

Long-term reconstruction in Christchurch: Learning from its governance structure

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Abstract

New Zealand is prone to significant natural hazards. Past experience in New Zealand has demonstrated an ability to cope with small-scale natural disasters; but the recent Canterbury earthquake sequence, in particular, the September 4, 2010 and February 22, 2011 earthquakes in Christchurch, has tested the nation's capability of tackling a large-scale event. This article looks at the long-term reconstruction process following the Canterbury earthquake sequence. It identifies the organisations, institutions and critical decisions that likely govern and drive community recovery. The disaster and its impacts in Christchurch have created challenges and issues that distinguish its recovery from others. Liquefaction-related land zoning, insurance, and recovery planning for Central Christchurch dictate different approaches to reconstruction of housing, infrastructure, and commercial buildings. Institutional and technological innovations, such as alliance-like project management, emerging agencies for managing the recovery, and a new seismic design for building foundations, all feature in the post-earthquake recovery practice. Current reconstruction in Christchurch provides a laboratory showing how the distinctive governance structure affects the systems of community recovery. The lessons learned from this event provide insights which can improve the design of recovery planning in New Zealand, and beyond.

Keywords: The Canterbury earthquake sequence, community recovery, reconstruction, governance

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Introduction

New Zealand is susceptible to a wide range of natural hazards. When the Darfield earthquake with a magnitude of 7.1 struck Christchurch on 4th of September 2010, there was little prior experience in New Zealand to deal with a large-scale post-disaster recovery. The major aftershock on 22 February 2011, causing 185 death, along with on-going aftershocks, compounded the impacts on the city and added difficulties in restoring the city's infrastructure utilities and buildings which suffered significant damages from a sequence of events.

Complexities and uncertainties are commonly endemic in a post-disaster situation, particularly following a large-scale event like the earthquakes in Christchurch. There is no instant 'fix' for disaster rebuild scenarios, however, order and progress can be achieved if parties involved in reconstruction have the appropriate methods for managing critical projects (Project Management Institute, 2005).

In New Zealand, the Government chose to enter into the purely commercial insurance market by creating the Earthquake Commission (EQC) to serve as its own insurance scheme. Provided insurance cover, known as the Earthquake Commission Cover (EQCover), is compulsory for private property and insures against loss or damage from natural disasters including earthquakes. If the dwelling or personal possessions are more valuable than the maximum amounts EQC will cover, or are outside the scope of what EQC will cover, home owners arrange extra cover with their insurance company (Earthquake Commission, 2012). This market intervention mechanism, however, has shaped the way the repairs and rebuilds of residential housing are undertaken in Christchurch following the earthquakes.

This paper draws on Resilient Organisations' on-going longitudinal study¹ of post-earthquake reconstruction in Christchurch since the 4th of September earthquake in 2010. The study was to understand the impacts of the earthquake sequence on the built environment, and examine the post-disaster strategies and approaches taken by multiple agencies. By using case studies, this paper looks at the overall recovery governance structure and the specific reconstruction approaches used in two different sectors. This paper aspires to 1) advance the understanding of distinct governance structures adopted for reconstruction projects in Christchurch; 2) identify key elements that feature within the activities of recovery.

The Canterbury earthquake sequence

Following the first Darfield earthquake on 4th September 2010, the Canterbury region of New Zealand has been struck by a sequence² of over 10,000 earthquakes, including several major events. The magnitude 6.3 earthquake that devastated Christchurch on 22 February 2011 was the most severe of all the events in the earthquake sequence (commonly known as the Canterbury earthquake sequence). This quake was caused by an unknown fault which was about 14 kilometres in length and extended east-northeast from Cashmere to the Avon-Heathcote estuary area (See Figure 1). The impact from this event was significant, causing the death of 185 people, collapse of many buildings, further damage to infrastructure and widespread liquefaction.

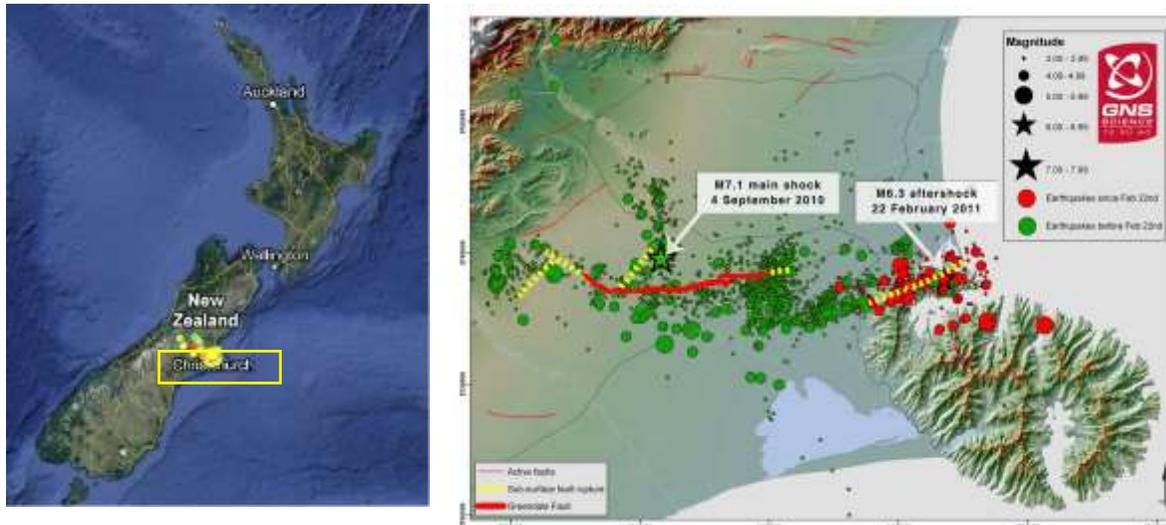


Figure 1: Geographic location of Christchurch and the two major earthquakes (Source: GNS Science, 2011)

The Canterbury earthquake sequence overall has been estimated as the third most expensive disaster in history in terms of insurance losses (Swiss Re., 2012). Earthquake damage has arisen from shaking and ground failure including lateral spreading, liquefaction, landslide and rock falls. Figures in Table 1 show the estimate of the total capital cost of the rebuild in 2012 and indicative funding shares between sectors. As more precise information becoming available, the latest figures released on 28 April 2013 by the Government suggest that the rebuild with improvements included could reach \$40 billion with high levels of uncertainty remaining. The damage is about 19% of New Zealand’s GDP.

Table 1: Estimated cost of recovery, source: (CERA, 2012b)

Cost shares between sectors		\$billion	Indicative funding shares		%
Residential	60%	12-18	Private insurers		30
Infrastructure	10%	2-3	EQC		40
Commercial	10%	2-3	Central government		20
Government	10%	2-3	Local government and others		10
Community assets	10%	2-3			
Total		\$20-30 billion			

More than 60% of CBD buildings in Christchurch were severely damaged (CERA, 2012a). Over 150,000 homes which are around three quarters of Christchurch’s housing stock sustained some damage from the earthquakes. The total number of individual building, land and contents claims received exceeds 600,000 (Earthquake Commission, 2011). Damage to infrastructure was widespread across the city. It has been estimated that about 1,021 kilometres of roading needed rebuilding, which is around 52% of Christchurch's urban sealed roads. The earthquakes damaged 51 kilometres of water supply mains, 528 kilometres of the sewer system and badly damaged the sewer pumping stations within the city. Around 100 sewerage pumping stations needed to be repaired or replaced. The most recent cost estimate is tabulated in Table 1, indicating that

insurers' estimates of all the earthquake events exceeds \$30 billion with high levels of uncertainty remaining.

Following the major event on 22 February 2011, the forecasts of the New Zealand Treasury (2011) assumed that a big increase in residential investment activity would take place in 2012, with commercial activity and infrastructure spending growing steadily in 2013 and 2014. While some construction activity picked up in the second half of 2012, Canterbury region-wide rebuild activity still remained below what had been expected, two years after the 22 February event. Lingering issues around land decisions, insurance payments and acquiring consents have added uncertainty about the scale, cost and timing of the rebuild. Against these backdrops, this research aims to examine the governing mechanisms used for managing the recovery and rebuild projects over the last two years in Christchurch.

Post-disaster recovery governance and institutional arrangement

After major disasters, the process of recovery and reconstruction tends to follow one of four models: the paternalistic model, the infusion of aid model, the limited intervention model, and the market model (Comerio, 1998). Those four models cover a wide range of institutional frameworks of recovery and reconstruction following a disaster. On one side of the spectrum is the recovery governance structure in which a government takes on the entire program of rebuilding; on the other side is a market-centred approach in the recovery effort. In order to understand the recovery process at various points of this spectrum, various stakeholders and their level of influence and power over reconstruction should be identified (Inam, 2005). This section outlines the four models of recovery governance.

- 1) The paternalistic model: this model promotes an idea that only an activist government has the capacity to provide aid for communities to restore some level of normalcy and decency in the aftermath of large-scale disasters (Dreier, 2006; Hartman & Squires, 2006). However, the success of this model depends on the capacity of governments at different levels under an overarching governance system (Alexander, 2002). This government-driven recovery is assisted by various organizations, both civic, and non-profit with a limited degree of community participation. This model was seen in the city of Tangshan, China, during its recovery from devastating earthquake (Comerio, 1998). The entire program of rebuilding was undertaken by the government with national and local funds. The process of recovery is primarily influenced by the decisions from the governmental authorities.
- 2) The infusion of aid model: involves the international relief organizations to finance and oversee the reconstruction of damaged infrastructure and properties. Like many disasters in developing countries, the recovery of Sumatra from the 2004 Indian Ocean tsunami (Meisl, Safaie, Elwood, Gupta, & Kowsari, 2006), of Bam from the 2003 Bam earthquake (Ghafory-Ashtiany & Hosseini, 2008; Omidvar, Zafari, & Derakhshan, 2009) is comparable to this capital infusion model. The infusion of outside capital, in the form of international aid combined with outside and local expertise, is used to support reconstruction for communities. This model, however, has received criticism such as the possibility of misappropriating funds and rebuilding projects lack of cultural sensitivity (Comerio, 1998).

- 3) The limited intervention model: over time, the world has witnessed a shift from government-led approach to market-oriented approach in the response to disasters, particularly in the reconstruction phase. The limited intervention model calls for a more participatory post-disaster rebuilding from both the private sector and communities with less government involvement. In some cases, the stakeholder participation philosophy prevailed particularly in the stage of recovery planning and implementation (Ganapati & Ganapati, 2009; Ying, 2009). The program of community involvement in recovery activities requires to be well designed with a combination of technical, financial, and administrative assistance from public and private sectors.
- 4) The market model: this model simply lets the market place sort out the winners and losers after a disaster, focusing government and charitable aid only on the emergency period (Comerio, 1998). This is a typical model used in the United States and other developed countries where the market forces such as banks and insurance and private sector play a predominant role in recovery. A number of scholars such as Gotham (2008) and Peck (2006), examined the process of post-disaster recovery and rebuilding in New York City since the September 11 event and in New Orleans since the Hurricane Katrina in 2005 through the lens of 'neoliberalism'. They argued that using market-centred approaches for urban recovery and rebuilding in those two areas should be seen not as coherent or sustainable responses since private sector-oriented restructuring of disaster aid only exposes and even reinforces the socio-economic vulnerabilities of affected communities.

The government and institutional approach to disaster reconstruction varies across these models depending on the type of funding sources being channelled. Additionally, the post-disaster reconstruction governance also includes the enactment of legislative and regulatory arrangements, establishment of national and local institutions, formulation of national policies implemented at the local level and involvement of other social and private agencies. These elements, according to Inam (2005) however, are particularly relevant to each political-economic context and set of specific urban conditions. The recovery and reconstruction of Christchurch following the earthquakes, however, appears to fall into the model between the limited intervention and market model. The following section is to examine the governance arrangements in the overall recovery in Christchurch and by using case studies to present the features that are prominent in its recovery activities.

Research methods

A case study method was adopted for this research due to its explanatory nature (Yin, 2003). Data have been collected through field-based observations, interviews and other qualitative records over the last one and half years since September 2011. During the field visits to Christchurch, a range of semi-structured interviews were conducted covering the topics of recovery activities, critical decisions, project management modes, resourcing challenges and other emerging issues that arise during the rebuild. This paper gives a primary focus to the governing structures used for the rebuild of city's built environment.

A profile of an overall recovery governance structure and three specific approaches to the rebuild of housing, infrastructure and commercial sectors are delineated in Table 2 below. The rebuild in the CBD, however, is much slower and more complex than the reconstruction efforts taking place in housing and infrastructure sectors. Therefore, for the purpose of this paper, only two sectors, housing and infrastructure, were selected for detailed case study analysis.

The interviewees were selected in terms of their involvement in the reconstruction effort, their position and experience with respect to recovery management and governing. Qualitative information on perspectives of these participants was captured, including: 1) Overall recovery management and governing structure, 2) Reconstruction approach to residential and infrastructure rebuild projects, and 3) Challenges and issues emerging from the operations of those governance structures. The following sections report research results based on these three areas.

Table 2: Governance structures in reconstruction sectors

Sector	Governance approach (structure and form)	Leading agency
Overall recovery governance	A Central Agency created to lead and coordinate the on-going recovery effort	Canterbury Earthquake Recovery Authority (CERA)
Housing	Insurers' Project Management Offices (PMOs) managing housing repairs and reconstruction	EQC and commercial insurers, and their PMOs
Infrastructure	Alliance between asset owners and delivery teams	Stronger Christchurch Infrastructure Rebuild Team (SCIRT)
Commercial buildings in the CBD	Partnership between Central Government (through CCDU within CERA), the Christchurch City Council (CCC) and other groups to focus on rebuilding Christchurch's CBD	Christchurch Central Development Unit (CCDU), Christchurch City Council

Overall recovery management in Christchurch

Historically, a risk-based approach to hazard management was adopted in New Zealand's Civil Defence Emergency Management (CDEM) arrangements, based on '4Rs', namely reduction, readiness, response and recovery. With a vision of national resilience, 'Focus on Recovery' (MCDEM, 2005) – a framework encompassing the community and four environments: social, economic, natural and built environment – was adopted into the CDEM framework in 2005 and provides for multi-level and multi-agency structures and processes to be involved in post-disaster recovery.

Shortly following the Darfield earthquake, on 14 September 2010, the Central Government released the Canterbury Earthquake Response and Recovery Act 2010 which stipulated the establishment of the Canterbury Earthquake Recovery Commission (Parliament of New Zealand, 2010). The purpose of this Commission was to advise the Government on the recovery issues and liaison between the central and local Government.

However, the scale of the 22 February earthquake outstripped the capacity of local authorities, and further wide-ranging legislation, the Canterbury Earthquake Recovery (CER) Act, was passed

in April 2011, which created a new entity – the Canterbury Earthquake Recovery Authority (CERA). As the state of emergency ended in May 2011, CERA took over from Civil Defence and acts as a primary agency driving earthquake recovery in Canterbury region. Under the CER Act, CERA was tasked with developing an overarching recovery strategy, while the Christchurch City Council developed a Central City Plan. Drafts of two plans were published in September and August 2011 for public consultation and were finalised in May and July 2012, respectively.

The CERA Act 2011 also stipulated the role of the Minister for Canterbury Earthquake Recovery who was appointed by the Prime Minister to coordinate the recovery effort at the executive government level. This role reports to the Cabinet Committee on Canterbury Earthquake Recovery, which was tasked to oversee and coordinate the government’s response to support the recovery and reconstruction following the earthquakes.

The Canterbury Earthquake Recovery Authority (CERA), as the primary agency for recovery, works closely with the Minister, along with all government departments contributing to the recovery efforts. Other government agencies and departments are coordinated through a Senior Officials Group, chaired by the Chief Executive of CERA. Elected members, commissioners and leaders of the strategic partners are engaged through the Recovery Strategy Advisory Committee (RSAC). The Recovery Strategy (CERA, 2012) which was released in 2012 is the overarching document to coordinate action amongst government and strategic partners. Figure 2 below illustrate this framework covering all levels of governance (political, central government, local government and stakeholder/community).

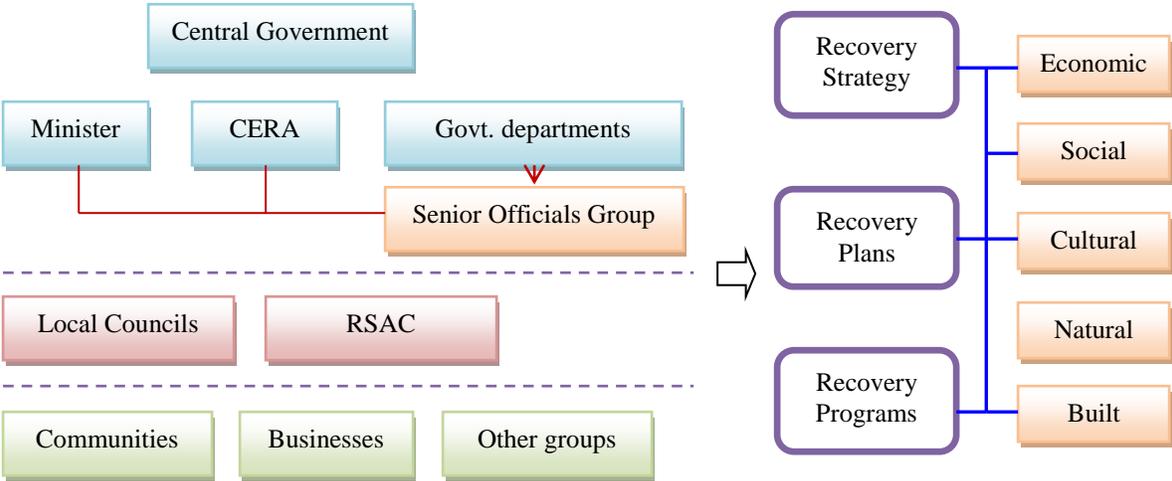


Figure 2: Recovery governance structure

As mentioned earlier, the insurance companies including both government-led Earthquake Commission (EQC) and private insurers have been a major player in the wake of the Canterbury earthquakes. In general, private insurers manage over-cap repairs and EQC manages under-cap repairs (the cap is usually \$100,000 plus Goods and Services Tax). Some claims which are for comparatively low-value damage are cash-settled, in which case the homeowner manages their own repair.

In the aftermath of the earthquakes, a Project Management Organisation/Office (PMO) ³ approach to the end-to-end building design and construction activities were employed by most of

insurance companies for managing their housing repair programmes⁴. This paper will focus on the case studies of EQC's housing repair programme and the Infrastructure rebuild programme in Christchurch.

Reconstruction project governance

Case 1: Canterbury Home Repair Programme (CHRP)

Following the Darfiled earthquake on 4 September 2010, the Earthquake Commission (EQC) took swift actions in response to housing repairs under its insurance policy in the Canterbury region. The Canterbury Home Repair Programme (CHRP) was set up for this purpose. EQC entered into a contractual agreement with Fletcher Construction, the New Zealand's largest construction company, as a single point Project Management Office (PMO) to manage its repair programme for Canterbury homes with damage between \$10,000 and \$100,000 per claim. Claims below this range where there is structural damage are also managed through CHRP.

The Project Management Office is known as 'Fletcher EQR', representing the earthquake recovery division of Fletcher Construction. Fletcher EQR operates from 18 geographical hubs across the earthquake affected region. Fletcher EQR also helped to manage repairs to deal with winter heating needs resulting from earthquake damage. The repair work is carried out by independent contractors, including many local Canterbury tradespeople who have completed an accreditation process. The accreditation process factors in each contractor's trade qualifications, experience and other factors to ensure that appropriate standards are established for quality work. The governance structure for the Canterbury Home Repair Programme (CHRP) is illustrated in Figure 3 below.

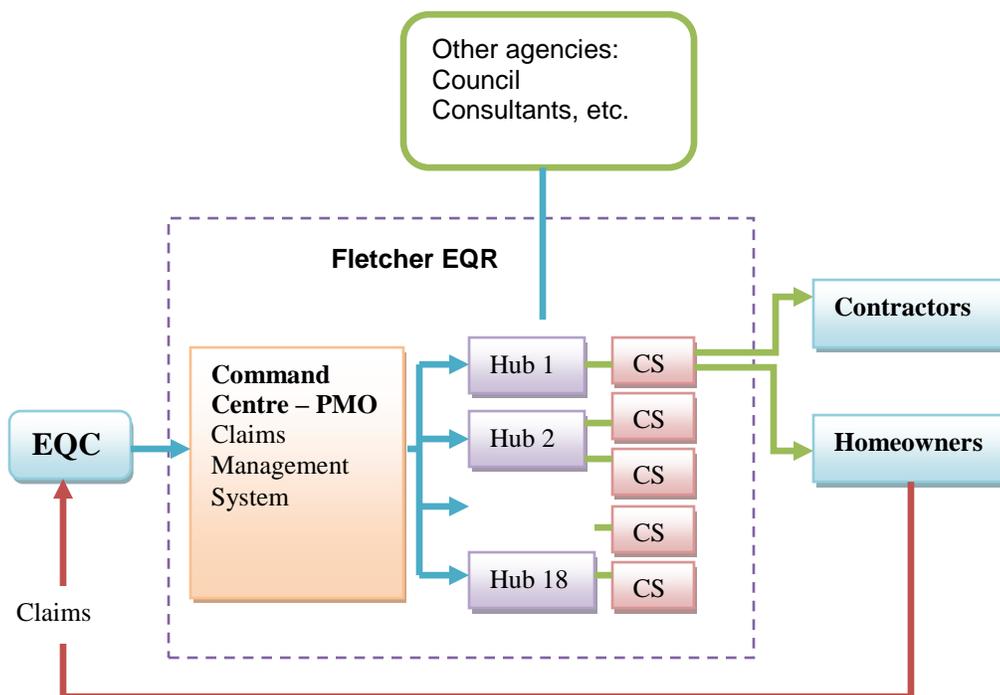


Figure 3: Governance structure for EQC's housing repair programme

Under the above governance structure, Fletcher EQR adopted a straightforward project management process for dealing with housing repairs. The scope of work to be carried out on each property is agreed between Fletcher EQR and the homeowner, and aligns with the EQC initial assessment. Once the scope is confirmed, Fletcher EQR assigns a competent accredited contractor to do the work. However, a nominated Fletcher EQR Contract Supervisor will oversee all work undertaken on each project and check that quality standards are being met. The Contract Supervisor acts as the point of contact between the homeowner and the contractor for any issues that may arise during the repair. When the repair work is completed, it will be inspected and signed off by Fletcher EQR. Rectification is available during the 90 day defect period if any problems with the repair are found after completion.

Case 2: Alliance structure for the infrastructure rebuild

The scale of the infrastructure rebuild in the Canterbury region is unprecedented. It is regarded as one of New Zealand's largest and most complex civil engineering projects and needs a large number of resources over a period of more than five years (Christchurch City Council, 2011). In order to restore the city's infrastructure system damaged from the Darfield earthquake, the Christchurch City Council (CCC) established an Infrastructure Rebuild Management Office (IRMO). Contractors were appointed to manage the repair and rebuilding programme of the Council infrastructure.

Significant further damage to the infrastructure facilities during the 22 February 2011 event has escalated the Government response. An organisational structure of a larger scale was needed to cope with increased repair and rebuild demands. Stronger Christchurch Infrastructure Rebuild Team (SCIRT) was therefore created to replace IRMO. The transition from IRMO to SCIRT was expedited in August 2011 in terms of accountability for delivery of all asset assessments, project definition, concept and detailed design and construction delivery. SCIRT has taken over full accountability for the above from 1 September 2011, responsible for rebuilding horizontal infrastructure in Christchurch following the earthquakes of 2010 and 2011.

SCIRT has adopted an alliance model which has been commonly used in delivering major infrastructure projects. The SCIRT alliance is made up of eight partner organisations. This includes three client organisations, the Christchurch City Council (CCC), CERA, and New Zealand Transport Agency (NZTA), each of which plays a different role: CCC and NZTA act as asset owner and funder while CERA is mandated to coordinate the overall rebuild activity on behalf of the Government. Five main contractor organisations were chosen as delivery teams within the alliance, including City Care, Downer Construction, Fletcher Construction, Fulton Hogan and McConnell Powell.

SCIRT is effectively a 'virtual organisation' which has a leadership team for governance (Aaltonen & Sivonen) and a management team (AMT) which looks after more than 200 people who are called the Integrated Alliance Team (IAT). This team is responsible for delivering the planning, design and management functions to enable the delivery teams to do the work. The delivery teams are responsible for the construction on the ground. They consist of the five main contractors described above and their subcontractors and suppliers. The governance structure for SCIRT is illustrated in Figure 4 below.

The alliance model adopted by SCIRT, as shown in Figure 4, is a form of collaboration between a client, consultant and contractor who mutually agree to undertake the work to target levels of

quality, cost and time. An additional rewards/sanctions mechanism is put in place to measure the performance of individual delivery contractors over time. Construction work will be allocated to them based on their performance. This leads to a high degree of trust between the parties and a focus on performing to the highest expectations. The alliance model of such kind replaced the traditional client-contractor management model and offered more flexibility in the way the stakeholders are coordinated.

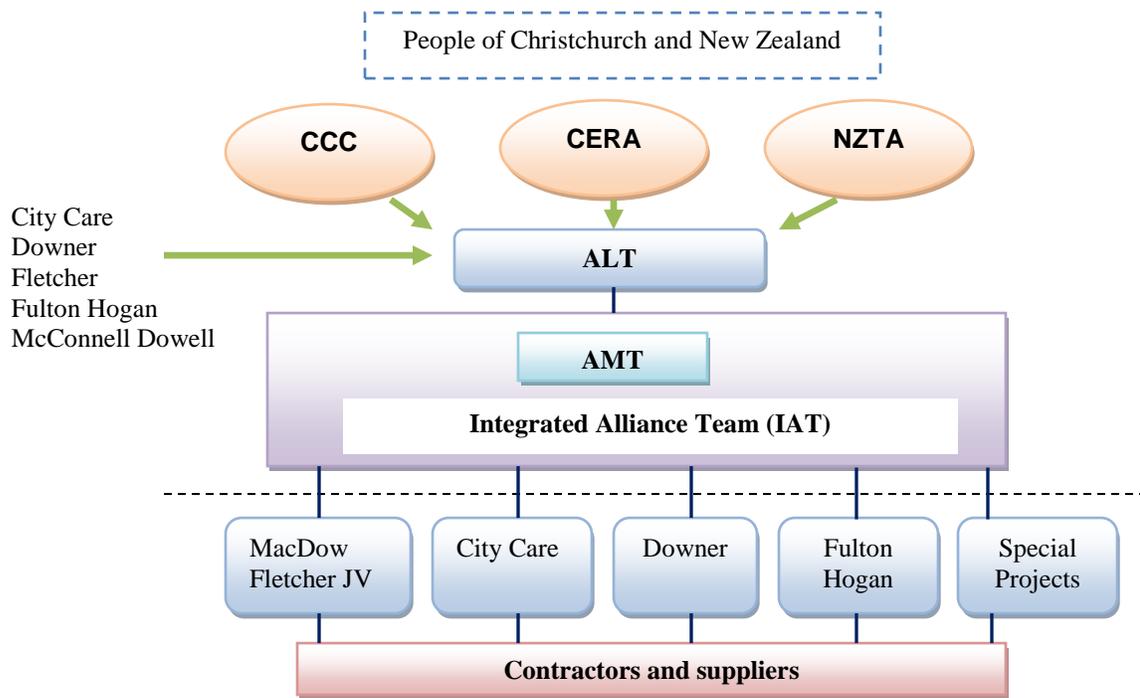


Figure 4: SCIRT governance structure for infrastructure rebuild

Challenges arising from recovery governance operations

The decisions about why and how to manage the recovery projects, as shown in the above two case studies, indicate the particular social, economic and political situation in Christchurch, and New Zealand nationwide. In spite of the varied stakeholders involved, funding mechanisms and organisational structures, the common method which Fletcher EQR and SCIRT share is a project management approach. This section reports on the issues related to the recovery projects and challenges that emerge from their governance operations.

Managing interface between EQC and private insurers

The Canterbury earthquake sequence, itself, has posed a number of challenges to the recovery and reconstruction efforts. Issues around the insurance payout have been reported by most interviewees as a major hurdle to advancing repair and rebuild. Settling claims where damage has caused by a number of successive earthquake events is much more complex than settling claims from a single natural disaster. Earthquake Commission (EQC) has to attribute or apportion the damage to individual events. Therefore, the speed of claim processing and subsequent repair management is determined by how quickly apportion between claims can be addressed and the

efficiency of communication between EQC and private insurers when deciding who will manage the repair.

Land zoning affecting the work prioritisation

Similar to the 1995 Hanshin-Awaji earthquake in Kobe (Comerio, 2005) and the 2009 Victorian bushfires in Australia (Chang-Richards et al., 2013), a complex planning process involved a variety of land-use and zoning adjustments to aid the rebuild process. Some areas of Christchurch have been assessed as red zones and declared not suitable for rebuilding, affecting more than 7,500 residential properties. One area where alignment for the horizontal infrastructure rebuild is required is with future land issues. This includes both the servicing of new subdivisions and developments in the city and also the treatment of red zone areas identified by CERA. For the housing repair programmes, new foundations of innovative design and materials are also needed for other zones such as green and orange⁵. Land zoning decisions thus had a great impact on the prioritisation of rebuild works.

Resource shortages for rebuild

The shortage of resources has been identified by interviewees as a critical issue in dealing with increased recovery demands. Resource pressures on rebuild projects were primarily from human resources associated with structural, architectural and land issues. Resource shortfalls have had an inflationary impact which flows through to higher costs. The inflationary effects of increased construction professional fees and an increase in temporary house rentals for housing inbound construction workforce have become major concerns. However, as the rebuild proceeds, construction-related inflation is likely to put extra pressure on the Canterbury labour market, community recovery and regional economic development of Christchurch.

Not business-as-usual

One of the challenges that, to some degree, are facing all the rebuild agencies is how to manage the scope, cost, time and the risk in a changing environment. The interviewees have highlighted that although a project management approach was adopted, it is not business-as-usual any more. Both housing repairs and infrastructure rebuild programme create several pressures that require the project managers at a strategic level and project teams at an operational level to have certain competencies. For instance, the disaster effects on local communities require the Fletcher EQR and SCIRT to create new ways of working, particularly in dealing with distressed and traumatised home owners. More socio-economic considerations in relation to the affected populations need to be included in the project plans. The uncertainties caused by on-going aftershocks, insurance, land zoning issues have created a dilemma of project management – how much planning to do. It is important that the project plans are designed to be flexible and able to response to changes as the rebuild evolves.

Conclusion

Any post-disaster recovery programme or project is a reflection of the vision for longer-term outcomes, as well as the capacity and capability needed over time. This paper takes a governance perspective to look at the governing structures for managing recovery and reconstruction

following the Canterbury earthquakes. In particular, it shows how the housing recovery is managed under the Government's market intervention mechanism (the Earthquake Commission) and how an alliance model is adopted to manage the infrastructure rebuild of a large scale.

The information presented in this paper shows that inherent uncertainties and complexities are challenging recovery decision makers and practitioners in Canterbury. By capturing data from agencies and organisations involved in recovery decision making and management, this paper provides an understanding of how New Zealand is responding to a sequence of earthquakes which challenged local capacity. A combination of market response and a government-led market intervention mechanism through EQC featured in its recovery practice. More than that, a project management approach was adopted in the context of rebuilding housing and infrastructure. The on-going research will capture information from those who were affected by the earthquakes in order to gain insights into the effectiveness of this governance structure.

The recovery governance decisions and reconstruction approaches provide an understanding of how the distinctive governance structure affects the systems of community recovery. The project management methods, particularly insurers using local construction companies as the Project Management Organisations (PMOs) for housing repair and rebuild programmes are worth further investigation. The alliance-type partnership model for managing the infrastructure rebuild is not simply an extension from alliancing for construction at normal times; it is a novel way of dealing with risks and changes in an unusual environment. Future research is needed to examine the effectiveness of these applications and the associated pitfalls.

'Governing structures' included in this paper contributes to the base of knowledge and practice that can be adapted and applied in managing post-disaster recovery projects. However, with complex projects including the delivery of longer-term outcomes that could benefit the disaster-affected region and communities, how the project will be measured and managed is important. Some additional steps are required to bridge the gap between commissioning the new rebuilds and achieving the desired redevelopment outcomes. For instance, it may be necessary to allow time for people involved in the rebuild to gain experience to convert new skills into competencies. The Government, along with the Project Management Offices (PMOs) may also need to give industry time to respond to new/improved requirements of rebuild or market.

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Author's Biography



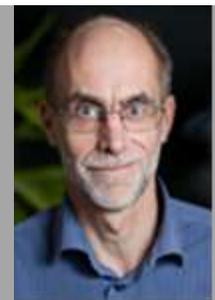
Dr. (Alice) Yan Chang-Richards is a post-doctoral research fellow in the Department of Civil and Environmental Engineering at the University of Auckland. She specialises in resource management for post-disaster reconstruction. Alice's PhD at the University of Auckland was focusing on the incorporation of resource-related information into the improvement of recovery planning and preparedness of government agencies, and of productivity enhancement of various construction organisations. Alice had internship experience working for CARE International in Indonesia as a housing consultant to the post-tsunami recovery and reconstruction projects in 2008. She is particularly interested in longitudinal studies of post-disaster reconstruction.



Dr. Suzanne Wilkinson is Associate Professor in the Department of Civil and Environmental Engineering at The University of Auckland. She has strong connections with the New Zealand construction industry, and has been teaching and supervising students in the fields of construction productivity, procurement, and post-disaster reconstruction. Suzanne is an international expert on post-disaster recovery and reconstruction, leading research in this area for the last 8 years. She is very active in the longitudinal studies of disaster events and the dissemination of these findings into the planning and evaluation processes of Civil Defence Emergency Management in New Zealand. She is also an outstanding science leader within the Resilient Organisations research programme.



Dr. Erica Seville is a research fellow in the Department of Civil Engineering at the University of Canterbury. She co-leads the Resilient Organisations Research Programme. Erica is widely published and is regularly invited to speak on the topic of resilience. She is the only non-Australian member to sit on the Resilience Expert Advisory Group, providing advice and support to the Critical Infrastructure Advisory Committee of the Australian Federal Government. Erica also has extensive experience in offering resilience advice to many organisations in New Zealand. She has a long track record of academic, consulting, and PhD-supervision success. She is well networked with collaborative research involving major US, Canadian and European research groups in this area.



David Brunson is director of Kestrel Group Ltd, a consulting practice specialising in risk and emergency management planning for local and central government agencies and infrastructure providers. David is the New Zealand National Engineering Lifelines Co-ordinator. He draws upon a wide range of experience across the building, infrastructure, emergency management and research sectors. David had led the Civil Defence engineering assessment team in Christchurch over the response period following the Canterbury earthquake, and prior to that he had experience in the 2004 Lower North Island floods, and many of the major earthquakes in the Pacific region, including Gisborne, Newcastle and further afield in Indonesia, Japan and Taiwan.



Dr. Regan Potangaroa is Associate Professor at the School of Architecture, Unitec, Auckland. However, during the semester breaks he is on standby as a RedR Engineer (refer to www.redr.org) often being assigned to the United Nations in various disaster situations throughout the world. In the last 7 years has worked in Aceh (following the 2004 tsunami disaster), Pakistan (following the Afghanistan conflict and again for the 2005 earthquake), Syria (at the time of the Iraq conflict), West Timor (at the establishment of a separate Timor), West Darfur (at the initial onset of internal conflict) and Geneva (with UNHCR). In all, 16 such overseas assignments. Thus, he brings real world experience and a “sense” of disasters (both natural and man-made, emergency and post disaster reconstruction) to the team. He has been involved in various advocacy roles following the February 2011 Christchurch Earthquake.

Notes

¹ For further information on the research undertaken by the Resilient Organisations, please go to www.resorgs.org.nz.

² The major aftershocks following the Darfield earthquake on 4th of September 2010 include Mw 4.7 December 26, 2010, Mw 6.8 on February 22, 2011, Mw 6.0 June 13, 2011, Mw5.8 December 23, 2011 and Mw 5.2 January 7, 2012. Since the Darfield earthquake, more than 7000 aftershocks with magnitudes up to 6.2 have been recorded by GNS. These earthquakes are termed the Canterbury earthquake sequence.

³ The definition of a Project Management Organisation/Office (PMO) is an organizational unit working on behalf of an insurance company with responsibility for the central, coordinated management of building projects such as repair and rebuilding of buildings that have been damaged by the Canterbury earthquake.

⁴ Fletcher Construction has been appointed by the Earthquake Commission (EQC) as the PMO for building work in the \$10,000 - \$100,000 value. Hawkins Limited has been appointed as the PMO for IAG (NZI and State). Arrow International has been appointed as the PMO for AMI (Southern Response). Mainzeal and MWH joint venture has been appointed as the PMO for Vero/ stream has been appointed as the PMO for Tower. Ireland has been appointed as the PMO for Lumley.

⁵ For further information about the land zoning in Christchurch, refer to <http://cera.govt.nz/land-information/land-zones>