Learning from Earthquakes
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Improving Earthquake Resilience through Community Engagement

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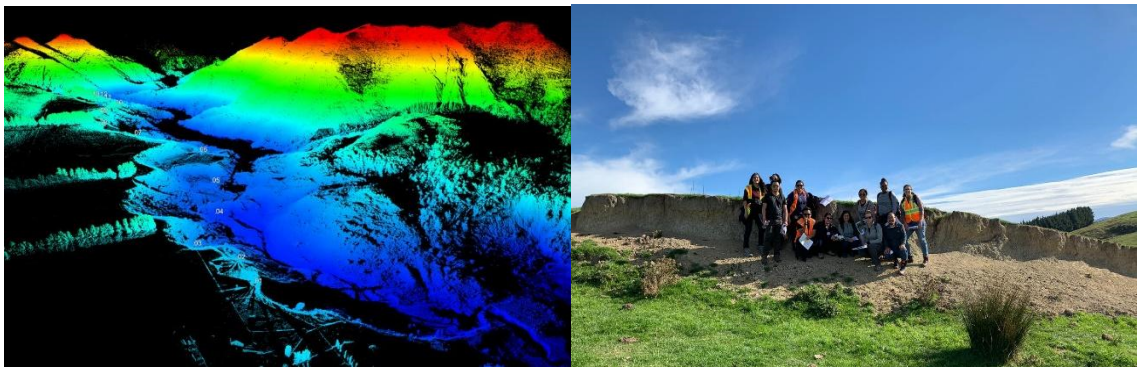

The Learning from Earthquakes (LFE) Travel Study Program took us to the earthquake affected sites of Christchurch, Kaikoura, Blenheim, and Wellington and provided us with some rare opportunities of interacting with prominent members of various organizations. Through these interactions, we realized that the community was at the core of all response efforts. This report summarizes our observations in the tour regarding community participation, communication, and engagement during search, rescue, and recovery phases of the Christchurch and Kaikoura earthquakes. The report is structured to provide actionable recommendations based directly on these observations for each of the 4 phases of disaster resiliency planning i.e., Reduction, Readiness, Response, and Recovery.

General observations

2010-2011 Christchurch Earthquakes

Christchurch experienced a series of damaging earthquakes in 2010 and 2011, including the M7.2 September 2010 Darfield earthquake and the M6.2 February 2011 Christchurch earthquake. The 2011 February earthquake was only 10 km south of Christchurch. 185 people were reported to have died in the 2011 February earthquake, mostly due to building collapse and falling debris. Significant liquefaction damage, landslides, and rockfalls caused numerous properties and areas being red-zoned. Even though people in New Zealand are generally informed on seismic hazards, these earthquakes were unexpected as both of them occurred on previously unknown faults.

We spent two days in Christchurch in the beginning of the 2019 LFE travel study, interacting with people who have been at the core of response and recovery activities during and after the 2010-2011 Canterbury earthquake sequence to learn about what happened during this period in Christchurch and to reflect on what could have been done differently to accelerate the recovery and improve the seismic resilience.

Overall, our experience in Christchurch during this travel study highlighted the importance of community engagement, in all 4 phases of disaster resilience, i.e., Reduction, Readiness, Response and Recovery. In our observation, the community input seems to be heavily influencing the recovery process in Christchurch. Examples of this include: 1) the consultation and communication activities of Stronger Christchurch Infrastructure Rebuild Team (SCIRT), an alliance formed to rebuild Christchurch's horizontal infrastructure, which placed a strong focus on face-to-face communication; 2) the consultation process before and during the construction of Turanga library, the largest library on the south island "designed by and built for the community" with an emphasis on connecting people, inspiring discovery and enriching communities; 3) the involvement of community members in drafting the New Building Act (2016) known as the Brower amendment, which states that unreinforced masonry buildings with façades and verandas that are in public spaces frequented by pedestrians and vehicles would be required to be assessed and repaired in half the normal required time; and 4) the decision-making process for the reinstatement of the Christchurch Cathedral, which took 6.5 years due to the initially proposed demolition of the cathedral being opposed by a number of community groups, including several heritage groups and a group of engineers.

2016 Kaikoura Earthquake

On 14 November 2016 a moment magnitude (Mw) 7.8 Kaikoura earthquake struck 15 km north-east of the North Canterbury town of Culverden at 12:02 am. With almost two minutes of intense shaking, the Kaikoura earthquake caused severe and lasting impacts on the social, built, economic, and natural environments in the region. Two people were reported to have died in the 2016 Kaikoura earthquake, one from a building collapse and another from a heart attack. According to North Canterbury Transport Infrastructure Recovery (NCTIR), many communities were completely isolated overnight due to road and rail damage. 85 landslides occurred along the coastal corridor, over one-million cubic meters of slip material had fallen on the road and rail. Up to 5 meters of uplift was observed along the coast, and 39 road and 20 rail tunnels were damaged. Examples of road and rail damage can be observed in Figure 1.

Figure 1. Damaged road and rail along the coastal corridor (Curtsey of NCTIR)

In the middle of this travel study week, we spent almost two days in Kaikoura. The first day was spent doing fieldwork: 1) using the RAPID scanning equipment to make landscape observations, and 2) learning about the local geology and post-quake landscape change. We also listened and spoke with people who have been at the core of response and recovery activities during and after the 2016 Kaikoura earthquake, among them Lincoln University researchers, Kaikoura District Council managers, and NCTIR engineers. Figure 2 includes pictures of these activities.

(a) (b)

Figure 2. (a) RAPID scanning lead by Mike Olsen from Oregon State University, (b) Lecture by Susi Haberstock, Community Service Manager, Kaikoura District Council

Our observations during this travel study highlighted the importance of the community engagement. During these lectures, we learned that there is a Social Recovery Plan, developed by Kaikoura District, whose goal is to empower individuals and communities to positively adapt to their changing environments. This Social Recovery Framework encompasses a needs assessment that involves psychosocial, accommodation, financial, community participation, communication & engagement, and building back better.

One case specifically that stood out was the assistance that the local Maori community provided in Kaikoura. The community had been offered shelter at Takahanga Marae, a Civil Defense welfare center, one hour after the devastating earthquake. Volunteers and employees from quake-affected businesses joined forces to serve food and sheltered people before the red cross came to set up their centers. It was a massive contribution and significant effort that the community did for feeding hundreds of people every day. It acts as an extraordinary reinvention community example that shows the importance of having a pre-identified space for gathering during recovery, which Kaikoura fortunately had. These examples provide evidence that community engagement empowers a community to play an active role in its own resilience.

Marlborough Region: Wine Industry

The Marlborough region has an extensive wine industry that includes 680 wineries that accounts for about 70 percent of New Zealand's wine production. The structure of the wine industry is based on an overarching industry body with regional wine associations throughout the country led by an elected board. The Marlborough region has been noted to have suffered extensive damage from the 2013 Seddon earthquake and from the 2016 Kaikoura earthquake.

The immediate response in the Marlborough wine industry was led by Wine Marlborough Ltd, which is owned by the industry and is responsible for the marketing and protection of the Marlborough wine industry. The first response was to visit different sites and collect initial estimates on the severity of the damages. It was followed by the initiation of a media ban and the establishment of a steering group to head the efforts of preparing a more accurate damage assessment. These initial steps ensured that the industry would have one strong collective voice that controlled the messaging and protected the interests of the industry.

Damage assessment was carried out through a 9-day survey of the different wineries. The survey revealed that the damages to the Marlborough wine industry were concentrated mainly on the loss of about 20% of tank capacity. Examples of tank damage can be observed in Figure 3, and include toppling or dislocation of tanks, damaged connections and collapsed catwalks that were rigidly connected to the tanks.

Figure 3 – Damaged wine tanks after the 2016 Kaikoura earthquake (Curtsey of Marcus Pickens)

Overall, the damages to the Marlborough industry were minor, and the recovery was very quick without a major impact on sales as a result of reduction actions and readiness following the 2013 Seddon event. Information about mitigation methods based on the former event was shared through the community and was well underway in most wineries with the implementation of seismic upgrades of tank anchoring systems. In addition, the steering committee established basic guidelines for repairs and worked with other organizations to solve the logistical problems that arose, such as storage and shipping logistics.

City of Wellington

Wellington city has suffered some building and infrastructure damages from the 2016 Kaikoura earthquake, especially around the harbor area. This event has been a wakeup call for the Wellington community and sparked large efforts of reduction and readiness for the next event that might originate at a closer fault. In general, the Wellington resilience office has a high priority of involving the community in the decision-making process regarding the preparation for the next event. Steps to inform the population of the local hazards were designed to prepare and mitigate the damages by creating and sharing hazard maps, such as liquefaction areas and peak ground accelerations. Furthermore, the city opened discussion regarding the investment in the retrofit of structures that are important to the public and were deemed unfit according to the current seismic codes, such as the Town Hall. This preventive action was carried out to ensure a smooth recovery process following the next seismic event, without spurring a lengthy litigation process like the Christchurch cathedral.

Recommendations

The following section details our groups recommendations to promote resilience within the four phases of disaster planning i.e., Reduction, Readiness, Response and Recovery. These recommendations were presented to a panel of resilience planning experts for feedback and comment at the end of the program.

Risk Reduction and Readiness

Christchurch city is undergoing a 7 years long post-earthquake urban reconstruction which has prevented it from achieving its pre-earthquake economic state. The demolition of 80% of structures has left vast gaps in the city with only addresses but no buildings standing there. This prolonged phase of recovery has led to a growing consensus among researchers and city officials for higher standards than “life safety” so that city resilience can in addition be about functionality and the ability to get back to working normally. Risk reduction and readiness are central to achieving this level of resilience.

Based on our learnings and observations in Christchurch, Kaikoura, Marlborough, and Wellington related to community engagement, the recommendations are summarized below.

1. *Observation:*
    - Christchurch Cathedral was severely damaged. Additionally, there was disagreement between the city council and other stakeholders regarding the future course of action. A survey showed that 59% of community members believed that the cathedral was too important for the church alone to determine its future due to its heritage value, but ironically 53% of them wanted the restoration to be funded by the Anglican church. 58% of survey respondents initially preferred reinstatement but the number dropped to 49% when they were informed about the cost of reinstatement that was to be borne by the city council. Hence, even though the majority of people preferred restoration, not many of them were willing to contribute to the cost of restoration. This conflict of ownership and interest led to a 6.5-year long indecision. Another decade is expected until the repair is completed. Many people feel that such a delay is unacceptable. This raised the question “What could have been done to accelerate this decision making”?

Reduction:

- Identify risks to landmark buildings and other structures of importance to the communities.

Readiness:

- Analyze the cost of repair and demolition of these identified buildings based on different damage scenarios. Formulate scenario-based division of cost to develop plans and reach agreements within the community on how much would be borne by public and private stakeholders in various cases. It is important to reach such agreements prior to a disaster to avoid conflicts that may prolong the recovery phase.
- Develop plans for periodic inspections and strengthening of these identified buildings using public and private funds to develop a feeling of ownership among members of the community.

2. *Observation:*

- Members of the Maori community opened the gates of Takahanga Marae to provide food and shelter to disaster-affected public until red cross could set up its centers. This is regarded as a phenomenal success story of local volunteers in the recovering community.

Reduction:

- Identify means to strengthen community ties and potential collaboration opportunities.

Readiness: Strong community ties encourage acts of voluntary aid in times of need. For this reason, strengthening community ties are as important as the strengthening of community buildings.

- Encourage and provide funds for periodic public events.
- Provide funds for the development of public spaces like libraries, community centers, convention centers etc. to encourage public interactions.

- Identify key community centers to act as post-disaster hubs for information and resources. Ensure that these centers are reasonably expected to perform well during disasters to remain immediately occupiable after and event. Perform building strengthening as needed to ensure centers are ready.

3. *Observation:*

- Professor Ann Brower voiced her concerns regarding unreinforced parapets to the Parliament which resulted in passing of "Brower Amendment" in Building Amendment Act 2016. This amendment halved the remediation time for unreinforced masonry parapets and other falling hazards.
- Public was consulted during 6th April 2018 - 6th May 2018 regarding what the new library should be like in central Christchurch for development of Tūranga library. As a result the locals were very excited about its construction.

Reduction:

- Identify channels to give voice to public concerns and ensure multidirectional communication i.e. between government, public, insurance companies, activists etc.

Readiness:

- Promote community member engagement in infrastructure strengthening decision-making and prioritization.

4. *Observation:*

- Marlborough wine industry was able to ensure economic stability because of a single, strong, collective voice, and good connections of high-ranking members of the community with local council.
- Community needs assessment by the members of the recovery team could not be done properly in Kaikoura due to lack of acquittance between council members and community representatives. This lack of acquittance was due to council reshuffling which was, unfortunately, done a few weeks before the earthquake struck.

Reduction:

- Identify means to ensure social connections between various local and national bodies.

Readiness:

- Set up a committee of diverse representatives of community who will be consulted in the event of an earthquake (as reasonable/available) for decision making advice on response/recovery effort. Group of Maori leaders and other local community representatives can be pre-selected to be "on-hands" cultural consultants

5. *Observation:*

- During rescue works in Christchurch, the rescue team had only 14 engineers. Hence, volunteers were asked to assist them by holding surveying targets.

Reduction:

- Identify tasks that can be performed by unskilled community members during the response phase.

Readiness:

- During community meetings, hold events to train community members in performing these tasks.

5. *Observation:*

- In Christchurch, the city office was to be shifted to a new building. Unfortunately, the disaster stuck before this shift could be made. However, both old and new buildings were unsuitable for occupancy after the earthquake. Officials had to arrange for a new space for the workers to perform emergency tasks while rescue was being undertaken.

Reduction:

- Identify structures to be used as headquarters during search, rescue and recovery operations.

Readiness:

- Develop maps/fact sheets that lay people/owners can access and understand and that clearly communicate hazards to public and their private properties/structures. Engage community in identifying the structures that are in safe zones. Ensure these remain functional after disaster by periodic retrofitting.

Response

Volunteer Engagement

The experiences of Christchurch, Kaikoura, and Wellington demonstrate the benefits of early and continuous community engagement in the aftermath of an earthquake. Given the likelihood of the emergence of spontaneous volunteers in the post-earthquake environment, efforts should be made to identify necessary tasks and potential volunteer roles immediately following the event. A point-person, also well-integrated in the response management structure, should be appointed to oversee volunteer management efforts. Plans, if available, should be used to guide volunteer management efforts and ensure that they are safely and effectively incorporated into the response workforce. If no plans have been made ahead of time, emergency management organizations or others may consider consulting communities that have experience managing volunteers to develop a just-in-time system for volunteer registration, credentialing, assignment, training, health and safety, devolution, and follow-up . We also suggest a robust communications plan be incorporated into volunteer management efforts in order to enhance the potential that individuals with relevant and necessary skills volunteer their time and talents to the response and recovery efforts, and so that volunteers do not create an undue burden for the emergency response system by reporting too early or to an inappropriate location.

Volunteers may have less training or readiness for disaster work, and may be especially vulnerable to experiencing physical or mental health impacts associated with their efforts. A comprehensive health and safety plan should be in place for all members of the disaster workforce, including volunteers, and should address both physical and mental/behavioral health considerations.

Community Needs Assessments

The needs of different stakeholders should be assessed through a variety of modalities, each tailored to any given community's specific needs and interests. For example, industry needs (e.g., wineries in Marlborough) may be assessed by leveraging professional associations or other organizations that have trusted relationships with businesses. Needs should be assessed and shared in ways that protect business interests. For example, photos documenting damage should be devoid of specific business names or other identifying information without the business' explicit permission, especially if sharing such information with the media or others could have unwarranted negative impacts to the business or proprietor.

Needs of community members should be assessed through coordinated efforts. It was reported that Kaikoura residents sometimes received over a dozen door knocks to collect information and check on resident welfare. Agencies engaging in welfare checks or other post-disaster data collection efforts should coordinate with one another to avoid overburdening individuals already impacted by disasters from overzealous data collection initiatives. If possible, validated survey instruments should be employed immediately to ensure that data is collected in valid and reliable ways, and that needs can be tracked overtime. The Canterbury Earthquake Wellbeing Survey's use of the World Health Organization (WHO) Quality of Life scale scores and resultant development of the Canterbury Wellbeing Index is a great example in this regard, (Morgan et al. 2015) and may serve as a model for other communities that are planning post-community needs assessments. Moreover, communities may leverage any data that was assessed pre-disaster to identify baseline information about their community to better differentiate disaster-specific impacts.

The Information generated through any needs-assessments should be used in good faith to drive response and recovery decision-making; in other words, data shouldn't be collected for the sake of collecting data, it should be used to inform response and recovery implementation. Specific examples of success stories in this regard include the use of community input to guide the development of the Canterbury Earthquake Recovery Authorities activities.

Recovery

Community engagement in the context of recovery has been examined closely in the course of our trip to understand the effectiveness of post-earthquake recovery measures put in place by the following New Zealand areas (Christchurch, Kaikoura, Blenheim, and Wellington). Hence, these recommendations have been put forward:

As observed in Christchurch, some local initiatives were put in place to drive the entire post-earthquake recovery process which has provided opportunity for more coordination in the process. Also, there was more participation and personal responsibility in doing activities aimed to speed up the recovery from the 2010/2011 Canterbury earthquake sequences. Organizations like SCIRT, ENGAGE, and other community anchor projects such as the Turanga library, ongoing convention cent, artistic paintings on some selected Central Business District (CBD) walls helped to facilitate the recovery process by sustaining the socio-economic situations in Christchurch after the earthquake. This observation is quite different from the typical New Zealand situation where everything is left for the government to provide solutions that would promote community resilience after a disaster.

The Turanga library which is right next to the Christchurch cathedral was a very good example of a community anchor project observed to be very successful in promoting community participation and boosting the socio-economic conditions of the CBD. Though it was at the conceptual stage when the 2010 earthquake occurred, an opportunity was provided to build a bigger space for everyone of all age groups to use. The building has been opened to the public for 7 months and there has been a lot of positive

contributions to the CBD. It has attracted a lot of tourists to the city Centre, promoted the business activities in surrounding buildings, sustained the tax base of the area through the creation of employment, and has a blend of designs that incorporates both modern and Maori culture. It also promotes a feeling of belonging and sense of place for the Christchurch residents and promotes the Maori culture to its users. Although there were initial negative comments regarding concerns about the use of expensive technology, users of the building are now thrilled by the use of those same technologies. As a recommendation, the Christchurch city council should be more careful in providing sensitive financial information that may be irrelevant to the public when promoting anchor projects aimed at renegotiating community participation in the city's CBD.

In the case of Kaikoura, the population is much smaller. About 5000 tourists were affected by the 2016 earthquake. The armed forces mobilized very quickly and all tourists were moved out in three days. Embassies provided help for tourists who were stranded during the event. Most of the residents and tourists were housed in Maraes which was useful in providing shelter and food for the stranded.

The socio-economic recovery was very fast in Kaikoura compared to other areas. Local food vendors were used to feed the workers which helped to keep the economy going by keeping cash flow with the local economy. Additionally, business advisers provided assistance to business owners. There were no cordoning issues like in Christchurch which helped Kaikoura recover fast. There was also the introduction of an employee and business subsidy, which lasted for six (6) months. The local council also received significant support from national and international response teams. However, there was little communication between the recovery and council response teams. Businesses that relied on local tourism closed. Some residents were overwhelmed by the approach of volunteers which acted as an additional stressor. Volunteers need to get proper training on how to offer help otherwise the help would be useless if offered wrongly. Preplanning for volunteer tasks can help address and effectively use the influx of volunteer help that commonly arrives in the recovery phase.

Acknowledgements

This program provided our group the opportunity to witness real communities and environments that have recently tested resiliency strategies. Being able to listen and discuss best practices and lessons learned from leaders in these communities provided an incomparable learning opportunity for us. We are grateful to The Earthquake Engineering Research Institute (EERI), QuakeCoRE, and the Learning from Earthquakes program for creating and supporting this program that will shape our understanding of the importance of resilience moving forward in our careers.