research, and identify meaningful ways to co-create and share research outcomes with the community.
Manage expectations	Researchers often want to understand immediate needs, but may not be equipped to help resolve those needs. Some research outputs will be provided back to affected communities, while in other cases research outputs will be distributed more generally through research reports.	Researchers need to be clear with themselves and with communities about their limitations and intentions. Researchers should be clear with participants about how the outcomes will be used and distributed. And, where possible, make outputs accessible to research participants.
Develop communication strategies that are appropriate for the intended audience	As a way to make science accessible to the public, a strategy can include describing the impacts of an earthquake on something tangible, e.g. crockery rather than probabilities and magnitude which can be too abstract. In this case an earthquake's effects would be described in terms of how much the dishes in someone's cupboard might rattle or fall for a given intensity.	When communicating with the public at large, science messaging should be clear and related to people's everyday experiences. This may mean bringing in someone with specialised communication skills. Recognise that how you frame an event can affect people's perceptions and engagement. For example, referring to the crisis period as a 'transition' or 'recovery' can have an impact.
Clearly identify intended research impact and implementation pathway	Despite several suggestions for policy-oriented and "impactful" research, a lesson from the research following the Canterbury earthquakes is that some research outputs are not politically palatable, regardless of the quality and validity of the findings. Similarly, some research outputs will not have clear immediate implications or benefits but may be insightful later on.	Have a clear plan for how to embed research findings upfront. Socialise your research early and often with the groups you hope to reach. Not all work needs to impact policy or catalyse immediate action. Some work will incrementally advance understanding in a particular field and that is an acceptable outcome.
Prepare pre-event	The Canterbury earthquakes have enabled the research community to understand and pre-prepare to respond quickly post-event – to gather data to support response agencies and to collect perishable data. Those researchers that have well established relationships with communities, authorities or policy makers pre-event are usually the most effective at supporting recovery and maximising the impact of their research.	Develop relationships with policy makers and communities prior to an event. This could be through knowledge exchange, capacity development or secondments. Take advantage of the window of opportunity when a disaster occurs, as the government is most open to new ideas when they are confronted with a major unexpected challenge.
Be aware of the psycho-social strain faced by researchers	Many in New Zealand have been working on active disasters consistently since at least the beginning of the Canterbury earthquakes in 2010. Some are expected to respond immediately as each new disaster unfolds, as a result the strain within the research community has become a pervasive issue.	Researchers and their colleagues and collaborators should monitor the psycho-social wellbeing of those doing research on disasters, and practice self-care or raise the issue with colleagues you are concerned about.

ethically sound, timely and impactful in the wake of a disaster.

The lessons learnt through the workshop and principles developed for post-disaster research will be of value for researchers in New Zealand and internationally who are preparing to respond to disaster contexts within their own communities. Researchers can take steps before an event to develop relationships and collaborations with other researchers, governing bodies and communities so that they become trusted advisors and partners throughout the response and recovery of local communities. The established and trusting relationships resulting will help enable more timely, effective and impactful post-disaster research.

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