

Deloitte Access Economics

Four years on:  
Insurance and  
the Canterbury  
Earthquakes

Vero Insurance

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## Acronyms

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CERA	Canterbury Earthquake Recovery Authority
CGE	Computable general equilibrium
DAE	Deloitte Access Economics
EQC	Earthquake Commission
FTE	Full-time equivalent
GDP/GRP	Gross domestic/regional product
GST	Goods and services tax
NPV	Net present value
NZ	New Zealand
PMO	Project Management Office
TC3	Technical category 3

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## Executive summary

- Over the period September 2010 to December 2011, a spate of earthquakes and aftershocks inflicted substantial damage on the Canterbury region. The location of New Zealand in the Pacific Ring of Fire has meant that the country is prone to earthquakes and other natural disasters. However, multiple and enduring episodes of earthquakes and tremors of such magnitude in the same region have not been experienced before in New Zealand's history.
  - This has led to a rebuilding effort of unprecedented scale in New Zealand, and the fifth-biggest insurance event in the world since 1953. Latest estimates from the Treasury indicate that the total damage bill may be as high as \$40 billion – equivalent to 20% of current gross domestic product.
  - Beyond the economic and financial losses brought about by the Canterbury earthquakes, the social fabric and characteristics of the local community have changed. The Canterbury Earthquake Recovery Authority's Wellbeing Surveys have found consistently higher rates of anxiety and depression due to the dislocation and financial hardship that is associated with prolonged decisions regarding property settlements and insurance coverage.
- This study examines Vero's contribution to the process of economic recovery, both retrospectively from 2010 and going forward to 2025.

### *The role Vero has played in the rebuilding effort*

- As one of the larger general insurers in Canterbury, Vero alone has received 31,050 earthquake-related claims from policyholders, valued at just under \$4.8 billion in today's terms (net of GST and facultative insurance).
  - Around \$3.8 billion, or 80% of Vero's total expected Canterbury earthquake-related liabilities, had been paid out by mid-2014. This includes Vero leading \$1.5 billion worth of claim settlements for important social infrastructure, such as schools, universities, hospitals, transport networks and public housing.
  - There is a tail of payments out to 2021, which includes allowance for delayed receipt of claims or invoices, potential issues with repairs or rebuilds already done, and so on.
- In addition to directly assisting residential and commercial policyholders to restore property losses and facilitate business continuity in the aftermath of the disasters, claims payments from Vero and other insurers contribute to a more rapid return to normal patterns of economic activity. Claim expenditures continue to flow on to the broader economy by providing critical impetus to the construction task and by supporting regional employment through the chain of supporting service sectors.

### *Vero's economic contribution*

- The manner and extent to which Vero's claims payments to policyholders permeate through the economies of Canterbury and the rest of New Zealand have been simulated through computable general equilibrium modelling. Vero's insurance payments are estimated to have contributed an additional \$1.6 billion to Canterbury's gross regional product (GRP) since September 2010. The spillovers from already-resolved claims, along with future entitlement payments are projected to increase Canterbury's GRP by a further \$2 billion over the next five years in net present value terms (NPV).
  - The overall impact of Vero's claims payments to GRP in NPV terms between 2010 and 2025 is \$4.6 billion.
  - Vero's payments are estimated to have added 1,370 full-time equivalent jobs in Canterbury and 100 FTEs across the rest of New Zealand in 2013. This is on top of the workforce employed directly by Vero.
  - It is projected that, in the coming years, the number of additional economy-wide jobs will remain above 750 FTEs even out to 2025. Ongoing higher employment illustrates the lasting feature of stimulus from insurance payments.
  - Reflecting the location of the damages and concentration of construction activity, an overwhelming share of the flow-on impacts is felt in the region when compared to the rest of New Zealand.

## Executive summary (continued)

### *Lessons learned and their implications*

- The post-earthquake recovery process has been extremely complex and lengthy for Canterbury residents and businesses. Understandably, there has been vexation expressed by policyholders regarding the time taken to settle claims and repair properties. This is a sentiment acknowledged and shared by Vero.
- Factors such as some aspects of New Zealand's dual insurance model, unclear protocols, coordination issues between government and private insurers, and the time it has taken for quality information to emerge about changed land formations have all served to extend property settlement times. Indeed, many of these factors are unique to the New Zealand insurance market and are compounded by the unprecedented size of the earthquakes and the number of substantial aftershocks. These factors prevent straightforward comparison of the recovery process following this and other natural disasters.
- During the course of the recovery effort, Vero has continuously learnt from its experiences and has responded to the external challenges by instituting a number of new processes, such as the strategic resourcing of experienced case managers based in Christchurch, a tailored Customer Communication Programme and the establishment of specialised earthquake teams. These have been found to be effective in raising finalisation rates across residential and commercial claims. There is now, also, a greater level of collaboration and confidence between Vero and the Crown's Earthquake Commission (EQC) on the management of 'overcap EQC claims'.
- As a result of these changes, Vero believes the company will be in a better position to manage and accelerate the processing of claims in the unfortunate event of another major disaster. Though Vero's internal changes following the Canterbury earthquakes are certainly important to building the firm's productive capability, the continuation of the external impediments within New Zealand's insurance market is likely to play a much larger role in determining the effectiveness of future disaster-response efforts.
- If both Vero's current customer-centric model had already been in place and the noted external barriers had not existed, it is believed that claim settlements and the economic gains associated with financial stimulus and rebuilding activities would have occurred sooner.
- Perhaps even more crucially – the extent and duration of financial hardship, mental stress and poorer welfare outcomes experienced by some policyholders would have been limited. As the international literature demonstrates, it is usually these adverse social and wellbeing consequences that have longer-term impacts on community psyche, even after material possessions are restored.

# 1 Introduction

New Zealand is located in the tectonically active Pacific Ring of Fire; therefore, earthquakes are relatively common phenomena in this country. Around 20,000 earthquakes are recorded each year, the majority of which are minor and not powerful enough to be felt.

Geological movements were much stronger over the period between September 2010 and December 2011. During this time, New Zealand's South Island endured a cruel sequence of severe and widespread earthquakes in the Canterbury region, including the deadly Christchurch earthquake in February 2011.

Those earthquakes and the ensuing cycle of aftershocks have resulted in the tragic loss of life and in devastated communities, and have inflicted substantial damage to the Canterbury and New Zealand economies. The damage bill from the Canterbury earthquakes is unparalleled in New Zealand history, estimated by the Treasury to be around \$40 billion, the equivalent of almost 20% of the country's current gross domestic product (GDP).

From an international perspective, it is difficult to express or compare the total insured losses and claim finalisation rates caused by the Canterbury earthquakes to other one-off mass disasters, without consideration of the surrounding circumstances. The New Zealand insurance market is unique, with natural disasters managed under a dual model between the Crown's Earthquake Commission (EQC) entity and private insurers<sup>1</sup>. Also, home-owners are indemnified for land damage by the EQC in the event of an earthquake, an entitlement not provided elsewhere.

For Vero alone, around 31,050 claims related to the Canterbury earthquakes have been received, valued at just under \$4.8 billion in present value terms (net of GST and facultative insurance<sup>2</sup>). In this context, Deloitte Access Economics has been engaged to examine Vero's contribution to the process of economic and social recovery in the aftermath of the Canterbury earthquakes.

Deloitte Access Economics has worked closely with Deloitte New Zealand and Vero to provide local expertise and insight. In addition to consultations with Vero personnel, this study has been informed by feedback from key government organisations in New Zealand.

A particular focus of this analysis has been to describe the activities undertaken by Vero, shed light on the reasons for payment delays and share key learnings that can be used to inform future disaster preparedness and resilience policy for insurers and government alike in New Zealand.

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<sup>1</sup> In New Zealand, the EQC covers residential dwelling, personal property and land that is damaged by a natural disaster up to set limits. Building damage beyond these limits is covered by private insurance policies in place at the time of loss. Private insurance policies do not cover damage to land.

<sup>2</sup> Facultative insurance refers to the use of reinsurance by the primary insurer for liabilities attached to a single type of risk (i.e. an individual asset) or defined set of risks (i.e. an asset class). In the case of Vero, facultative insurance payments relate to the reinsurance of particular types of building structures or large commercial/government assets.

## Analytical approach

In an economic sense there two main types of benefits of insurance claims payments:

- **Direct economic impacts** arise when policyholders receive their full entitlements for the physical damage and financial losses incurred.
- **Indirect economic impacts** are created in the sectors that are commissioned to undertake the rebuilding effort and the chain of suppliers which provide the inputs and services to manage and deliver construction tasks.

The manner and degree to which Vero's claims payments to residents and commercial customers induce economy-wide impacts are simulated through Deloitte Access Economics' in-house computable general equilibrium (CGE) model. This is based on detailed information from Vero regarding actual claims payments and projected claims to 2020-21.

This has been done by modelling the Canterbury and New Zealand economies with and without the Vero claims payments in order to estimate the portion of economic growth (and other macroeconomic variables) that is attributable to those claims payments being injected into the economy. The model provides estimates of the impact of the claims payments on macroeconomic variables such as output, employment and household consumption at the Canterbury and New Zealand levels, both retrospectively and into the longer term.

### *Some limitations*

The analysis illustrates the important contribution made by Vero on the transitional dynamics of the regional economy following the Canterbury earthquakes, but there are some interpretative limitations.

Though Vero is one of the largest general insurers in the Canterbury region (with higher market penetration for commercial properties in the CBD, in particular) and covers earthquake risk as part of its general home and contents policy, it is not the only provider of broad risk management services. If Vero did not provide these services, it can be assumed that other insurers would absorb part of the market. Inferences about what would have happened in the absence of Vero's claim payment inflows cannot be made. It should be noted also that the analysis does not measure the broader impacts (such as the cost and other benefits of purchasing insurance) caused by insurance markets in the economy.

It does not capture the social and welfare impacts of earthquakes for affected individuals and communities. These impacts are discussed qualitatively in this study.



## Report structure

Chapter 2 provides measures for the size and level of damage caused by the Canterbury earthquakes, with comparisons made to other severe earthquakes and natural disasters around the world.

Beyond the economic and financial losses brought about by the Canterbury earthquakes, the social fabric and characteristics of the local community have changed. Chapter 3 explores the different facets of community wellbeing, emphasising the areas that could be most improved by faster claim finalisation.

Chapter 4 outlines the repair and rebuilding effort that has been taking place in response to the devastation. The contribution of Vero, a locally led insurer, to the recovery process is highlighted, as are some of the key changes in strategy necessitated by a disaster of this scale. Building on this, Chapter 5 provides estimates of the economy-wide impact of Vero's payments, including the direct financial entitlements received by policyholders and the flow-on gains to other parts of the economy.

Finally, Chapter 6 details the key lessons learned from Vero's earthquake response experience, identifying areas for further improvement in future. Also, an estimation of the potential economic benefits of earlier implementation of the strategies that Vero has found most effective is gauged at a high level.

## 2 The Canterbury earthquakes

From September 2010 through to December 2011, Christchurch and the wider Canterbury region were hit by a series of devastating earthquakes and aftershocks. The four most significant of these (in terms of seismic magnitude), along with the Boxing Day 2010 earthquake, are described in Table 2.1. These five earthquakes have all impacted the private insurance sector.

**Table 2.1: Five major Canterbury earthquakes**

Time	Location	Magnitude	Intensity
4:35am, 4 September 2010	840m from Ansons Road, Charing Cross	7.10	X
10:30am, 26 December 2010	40m from Brougham Street, Sydenham, Christchurch	4.91	V
12:51pm, 22 February 2011	340m from Rapiki Road, Hillsborough, Christchurch	6.34	VIII
2:20pm, 13 June 2011	690m from Barnett Park Track, Redcliffs, Christchurch	6.41	VIII
3:18pm, 23 December 2011	250m from 466–68 Marine Parade, South New Brighton, Christchurch	6	VII

Source: GeoNet (2013)

The 4 September 2010 earthquake (the Darfield earthquake) had the greatest magnitude and intensity in the Canterbury sequence but caused no loss of life (Berryman 2012). It did, however, instigate a large number of near-continuous aftershocks, as Chart 2.1 shows.

Initial estimates of how much damage the 4 September earthquake caused have been revised upwards over time, with more of the total damage apportioned to this event. Insurers continue to grapple with the internationally and historically unique apportionment issues that the Canterbury earthquakes have raised.

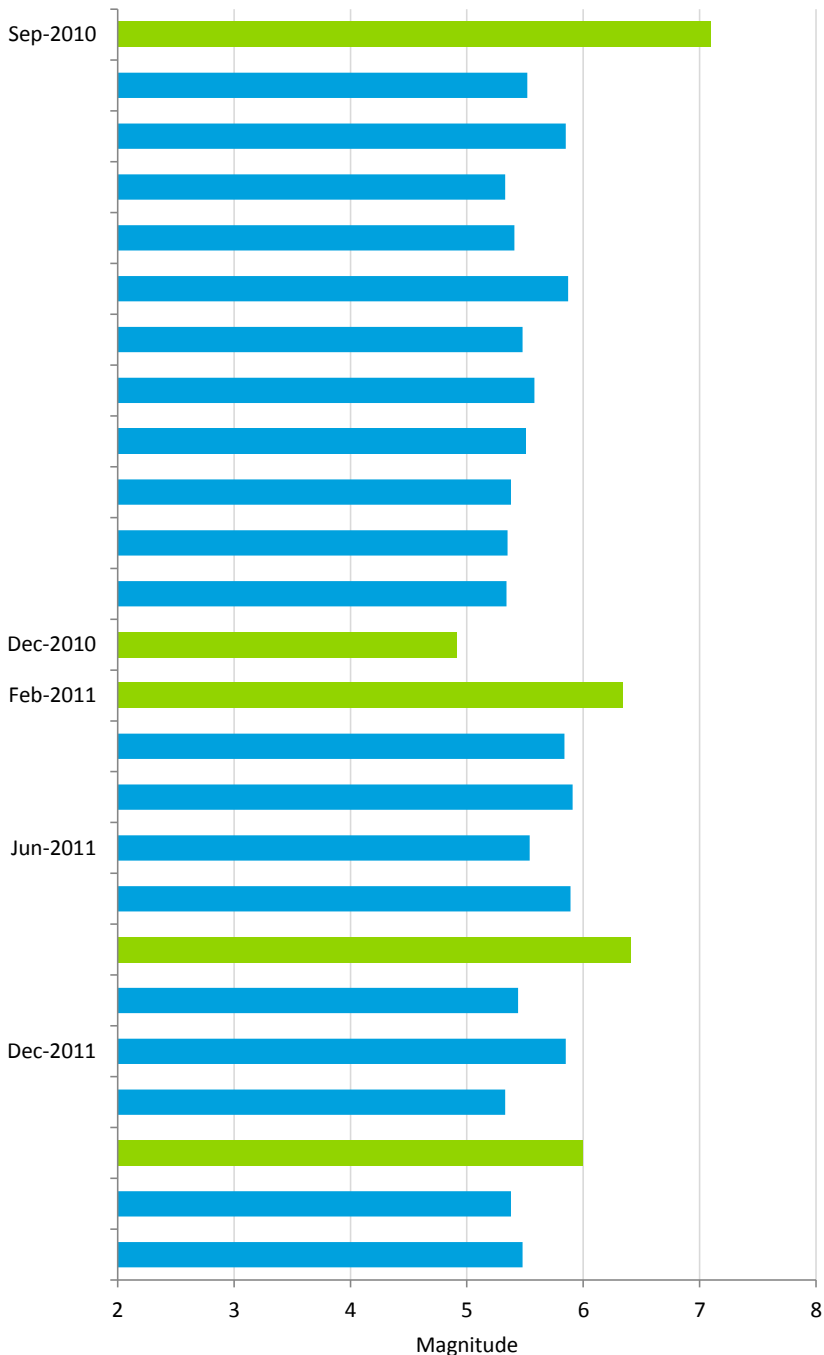
The 22 February 2011 earthquake (the Christchurch earthquake) had a death toll of 185 people (New Zealand Police). An estimated 30,000 houses were destroyed in the entire Canterbury sequence, with the 22 February Christchurch earthquake responsible for around three-quarters of these (Berryman 2012). The only other natural disaster to result in greater loss of life in New Zealand's history than the Christchurch earthquake was the 1931 Hawke's Bay earthquake, with 256 lives lost (Te Ara 2014).

The June 2011 earthquake, originating from South New Brighton was ranked equally as intense as was the Christchurch earthquake; however, it resulted in one death and less damage to the city and surrounding areas. A number of buildings that had been slated for repair from earlier damage were destroyed.

Individually, each of the major earthquakes (and the thousands of aftershocks) caused significant damage to people and property, especially the Christchurch earthquake of February 2011. The fact that the sequence occurred over such a short time frame meant

that ensuing negative impacts were cumulative and compounding, and greatly challenged the recovery and rebuild efforts beyond what had been anticipated or experienced before.

**Chart 2.1: Top 25 Canterbury earthquakes from September 2010 to December 2011**



Source: Geonet (2013)  
 Note: Chart 2.1 shows the top 24 Canterbury earthquakes (by magnitude) as well as the Boxing Day 2010 earthquake. The earthquakes described in Table 2.1 are shaded in green.

## 2.2 Putting the Canterbury earthquakes in context

Against any yardstick, the series of earthquakes in Canterbury over 2010 and 2011 were major disaster events in New Zealand's history. This section presents more context regarding the scale of the Canterbury earthquakes, in comparison first to other natural disasters in New Zealand and then to international disaster events.

### Past events in New Zealand

New Zealand has a history of earthquakes and other natural disasters. Major fault lines run much of the length of the country, with the capital situated directly above the infamous Wellington Fault. The Canterbury earthquakes were caused by comparatively minor faults (GNS Science 2014).

On the basis of estimates produced by the Insurance Council of New Zealand, the collective costs of the Canterbury earthquakes are several orders of magnitude greater than all other natural disasters in the country's past (Table 2.2). The estimated \$29 billion of total damages in Table 2.2 comprises \$17 billion of private insurance costs and \$12 billion from the EQC. Note that the value of insurance claims associated with the Canterbury earthquakes in Table 2.2 is an indicative estimate as claims are still being processed.

**Table 2.2: Top 10 disasters in New Zealand by insurance costs 1968–2013**

Event	Year	Insured losses (NZ\$m)
Canterbury earthquakes	2010–11	29,000
Bay of Plenty earthquake	1987	371
Wahine storm damage, including loss of the Wahine	1968	221
Storm damage, lower North Island	2004	140
Invercargill/Southland floods	1984	140
Nationwide storm	2013	75
Storm event – Far North/Auckland/Coromandel	2007	69
Cyclone Bola	1988	68
Queenstown Lakes District floods	1999	64
Canterbury storms	1975	62

Source: Insurance Council of New Zealand 2014a

Note: Events other than the Canterbury earthquakes and the nationwide storm in 2013 were inflation adjusted as at 31 December 2011.

### International events

It is estimated that the 4 September 2010 earthquake was the third greatest insured loss event globally in 2010 (Aon Benfield 2010). The 22 February and 13 June 2011 earthquakes were both among the top 10 insured loss events worldwide in that year, with the February event ranking second, and the June event ninth (Aon Benfield 2010).

On its own, the February 2011 earthquake is ranked as the ninth most-costly global insured loss event since 1980 (see Table 2.3). Based on current estimates of insurance claims paid

and expected future payments (see Section 4.2 and Chapter 5), the Canterbury sequence as a whole is likely to rank sixth.

**Table 2.3: Top 10 costliest global insured loss events 1980–2013**

Location	Event	Year	Insured loss (2014 USD\$m)	Share of losses insured
USA	Hurricane Katrina	2005	75,884	0.50
Japan	Earthquake/tsunami	2011	42,400	0.19
USA	Hurricane Sandy	2012	30,680	0.43
USA	Hurricane Andrew	1992	28,900	0.64
USA	Earthquake	1994	24,633	0.35
USA	Hurricane Ike	2008	20,535	0.49
USA	Hurricane Ivan	2004	17,388	0.60
Thailand	Flooding	2011	16,960	0.37
New Zealand	Christchurch earthquake	Feb 2011	15,476	0.73
USA	Hurricane Wilma	2005	15,250	0.57

Source: Munich Re 2014

Note: Munich Re data have been converted to 2014 dollars using United States Department of Labour 2014

While the Christchurch earthquake is among the top 10 insured loss events worldwide since 1980 on the above estimates, it is outside the top 10, based on *overall* losses. This indicates that the impacts of the Canterbury earthquakes had a high level of insurance cover relative to other disaster-prone countries. On the basis of Munich Re (2014) estimates, insurance covers 73% of the overall losses from the Christchurch earthquake: a greater percentage than that of any of the other top 10 insured loss events globally from 1980 to 2013. This number will likely vary in a final evaluation of total and insured losses. Among the 10 costliest events from 1980 to 2013, based on overall losses, the share of losses insured ranges from 0.4% (Chinese earthquake in 2008) to 64% (Hurricane Andrew in 1992 in the USA).

The function of insurance is to transfer risk associated with events that are imperfectly foreseeable, costly and harmful between, on the one hand, individuals, businesses and governments and, on the other, insurance companies. Simply put, the function is to offset the costs of harmful events with insurance payouts. On that basis, insurance has served its purpose in the aftermath of the Canterbury earthquakes, with internationally high levels of insurance coverage.

Table 2.4 below provides a comparison of the major features of the Canterbury sequence with other major recent earthquakes worldwide.

Table 2.4: Comparison of the Canterbury and other major recent earthquakes

	Canterbury	Tohoku (Japan)	Central South Chile	Kobe (Japan)	Northridge (United States)
<b>When</b>	September 2010 to December 2011	11 March 2011	27 February 2010	17 January 1995	17 January 1994
<b>Population affected</b>	563,000 in Canterbury region in 2010	About 400,000 directly affected	More than 2.5 million people directly affected	500,000 in worst affected area	~30,000 in worst affected area
<b>Fraction of economy</b>	12.4% of national GDP in 2010	4.0–6.0% of GDP	Worst affected areas, 10.0% of national GDP	Worst affected areas, 4.0% of national GDP	Very small share of national output
<b>Damage estimates</b>	185 deaths, >150,000 homes damaged, 30,000 seriously	>15,000 deaths; 300,000 buildings partially or totally destroyed; 600,000 damaged	>500 deaths; ~450,000 houses destroyed or damaged; extensive damage to infrastructure	>6,000 people died; 100,000 buildings destroyed; 300,000 damaged	~60 people died; >100,000 commercial and residential buildings damaged or destroyed
<b>Industrial structure affected</b>	Tourism hub, accounting for roughly 20.0% of total tourist arrivals in NZ; manufacturing centre, although most were outside worst-affected area.	Damage to electricity generation; radiation from Fukushima meltdown; several ports damaged; damage to automotive and electronic goods factories, agricultural and fishing sectors	Damage concentrated to areas accounting for 40.0% of agricultural output, 20.0% of manufacturing; tsunami destroyed port facilities and devastated the fishing industry	Japan's major port; manufacturing accounted for over 25.0% of prefecture GDP but also supplied parts for manufacturing in other areas of Japan	Mostly light manufacturing and services sectors; significant indirect costs from shutdown of Santa Monica freeway
<b>Losses</b>	Insured losses of NZ\$29b (Insurance Council of New Zealand 2014a)	Overall losses of over US\$200b (over 3.0–4.0% of GDP); US\$35b to US\$40b represented injured losses	Losses of around \$US30b (20.0% of GDP); insured losses of around US\$8b	Losses estimated at over US\$100b (~2.0% of GDP); insured losses of about US\$3b	Over US\$40b (<1.0% of GDP); insured losses of US\$15b
<b>Initial conditions</b>	Modest recovery from recession; positive medium-term outlook; some spare capacity; high agricultural and commodity prices	Interest rates at zero; high government debt; government responsible for liabilities beyond a certain total insurance cost borne by insurers	Economy had begun to recover from recession at the time of the earthquake; relatively strong fiscal position	National and regional economy weak before the earthquake; large stocks of saving helped residents	San Fernando Valley had been in recession before the earthquake; depressed local housing market; relatively high vacancy rates (reducing the need for temporary housing)

Source: Adapted from Parker and Steenkamp (2012)

## 3 The social consequences of the Canterbury earthquakes

Natural disasters often lead to significant economic and financial losses for affected communities. An aspect that can be masked in official damage figures is the chain of social consequences that are triggered after a disaster and its longer-term manifestations.

Unlike the accompanying wealth losses, the social consequences of a disaster are inherently intangible, can be internalised and challenge traditional methods of identification and quantification. This is compounded by the fact that the distress and emotional toll caused by a disaster is different for each individual, depending on factors such as personal circumstance, the type of event at hand, regional characteristics, level of insurance coverage and available support networks.

International experience and early observations from the Canterbury earthquakes suggest that these social impacts can be gauged through community wellbeing indicators such as population movements, the incidence of mental illness, housing affordability, employment outcomes and crime patterns. Tracking these measurements over time provides more meaningful findings as poorer public welfare outcomes are often the culmination of several pressures that may not be as forceful immediately after an event as they become later.

It is an unfortunate reality that natural disasters tend to adversely impact community wellbeing. What is less clear is the extent to which these social consequences could be avoided or minimised through better preparedness, disaster management and resilience strategies applied by government, private insurers and other assistance groups.

As the rebuilding effort from the Canterbury earthquakes continues into its fourth year, the dual insurance model currently in place in New Zealand, and its part in extending claim settlement timeframes, has raised specific concerns around the impact of such events on community welfare.

Prolonged decisions about property settlements and insurance coverage have been found to bear significantly on the social healing process. In general, the longer that residents wait for their claims to be resolved and settled, the higher the likelihood that disruptions to normal life and financial hardship will transcend personal thresholds and cause lasting mental and wellbeing challenges.

The following chapter explores changes in the community profile of the Christchurch City and Canterbury region in the aftermath of the Canterbury earthquakes, highlighting parallels to the social impacts experienced during other major international disaster events. A key consideration has been to separate the effects that can reasonably be attributed to the Canterbury earthquakes as opposed to those that form part of long-standing, socio-economic trends.

### 3.1 Population and demographic dynamics

Population size, demographics, a shared history and social interactions play important parts in shaping the cultural identity of a community. In addition, population is a strong driver for determining the demand for natural, physical and economic resources. In essence, the more people there are in a region, the higher the demand for essential and recreational goods and services, which, in turn, creates and

sustains local employment. Population growth is widely considered to be one of three 'P factors' that underpin long-term economic growth and rising living standards; the others are productivity and (workforce) participation.

A decline in population can elicit the opposite effect, reducing both demand and supply-side inputs like labour. The reduced activity can place greater pressure on local businesses, jobs and the viability of public services such as hospitals and schools.

The population of any region is seldom static and undergoes constant change through the natural processes of births and deaths or shifts in migration patterns. Before the 2010–2011 series of earthquakes, the Christchurch City's population was growing and was forecast to do so out to 2031 (where subnational projections cease). For instance, over the four-year period to June 2010, Christchurch City's population grew at an average annual rate of 1.0%, thanks to both natural gains (2,200 per year on average) and net migration (1,600).

In the immediate aftermath of the February 2011 earthquake, there were reports of around 70,000 people leaving Christchurch City (19% of the total population). This appeared to be a short-term response to the disaster, accentuated in regions where the damage sustained made homes unliveable, essential infrastructure like water and sewage systems was broken and important social services such as schools were shut down indefinitely. Statistics New Zealand data suggest that the majority of these people returned over the subsequent weeks and months.

In the year to June 2011, 8,900 people, or 2.5% of the population, left Christchurch City, followed by the departure of another 4,600 people over the next year. Around 80.0% of these residents are estimated to have relocated within the wider Canterbury region. The five territorial authorities with the fastest rate of population growth over June 2010 to June 2012 were Selwyn, Queenstown-Lakes, Ashburton, Waimakariri, and Hurunui. As Waimakariri and Selwyn are very close to Christchurch City, once population migration to these two territorial authorities is taken into account, overall population declines in the area are relatively minimal.

This is consistent with international literature for the Queensland floods and Kobe earthquake in Japan where displaced people relocated near their previous homes in order to maintain links to their communities and continue to work and attend schools in their usual places (Love 2011).

## **Demographic changes**

From a demographics perspective, outward migration has been higher amongst the 0–19 and 35–49 age groups. This indicates that there has been a net outflow of children and their parents since June 2010. In contrast to trends before the Canterbury earthquakes, there have been fewer young adults aged between 15 and 19 years moving to Christchurch City for secondary and tertiary studies.

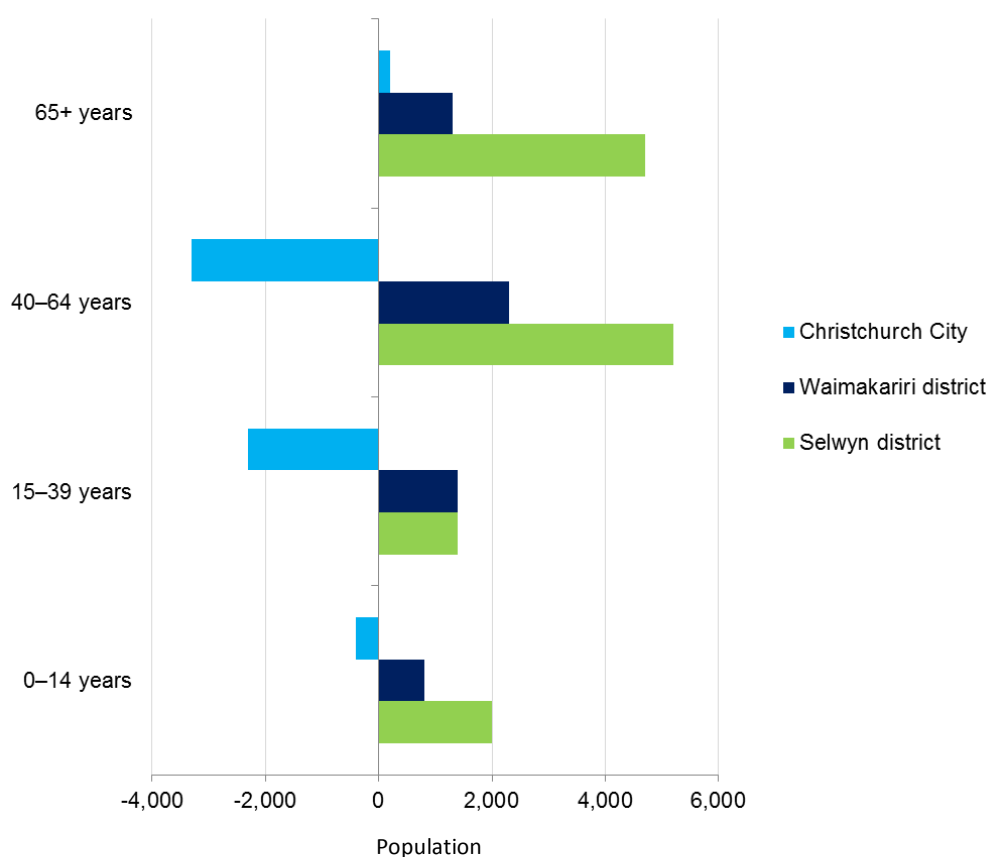
In the young male adult population, there has been a net increase of 650 men aged 20–34 years over the four-year period 2010–2014, reflecting the influx of construction, engineering and trade workers involved in the rebuild effort. In comparison, there was a 1,600 decrease in female residents in the same age group.

The population aged 50 years and over has grown slightly, up by 2,500 over June 2010 to June 2014. While this increase reflects a natural progression of middle-aged people into this group, older residents have appeared to be more reluctant to leave Christchurch City also.



Overall, the disproportionate movement of children, parents, students and mobile young professionals out of Christchurch City has raised the median age of residents from 36 in 2006 to 38 in 2014, in a region that was already in the midst of pronounced population ageing. Chart 3.1 displays the movement of population groups out of Christchurch between 2010 and 2014.

**Chart 3.1: Population change by age groups between 2010 and 2014**



Source: Statistics New Zealand 2014

### Long-term impacts

Without a natural increase in the birth rate over the period between 2010 and 2014, and inward migration from those involved in the rebuilding process, the total decline in the number of residents in Christchurch City may be closer to the 20,000 mark, equivalent to 5.5% of the pre-earthquake population base (Statistics New Zealand 2012). It is unknown whether the people who have left the city (and chosen not to reside in neighbouring Selwyn or Waimakariri) will be gone for good or will return at some later stage.

In the case of Hurricane Andrew in Florida and the Kobe earthquake in Japan, population dynamics, and outward migration in particular, were found to stabilise within two years or less. An estimated 1.5% of residents left Florida permanently after Hurricane Andrew; this figure was slightly higher in Japan, where 2.5% of the original population left and did not come back after the Kobe earthquake (Sapere Research Group 2011).

Though often cited as a comparison for the impacts of the Canterbury earthquakes, it is difficult to draw direct resemblances from the experience of New Orleans after Hurricane Katrina where departure rates

were estimated to be around 30.0% (Sapere Research Group 2011). For one, the level of damage was on a different magnitude, with the entire city being evacuated for more than one month. Moreover, the reconstruction and recovery processes in New Orleans were deemed widely to be inadequate and reduced the chances of greater population return.

## 3.2 Prevalence of mental illnesses

Mental wellbeing is widely described as a positive state of mind, where people are engaged with life and have a sense of meaning and purpose. Several studies have found that mental wellbeing can positively affect many facets of a person's life, including family and friendships, productivity, employment outcomes, education achievements, physical health and life expectancy (Spittlehouse 2014; and Wells et al. 2006).

Mental health issues have been strongly correlated to large natural disaster events around the world. The World Health Organization estimates that, after a disaster, severe mental health disorders can increase from 2.0% to 3.0% to 3.0% to 4.0% of the population, while mild to moderate mental health issues can double from 10.0% to 20.0%.

The Canterbury earthquakes and the associated loss of life, and damage to homes and businesses have deeply affected the mental health of some residents in Christchurch City and the greater Canterbury region (Fergusson 2013). In May 2011, the Chief Science Advisor Professor Sir Peter Gluckman hypothesised that up to 5% of Canterbury's population may experience significant psychological ill health as a result of the Canterbury earthquakes. This has subsequently been supported by admission data from both the Canterbury District Health Board and Christchurch's Pegasus Health's mental issues unit. In the case of the Pegasus Health mental issues unit, there was a 15% increase in appointments over the two-year period to December 2012.

The specific nature of earthquakes and the constant threat of aftershocks well after the initial earthquake event serve as further barriers to the mental healing process as victims are required to deal with multiple events over a longer period of time than is the case with other one-off disasters. A review of mental health services demanded after large natural disasters by MacFarlane and Williams in 2012 asserts that the most common symptoms presented by patients are anxiety, hyper-vigilance and sleep disturbances.

This study also forms part of a growing body of evidence to suggest that symptoms of mental illness can persist long into the future, even after the community is rebuilt to pre-disaster levels, or the physical injuries and financing difficulties have dissipated. This can be related back to the trigger, or tipping points, that cause the onset of mental health issues. In broad terms, mental illness triggers after a natural disaster can be classified into two forms:

- **Primary stressors:** These are directly related to the disaster event, such as the death of a loved one, damage to the residence and physical injuries.
- **Secondary stressors:** These are related to the by-products of a disaster event, such as financial adversity, employment uncertainty, poorer-quality living arrangements and disruptions to day-to-day life.

International experience suggests that it is these secondary post-disaster stressors that have a longer-term impact on community wellbeing and individual personal mental states (Lock et al. 2012). Whereas the loss of physical assets and damage are considered to be unfortunate – yet uncontrollable –

consequences of a natural disaster, there is a perception that more can be done to expedite the recovery process and limit the duration of adversity faced by the community.

This characterises the tension between the desire for immediate action and the need for formal protocol, planning and future risk safeguarding that occurs in the aftermath of natural disasters. Over time, these tensions are typically aggravated, with the desire for action growing stronger. Symptoms of disaster-triggered mental illness also tend to become more prominent in time. In other words, the longer it takes to restore quality of life to pre-disaster levels, the greater the community frustration and chances that personal mental thresholds are exceeded indefinitely. In this respect, prolonged decisions about property settlements and insurance coverage can considerably elevate the risk of mental ill health and hinder the chances of full psychological recovery (Chou et al. 2004; Ke 2010).

The shift in prominence from primary disaster stressors towards secondary stressors over time has been evident in the Canterbury region. Figures from the Canterbury District Health Board show a drop in stress, hypertension, sleep disturbances, depression and anxiety admissions from mid-2012 onwards. By comparison, the total number of residents accessing mental health support services increased by 7% in the year to June 2012, and by 5.0% in the following year.

The September 2012 Canterbury Earthquake Recovery Authority (CERA) Wellbeing Survey revealed that a growing number of people started reporting that their mental health was being adversely affected by the uncertainty around home repairs, rebuilding and the level of insurance assistance. Table 3.1 presents key findings from the 2012 CERA Wellbeing Survey. Approximately 65% of those surveyed indicated that dealing with EQC and insurance coverage issues in relation to personal property or house had an impact on their mental wellbeing, with 27% reporting that this had a moderate to major negative impact on their everyday lives. The latest CERA Wellbeing Survey of April 2014 shows that, since the first survey was conducted in 2012, the share of residents that continue to experience moderate to major negative impacts in relation to their dealings with the EQC and private insurers has dropped from 38.0% to 21.0%.

Other issues found to have a moderate or major negative impact on the daily lives of residents were living in damaged environments, being surrounded by construction work and difficulty accessing transport.

**Table 3.1: Most common negative outcomes from the Canterbury earthquakes in 2012**

Negative outcome	% who experienced outcome	% who reported a moderate to major negative impact
Loss of recreational, cultural and leisure time facilities	69	34
Distress or anxiety associated with ongoing aftershocks	66	42
Dealing with EQC/insurance issues in relation to personal property	65	38
Making decisions about home damage, repairs and relocation	54	29

Source: CERA Wellbeing Survey, 2012

While there have been some obvious challenges to mental wellbeing due to the Canterbury earthquakes, residents also experienced some positives. These include a heightened sense of community and pride in their ability to cope (CERA 2012). Research by Joseph (2011) on post-traumatic growth

suggests that the bonds between family and friends can strengthen as people become more compassionate and find new perspectives on life after successfully navigating through the adversities of a natural disaster.

### **Vulnerable groups in society**

Habitually, the severity of adverse mental health outcomes following a natural disaster is felt disproportionately across population groups; the brunt is faced by those in lower socio-economic and health profiles.

A study by Lock et al. in 2012 on the secondary stressors from extreme disasters found that the groups that are most vulnerable include people who already had mental health issues prior to the event, those on lower incomes, people with fewer social networks or households that experience the most significant losses, such as deaths of family members, personal injury or property damage. Women, especially mothers with young children, are likely to face greater stresses due to a disaster event.

In April 2014, the groups reporting higher levels of stress in the CERA Wellbeing Survey were those living in temporary accommodation (40.0% more likely to be stressed), people living with a physical health condition or disability (39.0%), Māori (33.0%), renters (30.0%) and those who had moved house since the earthquake sequence began (27.0%). In contrast, 85.0% of people who rated their overall quality of life positively were from higher-income households (defined as gross earnings of more than \$100,000 a year).

## **3.3 Housing stock and affordability**

Access to housing is a basic human need. Affordable housing is, therefore, essential to the functioning capacity and economic participation of all members of the community. A commonly applied measure for housing affordability is whether rented or owned housing costs equate to no more than 30% of gross household income.

Housing affordability and the availability of stock are closely linked concepts in practice. When the demand for housing in a region is greater than the supply, market rents are bid upwards. In these instances, lower-income households can be at risk of effectively being priced out of the market, or forced to settle for less-than-comfortable dwellings.

Poor quality of overcrowded housing can affect mental and physical wellbeing (United States Ministry of Social Development, 2012). In particular, housing that is cold, damp and mouldy can worsen the health of susceptible groups such as small children and the elderly. As is noted in the previous section, changes in housing environment can act as significant secondary stressors, negatively impacting on individual and community resilience after a natural disaster.

As a result of the Canterbury earthquakes, New Zealand Treasury and CERA data indicated that an estimated 171,000 properties in greater Christchurch required a dwelling damage claim. Around 12,000 properties were considered to have sustained serious damage and, of these, around 4,400 outside the red zone were deemed uninhabitable due to the extent of the damage. An additional 8,000 properties were classified as part of the residential red zone.

The availability of social housing was particularly diminished in the wake of the Canterbury earthquakes. Housing New Zealand and Christchurch City Council provide social housing to people with serious housing needs. Prior to the earthquakes, Housing New Zealand had 6,120 properties in greater

Canterbury, which housed approximately 18,000 people. Around 95.0% of these properties were damaged in the earthquakes, and 550 were classified as uninhabitable including 215 in the residential red zone (188 in Christchurch and 27 in Kaiapoi).

Other niche forms of housing were also affected. For example, at least 250 beds in boarding houses, bedsits and low-cost, one-bedroomed units in the east of the inner Christchurch City were lost. These dwellings predominantly housed vulnerable and homeless single men with social and mental health issues.

Acknowledging that data on homelessness and overcrowding are limited, the Ministry of Business Innovation and Employment (MBIE) estimated that, as a result of the Canterbury earthquakes, between 5,500 and 7,400 residents were left without secure housing in 2013, up from around 3,750 before the disaster sequence.

Adding to the financial impacts of the disaster was the need to meet mortgage repayments for damaged properties. This is consistent with a temporary spike in mortgage delinquencies immediately following the Canterbury earthquakes. For example, reports from ANZ and Westpac found that 90+-day mortgage delinquencies in Canterbury peaked at between 80 and 90 basis points in March 2011, and started reverting back to historical levels from August 2011 onwards. A temporary increase in default rates is similar to what was observed after Queensland's summer of disasters in 2010–2011. Default rates following major disasters in the United States appear to be relatively low; however, home ownership in these disaster zones also appears to be low.

There are suggestions that a cut in the official cash rate, lower short-term fixed mortgage rates, concessional rates for households that had accepted government offers on their red-zoned properties and temporary accommodation assistance have all played a role in easing mortgage-related financial pressures.

### **Impacts of lower affordability and housing stock**

International evidence from Hurricanes Andrew and Katrina in the United States, the Kobe earthquake in Japan and the Queensland floods in Australia indicates that, in addition to lowering the quantity of available low-cost and other private housing, landlords typically charge greater rents after a disaster, even once the rebuilding process nears completion (Bolin and Stanford 1999; Hirayama 2000 and Risk Frontiers 2011). Initial increases in rental costs can be caused by excess housing demand but these may be sustained where houses are repaired to a higher standard.

According to New Zealand tenancy bonds data, in the year to January 2011, there were 10,170 bonds lodged with weekly rents below \$300; however, in the year to January 2014, 3,970 such bonds were lodged. These figures suggest that there has been a 60.0% reduction in the availability of low-cost private rental stock since the Canterbury earthquakes.

As of April 2014, mean private weekly rents across the wider Canterbury region were continuing to increase at a faster rate than the national average (Statistics New Zealand, 2014). Between 2010 and November 2013, weekly rentals for houses with five or more bedrooms increased by 46.0% in Christchurch City.

Beyond the direct reduction in housing stock due to the Canterbury earthquakes, there are some specific pressures that continue to impact housing affordability and availability across the low to mid-end public housing and rental market. These include the following:

- **Existing trends:** There has been an enduring disparity between optimal housing levels and pricing in greater Canterbury. The earthquakes of 2010 and 2011 have further intensified housing pressures in the region, especially for low socio-economic groups.
- **Displaced households:** The permanent relocation of (1) households from the residential red zone and from other homes that cannot be rebuilt, (2) displaced households requiring temporary accommodation while their homes are being repaired, and (3) the displacement of households previously living in affordable or public housing arrangements is placing pressure on the private rental and social housing market.
- **Construction workforce:** The arrival of a large construction and trade labour workforce to assist with the rebuild is crowding out accommodation for displaced local residents. In addition, an initial shortage of temporary accommodation for the construction workforce is believed to have hindered the capacity of the outside workforce to fully engage in the rebuilding effort from the onset.

The introduction of short-term and medium-term temporary accommodation villages in August 2011 eased some of these housing pressures. The Government's Temporary Accommodation Assistance allowance and the Earthquake Support Coordination Service have helped in this regard also. Significant land has been freed up to enable rapid rebuilding, with thousands of sections rezoned in greater Canterbury since the earthquakes. Statistics New Zealand figures show that the number of building consents for new dwellings is rising at a higher rate than is the trend across the rest of the country in 2013.

Looking ahead, the extent to which housing and affordability pressures soften in Christchurch City and the wider Canterbury region is very much contingent on settlement time frames for insurance claims or, more precisely, the expected completion dates for the houses of displaced residents. As more claims are resolved and houses are refurbished or rebuilt, fewer construction and trade workers will require ongoing rental accommodation. However, in addition to timely completions, the productivity and quality of skills of the construction workforce are essential in securing a better future for the greater Canterbury housing market and its residents.

As the New Zealand Productivity Commission's 2011 report on housing affordability states, the performance and productivity of both the Canterbury region and the national building and construction industry play crucial roles in the supply, quality and cost of new housing, along with the upkeep of existing rental, social and owner-occupied housing. The Commission's estimates illustrate a slowdown in construction workforce productivity and skill levels before and, certainly, after the Canterbury earthquakes present a concern for ongoing rebuilding efforts.

### 3.4 Employment outcomes

Employment has a direct impact on wellbeing, affecting the quality of life afforded by an individual and their family. Above the role that employment plays in securing income and meeting material needs, a person's job is often the apogee of preceding life achievements and can be central to their identity.

The complement to these facts is that *unemployment* and *underemployment* are tied to economic underperformance, lower socio-economic status, higher rates of mental illness, mortality rates and criminal activity (Keefe et al. 2001; Milligan et al. 2006; Waddell and Burton 2006). The Canterbury earthquakes spelt immediate economic consequences across the Canterbury region and the rest of the South Island. The most severely impacted sectors were tourism, small business and service industries such as retail, hospitality, education and aged care.

Businesses in the Christchurch CBD were cordoned off and red zoned following the February 2011 earthquake, prohibiting trade and access for employers and workers in this area. Smaller suburban centres in older parts of town such as Sydenham were affected also as the damage from masonry closed nearby roads, making it harder for residents to reach businesses located here. Some of the large shopping malls were also closed off. Overall, businesses were required to either shut down completely, or operate at a reduced capacity or shift to different parts of town.

Initiatives such as the Earthquake Support Subsidy allowed businesses to pay their employees when employers were unable to operate or were losing significant trade. A similar package called Job Loss Cover was set up to assist the self-employed.

In addition to this, a new wave of economic growth and employment activity has been generated by the rebuilding task. The occupational roles in greatest demand have been carpenters, joiners, concreters and general labourers. Statistics New Zealand figures suggest that, in 2014, one in eight adults, or 25,800 people, in greater Canterbury worked in the construction industry. This is an increase of almost 60.0% since 2006.

The rebuild effort has stimulated employment also in service occupations that support construction and land planning, including accountants, insurance, finance and lawyers. Other industries that have seen significant employment growth include social assistance, up by 14.0% from 2006, and public administration and safety (an increase of 30.0%). As the major driving force behind current and medium-term economic and employment growth, the performance of the New Zealand building and construction sector is more critical than it has been ever before.

On the back of earthquake business assistance measures and rebuild employment, fewer people than was expected moved onto the unemployment benefit during the period immediately after the earthquakes. Since then, the labour market has regained footing, with many businesses relocating to new premises and beginning trading again by the start of 2013.

In fact, more people have been leaving benefits for work in greater Canterbury in recent years than was the case during the period leading up to the earthquakes. For example, the proportion of beneficiaries in Canterbury who left a benefit for work was 3.8% in May 2011, compared to 2.6% across New Zealand at the same time (Statistics New Zealand 2014). In January 2014, 2.1% of unemployed individuals left the benefit for work in Canterbury, the same rate as across New Zealand.

One feature of this trend is that more men than women have been leaving unemployment benefits. This is likely to be a reflection of the manual nature of many of the new employment opportunities created by the rebuilding task. Pre-existing female workforce participation issues such as finding appropriate child care and flexible part-time options for single-parent households are likely to be other contributing factors.

### **Labour market resilience**

Table 3.2 indicates that, unlike many aspects of community wellbeing, labour market outcomes appeared to improve after the Canterbury earthquakes. Prior to the earthquake sequence, unemployment rates and workforce participation rates were tracking upwards, though remained below national levels. Since the Canterbury earthquakes, unemployment has decreased markedly, from 5.5% in 2010 to 3.8% in 2014. Similar decreases have been observed for the number of people outside the workforce. While participation rates have increased, the rise is off a lower working population base, with greater outward migration exhibited amongst more-mobile younger segments of the labour force.

As employment indicators continue to pick up, concerns about workplace stress as a result of the earthquakes appear to be having a less negative impact on the daily lives of people in Christchurch City and the greater Canterbury region. In the 2014 CERA Wellbeing Survey, 13.0% of residents indicated that work pressures such as business relocation and workload increases are having a moderate or major negative impact on their everyday lives compared with 27.0% in September 2012.

**Table 3.2: Canterbury labour force statistics**

Labour force metrics	2010	2011	2012	2013	2014
Persons employed ('000)	333.2	335.4	317.1	319.4	337.3
Not in labour force ('000)	152.8	153.2	158.7	147.3	142.7
Working age population ('000)	505.3	508.1	494.0	484.4	493.4
Labour force participation rate (%)	69.8	69.8	67.9	69.6	71.1
Unemployment rate (%)	5.5	5.5	5.4	5.2	3.8

Source: Statistics New Zealand, 2014

Figures at higher levels of aggregation conceal fluctuations and changes in outcomes for smaller groups within the labour force. From January 2011 to January 2014, although the region-wide employment rate increased, part-time employment fell by almost 10%. This is largely attributed to the fall in the number of people employed in the retail trade and hospitality sectors. These industries have a higher proportion of part-time and lower-income female workers.

In the three years after the Canterbury earthquakes, the female labour force participation rate has fallen from 65% to 60% in Canterbury, compared with a modest increase for women nationally (to 62%). Employment for younger residents, aged between 15 and 24 years, also decreased in the Canterbury region.

As the rebuilding task nears completion in the coming years, it is likely that employment in sectors such as tourism and accommodation will rebound, as more visitors are drawn to the rejuvenated Christchurch City outlined in the CBD Blueprint. At the same time, reduced construction activity will likely contribute to a slowdown in the supporting chain of service industries that have contributed to the Canterbury recovery. After a period of adjustment, it is likely that economic growth rates and by extension, employment indicators, will rebalance and more or less revert to the trends seen before the Canterbury earthquakes.

### 3.5 Change in crime patterns

Offending patterns, actual or even perceived, can impact on the appeal of a community to existing and new residents, signalling information about the quality of life, safety and degree of poverty in a region. Factors that tend to increase crime rates include low incomes, low levels of educational attainment and disruptive family upbringings. This notion is reinforced by findings from the New Zealand Crime and Safety Survey in 2010. In addition to preventing people from reaching their potential in life, considerable social and economic resources are devoted to reducing the likelihood of offending and recidivism rates.

As would be expected following a major natural disaster, the number of calls made to emergency services in the aftermath of the Canterbury earthquakes was high. However, these calls related mostly to damage-response needs rather than to criminal activity. Indeed, over the one-year period from the September 2010 earthquake, New Zealand Police recorded a substantial fall in total crime in the Canterbury region.



The total crime rate for the three years before the Canterbury earthquakes averaged at around 1,070 offences per 10,000 people in the population, higher than the 800 offences per 10,000 people recorded in the year to September 2011. According to New Zealand Police data, despite fluctuations and increases in some quarters, between September 2010 and September 2012 crime rates have declined overall across a number of areas:

- Assaults in public places dropped by 32.0%; serious assaults resulting in injury fell by 11.0%.
- Burglaries, robberies and vehicles stolen in greater Canterbury decreased by around 15.0%.
- The number of court protection orders was 17.0% lower and the number of pre-court counselling applications was 39.0% lower.
- Apprehensions for all offences by young people, aged 17 to 20 years decreased by 25.0%.
- Apprehensions for offences of a violent or sexual nature decreased by 28.0%.

The reduction in crime in Canterbury is a rather positive, yet unique, outcome when compared to other widespread disasters around the world. For instance, Hurricane Katrina was thought to instigate a spiral of petty theft, assault, domestic violence and gang activity. However, along with a larger devastation footprint caused by the hurricane, the New Orleans population differs greatly to that of greater Canterbury's in several important aspects, including higher levels of criminal activity and unemployment, and lower incomes before the hurricane.

Even in the case of the Queensland floods, in a State where crime rates had been declining for more than 15 years, criminal activity increased by 6.0% in the year after the series of cyclones and flooding natural disasters over 2010 and 2011 (Risk Frontiers 2012). This included a 12.0% rise in armed robberies, and 24.0% and 22.0% increases in the numbers of arsons and car thefts respectively.

A number of reasons have been put forward as explanations for this reduction in criminal behaviour in Canterbury. These include the possibility that, after the initial relocation of many people to other parts of New Zealand, the Canterbury community became more connected and unified in its response to the disaster. The shutdown of the Christchurch CBD precinct for more than 18 months – historically a crime hot spot – is also likely to be a significant contributor to curbed crime levels.

There are concerns that this has meant that the pattern of crimes and trouble zones, while decreased in total, has shifted towards other regions. New Zealand police crime maps show that there has been a sizable rise in call outs and incidents in suburbs such as Riccarton, Merivale and Addington since the Central City went off limits after the February 2011 'quake. Increases in disorderly and violent conduct in these areas have been largely attributed to alcohol use and greater access to licensed premises.

A neighbourhood policing team, tasked with reducing crime in Riccarton, was established in late 2011. This is being supported by the recently passed Local Alcohol Policy Alcohol Reform Bill that aims to work with stakeholders to reform and identify the socially optimal opening and shutdown hours of licensed premises in different regions.

## 4 The rebuilding effort and road to recovery

The rebuilding efforts following the Canterbury earthquakes have been unprecedented in New Zealand's history and will be ongoing for many years to come. It has been estimated that total reconstruction costs associated with the Canterbury earthquakes could be as high as \$40.0 billion (New Zealand Treasury 2013). This is made up of residential (\$18.0 billion), commercial and social (\$15.0 billion), and infrastructure investment (\$5.0 billion).<sup>3</sup> The Government's contribution to the rebuild (including EQC payments) is expected to be \$15.4 billion (English 2014). This figure (and the estimated total rebuild cost) has increased as the disaster has unfolded and the recovery effort has progressed – the most recent indications are that the Government's share could reach up to \$20.0 billion (Wood 2014).

There is significant uncertainty over estimates of the cost of rebuilding Christchurch and Canterbury after the earthquakes. It takes time and effort to evaluate damage to land and property. For example, it was only in November 2013 that the first of a series of reports looking into Port Hills slope instability was released, providing insurers with preliminary information needed to develop foundation solutions for properties in the region (Massey et al. 2013).

At \$40.0 billion, the current estimated total reconstruction cost for the earthquakes is equivalent to the *total* New Zealand average annual gross fixed capital formation over the 10 years prior to the earthquakes. If capital formation occurs in proportion to gross regional product (GRP), this means that the earthquakes have created a rebuild task that is around eight times the size of Canterbury's typical annual gross fixed capital formation.

This chapter frames the commentary of the rebuilding effort and insurance payments in the context of the singular circumstances following the Canterbury earthquakes and New Zealand's insurance model. This is followed by a discussion of Vero's role in the response to the disasters.

### 4.1 Unique circumstances

To better understand and learn from the Canterbury earthquakes' response and rebuild, it is important to consider several unique features about New Zealand's disaster insurance arrangements and how these have interacted with private insurance protocols and, ultimately, the recovery time frames.

#### **New Zealand's dual insurance model**

New Zealand's history of natural disasters, including the deadly Hawke's Bay earthquake in 1931, along with World War II, motivated establishment of the Earthquake and War Damage Fund in 1944 (Te Ara 2014). This provided insurance against earthquakes and war damage through an additional levy paid on all fire insurance policies.

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<sup>3</sup> Note that this cost does not include business interruption insurance, non-construction costs (such as red-zoned property purchases) and central government operating expenses resulting from the earthquakes.

In 1993, the Earthquake and War Damage Fund was replaced by the Natural Disaster Fund, which is managed by the EQC (EQC 2014a). The Disaster and Landslip Fund was incorporated into the Natural Disaster Fund. Holders of insurance policies contribute to the Fund through a 15-cent (plus GST) levy on every \$100 of home and/or contents fire insurance that any individual takes out (up to a maximum of \$180, plus GST) (EQC 2014b). The insurance provided by the EQC is called EQCover and events that are covered include: earthquakes, natural landslips, volcanic eruptions, hydrothermal activity, tsunamis and fires resulting from these natural disasters. Land is also insured against storm and flood damage. In contrast to previous arrangements, the Natural Disaster Fund does not cover commercial properties.

By 2009-10, the Natural Disaster Fund balance had reached \$5.93 billion (EQC 2010). This was still more than \$1.00 billion shy of what the EQC nominated as its maximum probable liability – \$7.00 billion (supported by \$2.50 billion of reinsurance) associated with a magnitude 7.5 Wellington earthquake (EQC 2010).

EQC liabilities associated with the Canterbury earthquakes (which do not constitute the total insurance liabilities associated with the disasters) will exhaust the Natural Disaster Fund (EQC 2013). However, in accordance with Section 16 of the Earthquake Commission Act 1993, the Crown will provide funding to ensure that the EQC can meet its liabilities.

EQCover covers three categories of losses associated with residential properties:

- **The dwelling** – up to \$100,000 plus GST may be paid by EQCover. (Some circumstances reduce this figure.) Excesses amount to \$200 (for claims of \$20,000 or less) or 1% of the claim value.
- **Personal property** – a total of \$20,000 of personal property cover is provided (or the amount that is specifically insured for, if it is less than \$20,000). The excess on all personal property EQCover claims is \$200.
- **Land** – land that is within eight metres of the dwelling or outbuildings, or is the main access way to the dwelling (but not artificial surfaces that cover the access way), is covered (within limits, and excesses apply). There is also limited coverage for bridges and culverts, and retaining walls and systems. Claims relating to driveways, pathways, pools and so on are ‘out of scope’ for the EQC and must be handled by private insurers (EQC 2014e).

Once claims for building damage exceed the EQC limit, they are deemed ‘overcap’ and further insured damage becomes the responsibility of private insurers where insurance coverage has been purchased. The inevitable outcome of this model means that losses need to be assessed by both insurers (EQC and private insurer) to quantify the insured damage and assess the policy entitlements under each contract of insurance. Where policy responses and damage assessments differ, agreement needs to be reached on which entity will manage the claim. This was the case experienced in the Canterbury earthquakes, a process that became known as the ‘Joint Review’ of claims to determine overcap status.

Because of the nature of EQC, demands on its services fluctuated wildly. Prior to the Canterbury earthquakes, fewer than two dozen staff were employed with the EQC in New Zealand, but this increased to 2,000 to cope with the hundreds of thousands of claims. The organisation’s assumption that it could scale up in response to any disaster and maintain satisfactory services had been questioned in the past (Cosgrove 2009).

A unique feature of New Zealand’s insurance arrangements leading into the Canterbury earthquakes was that residential policies were generally open-ended, implying ‘new for old’ replacement, as opposed to fixed-sum, capped liability (Bennett 2014). This did not apply to commercial policies, which were Sum

Insured. This is one factor explaining the increased speed of processing commercial claims. Once it has been determined that damage exceeded the sum insured for, the claim could be finalised quickly.

### Uncertainty and change during the rebuild

A number of factors unique to New Zealand's disaster insurance arrangements or that arose in the wake of the Canterbury sequence of earthquakes should be kept in mind when examining the after-effects of these disasters. These include questions around the extent of EQCover and modifications to the regulatory arrangements guiding the rebuild. It does appear that these factors, among others, have contributed to delays in the resolution of insurance claims relating to the Canterbury earthquakes (Parker and Steenkamp 2012).

#### *EQCover and multiple events*

Prior to the Canterbury earthquakes, the question of liability in the case of multiple events exceeding the \$100,000 EQCover limit had not arisen. Following, and during, the Canterbury earthquakes sequence there was significant uncertainty on the part of both the EQC and private insurers around the extent of the EQC's liability in the cases where multiple events caused additional damage to the same residential property. In particular, it was unclear whether the EQC had to pay (up to) \$100,000 for each separate event affecting the same residential property during the term of the underlying contract of insurance.

It was not until August 2011 that this issue came before the High Court. In September 2011, the High Court's judgment was that separate events during the term of an individual's private insurance contract do constitute separate loss events in respect of the EQC's liability, and could each attract up to \$100,000 in policy coverage.

The outcome of this judgment created a unique and complex situation in claims-management practices that had not been experienced in other disaster recovery programmes. The insurable damage caused by each major earthquake needed to be determined and agreed between the EQC and private insurer: a process referred to as 'Apportionment'.

#### *Regulation of the rebuild*

The Christchurch City Council has previously sought to require earthquake repair work to strengthen properties to 67.0% of new building standards which is an increase from the 34.0% legislated under the Building Act 2004. The Council was doing this through the Earthquake-Prone, Dangerous and Insanitary Buildings Policy 2010.

The Insurance Council of New Zealand (ICNZ) applied to the High Court for judicial review of the Council's policy, arguing that it was unlawful and invalid (New Zealand High Court 2013). The ICNZ was concerned that enforcing the policy would result in buildings being:

*"...strengthened beyond the level at which they are defined as earthquake-prone. This will increase the cost of earthquake repairs for building owners, who will in turn seek to claim against their insurers. The estimated increase to the repair bill of insurers may be several hundred million dollars" (New Zealand High Court 2013).*

Indeed, the University of Canterbury, which was committed to the 67.0% strengthening, submitted in the course of the High Court's review that costs with 67.0% strengthening would be \$140 million higher than they would be with 34.0% strengthening (New Zealand High Court 2013). The High Court found in favour of the ICNZ and this decision was upheld in the Court of Appeal, but the Supreme Court granted

leave to appeal (Courts of New Zealand 2014). On 11 November 2014 the Supreme Court judged that the Council could not go beyond the standards in the Building Act 2004.

Other aspects of regulation that impacted insurers' ability to commence repair or rebuild activity included:

- The introduction of guidelines to repair and rebuild foundations for technical category 3 (TC3) properties. These guidelines, affecting 28,000 Canterbury properties, were not introduced until April 2012, and took time to be properly understood and applied (Wright 2012).
- In July 2013, the Christchurch City Council lost its International Accreditation New Zealand accreditation to issue building consents. This happened because the Council could not meet the "high level of responsibility" demanded of a building consent authority (MinterEllisonRuddWatts 2013). However, the Council continued to issue consents because it was registered as being able to do so under the Building Act (Dougan 2013). The Council had to deal with volumes of consent applications that put pressure on the processes they previously had in place.
- Under the Canterbury Earthquake Recovery Act 2011, CERA has powers to compulsorily acquire land and buildings. The prospect of compulsory acquisition creates uncertainty for landowners and how their policies responded.

One of the main reasons behind the delays to commercial reconstruction was the red zoning of Christchurch's CBD, which remained cordoned off for more than two years. This created difficulties for adjustment valuations and surveying. Though instituted on legitimate safety grounds, this has ultimately contributed to the delay in construction of many of the city's iconic commercial and government buildings and general recreational precincts.

## 4.2 Rebuilding and insurance payments

As a first step, the Government activated its National Crisis Management Centre and declared a state of emergency. The immediate clean-up and reconstruction largely drew on the utilities, construction, safety, healthcare and social assistance sectors. When the February earthquake hit, these sectors were already engaged in the \$5.0-billion reconstruction task due to the September 2010 earthquake – stretching local resourcing.

According to the Stronger Christchurch Infrastructure Rebuilding plan, electricity was restored to 75.0% of the city within three days. By the end of 2011, key points of progress included: the repair of 20,000 individual roads; sealing 170km of road cracks; removing 510,000 tonnes of silt; and the completion of 9,100 water-main repairs. Water supplies and sewerage systems took several years to be restored fully in the areas affected by substantial soil displacement and liquefaction.

While efforts were made to restore essential utilities and transport infrastructure in a reasonable time frame, frustration has been voiced about the time taken to reinstate homes and, to a lesser extent, commercial buildings. Some reasons for delays to the rebuilding process were discussed above.

By mid-2014, \$19.4 billion worth of insurance claims had been paid out by insurers, including the EQC and Southern Response (Figure 4.1). (Southern Response is the government-owned entity responsible for settling claims by AMI policyholders for Canterbury earthquake damage that happened before 5 April 2012.) A sum of \$12.1 billion, or 60.0% of the total claims paid, has gone to residential claims (including EQC home contents claims).

**Figure 4.1: Insurance claims paid by mid-2014****Private insurers (incl. Southern Response)**

Residential (\$4.4b)

Commercial (\$7.7b)

**EQC**

Residential (\$6.8b buildings, \$0.5b contents)

Source: ICNZ 2014b, EQC 2014c, EQC 2014d

The EQC's average cost of settling a residential claim (excluding overcap claims) was \$37,479. The \$500 million paid out in contents claims has been distributed among 183,748 claimants, with an average payment of \$2,700.

As at 31 July 2014, the EQC had resolved 143,900 out of 169,000 residential property claims (EQC 2014c).<sup>4</sup> These were made up of:

- 58,000 property repairs through the Canterbury Home Repair Programme;
- 63,400 cash settlements; and
- 22,500 overcap claims.

The Canterbury Home Repair Programme was established to manage all aspects of repairs that cost between \$15,000 and \$100,000. The EQC-contracted repairs valued at below \$15,000 are generally settled by cash. This was the normal means by which the EQC gave effect to its insurance cover in the past. Claims above \$100,000 are managed by private insurers.

The programme was established because it was perceived that the EQC's standard operating model of cash settlement was not appropriate in the context of the Canterbury earthquakes. It was believed that by having the tens of thousands of individual repair jobs handled by a single entity, Fletcher Construction, it would be possible to mitigate risks including:

- the availability of building materials;
- cost inflation;
- the availability of skilled labour; and
- competition between organisations for labour and materials (Controller and Auditor-General 2013).

It would be possible also to employ consistent repair standards and prioritise repairs based on need (as distinct from a 'first in first served' approach, which would have prevailed if the EQC's old model had been used). However, it was not until later in the programme that this triage feature was used effectively. For this and other reasons, the programme's performance has been evaluated as mixed (Controller and Auditor-General 2013).

Half of the overcap claims have been fully resolved, with 2,203 resulting in major repairs or rebuilds and 9,189 cash settled (as at June 2014). That still leaves half of the overcap claims yet to be resolved from customers' perspectives. There are 11,347 of these. Their status is as follows:

- Repair or rebuild jobs in progress – 8,110
- Awaiting cash settlement – 850

<sup>4</sup> There were 420,000 claims across the earthquake sequence but this number has been rationalised effectively by the related nature of many claims (EQC 2014c).

- Undecided – 1,218
- No offer – 1,169.

Private insurers have been dealing with 64,320 out-of-scope claims. As at June 2014, 72.0% of these had been settled. Over half of the remaining claims were with project management organisations. Most of the remainder had reached an agreed external resolution but were not yet finalised, with 152 still to be sent to the PMO.

### 4.3 The role Vero has played

Through its insurance payouts, Vero has been one of the many stakeholders that have been involved in the rebuilding of Christchurch City and greater Canterbury. Following the five major earthquakes over 2010 and 2011, 30,050 claims were filed by Vero policyholders: 22,465 residential clients and 8,587 commercial clients. In terms of claims value, approximately 70.0% of losses were for commercial properties and 30% were for residential properties. Among the residential claims are 1,270 properties that have since been categorised as TC3: vulnerable to moderate to severe liquefaction.

To date, Vero had made \$3.8 billion in damage and business continuity claims payments, which represents about 80.0% of its total estimated costs. Of this, around 25.0% of claims payments have been made to residential policyholders, and the remaining 75.0% to Vero's commercial clients. In addition to allowing more people to move back or build new homes and facilitating continued trade for businesses, there have been some particularly notable settlements.

In April 2013, Vero reached a \$320-million settlement with Housing New Zealand. The claim involved over 5,559 homes damaged by the Canterbury earthquakes. Housing New Zealand is the largest residential landlord in Canterbury and a provider of essential social housing services; its CEO stated that the settlement allowed the organisation to move more quickly with its repair and rebuilding plans for the community. Vero's locally led claims team worked closely with Housing New Zealand to agree on the extent of damage and achieve a fair and pragmatic settlement.

In January of 2014, Vero reached a \$200-million insurance settlement for earthquake damage to Canterbury schools. Due to a locally led claims management team, Vero was able to recognise that simply repairing damaged schools as per the contractual obligations was not in the best interest of the client as many of the impacted schools were slated for demolition in the future, or were located in areas that had experienced significant population outflows. Due to the company's respected standing with its global reinsurance partners, Vero was able to negotiate a cash settlement with the Ministry of Education, allowing the client the discretion to choose how to allocate funds from their settlement. The Ministry of Education has expressed that the commencement of rebuilding activity has added impetus to the \$1.1-billion education renewal plan for Canterbury over the next decade, benefiting 15 schools and around 7,000 students.

A month later, Vero successfully settled an insurance claim with Lyttelton Port of Christchurch (LPC), worth \$440 million. This represents the largest single payout in the aftermath of the Canterbury earthquakes and is one of the highest insurance settlements in New Zealand's history.

Other notable settlements led by Vero that helped speed up the recovery of Christchurch:

- Ballantynes retail CBD store – this commercial property was badly damaged by the 22 February 2011 earthquake, leading to business closure for eight months. With support from the Vero claims team, the building was reopened in October of the same year.
- Hotel Grand Chancellor – the settlement of this claim allowed the building to be safely demolished early in the recovery process and also enabled the building owners to progress their plans for rebuilding on this site.
- PwC Building and Holiday Inn – the resolution of these claims enabled demolition to take place, in turn helping to reopen the Christchurch CBD.
- Winnie Bagoes – the restaurant and pizzeria moved from Gloucester Street to Colombo Street, following the September 2010 earthquake and was shut down after the February 2011 earthquake. With the financial assistance provided under its Vero Business Interruption policy, Winnie Bagoes remained viable and reopened at its new premises in 2013.
- Red-zoned properties – Vero has settled all its residential red-zoned properties with CERA. This settlement enabled CERA to achieve economies of scale by streamlining the planning and control phases of their clearance programme and avoided coordination with Vero. CERA believes that the clearance of the remaining red-zoned properties attached to other private insurers will be reached by mid-2015, with property removal and land clearing expected to occur by April 2016.

Beyond its residential and commercial commitments, Vero has been heavily involved in the rebuilding of cultural assets that hold intrinsic value to the community, including the Springston South Soldiers Memorial Hall and the Isaac Theatre Royal.

At present, Vero estimates that between \$80-million and \$100-million worth of claims are being paid out each month. Over the next two years, Vero expects to process another \$1.2 billion in claims payments. With the final cordon around Christchurch's CBD officially lifted in June 2013, Vero expects to be in a position to substantially complete commercial reinstatements by June 2015.

On the residential side, more information is emerging about the extent of damage sustained to TC3 properties, mass movement on the land on the Port Hills and the changed characteristics of land in these suburbs. There are also additional considerations for the resolution of high-density or multi-dwellings where retaining walls and other features are shared and insured by multiple insurers. In light of greater clarity around land viability, acceptable building tolerances and effective earthquake claim strategies, Vero believes that it is on track to resolve almost all claims by the end of 2014, either settled by cash or customers in contract.

Importantly, Vero's role in the rebuilding of Canterbury has extended beyond cash payouts and reconstruction. There has been a substantial up-scaling of resources, internal process changes and improvements in customer management. Key changes in Vero's disaster-response strategies after the Canterbury earthquakes are discussed in more detail below.

As with almost all disaster events, disputes over levels and scope of coverage have arisen and require resolution in court. The August 2014 Earthquake List published by the High Court listed 226 cases that had not been disposed of. Despite its significant presence in the Canterbury region, Vero was involved in only 23 of these. Vero's strong on-the-ground presence and relationships with reinsurers have made it possible to resolve disputes via negotiation or mediation.



## 4.4 Vero's targeted approach to earthquake claims processing

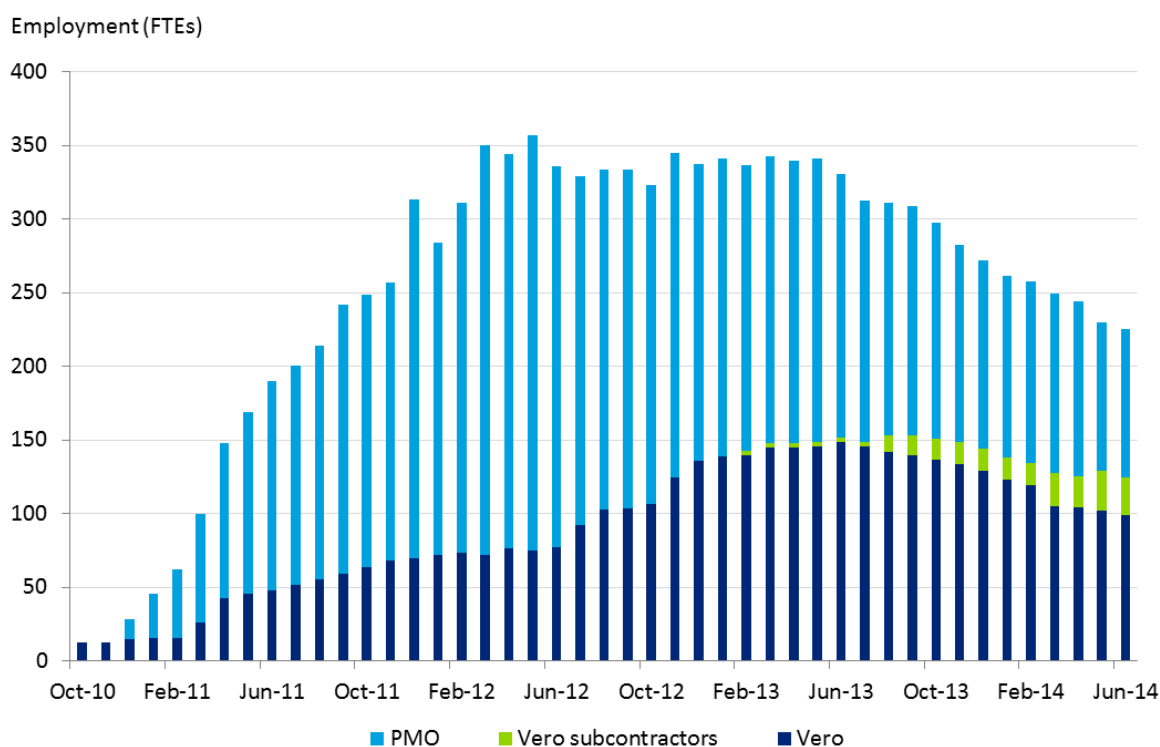
The ongoing nature of the Canterbury earthquakes and the complexities this introduced necessitated a permanent change to the way disaster insurance claims were processed by Vero. As was the case with most general insurers in the New Zealand market, prior to the Canterbury earthquakes of 2010–2011, smaller one-off disasters were managed in-house and through business as usual resourcing channels.

After witnessing the mass devastation and long sequence of aftershocks, Vero invested significantly in upskilling its workforce. As a first step, in February 2011, Vero engaged the services of MWH, a global engineering company experienced in Programme Management, to set up Vero's Commercial and Residential Reinstatement Programme. This included undertaking site inspections, damage assessments and scope, contract development and construction monitoring. Partnering with an external Project Management Office (PMO) after major disasters is standard practice within the Suncorp Group, and is intended to support efficient claim resolutions and settlements for all customers.

This partnering arrangement allowed Vero to bring the scale of its earthquake response operations in line with customer expectations and market demand. It also allowed Vero to perform detailed property assessments for most of its damaged residential and commercial buildings. This assessment information proved critical when conducting future Joint Reviews and Apportionment negotiations with the EQC. Between December 2011 and 2012, an average of 240 FTE employees was drafted in by MWH. Around 100 MWH staff members are still working on the rebuild at present.

Even with the large increase in resourcing, Vero recognised that more could be done to improve its claims handling. This led to the decision to explicitly separate earthquake-related insurance matters from the other non-earthquake insurance claims. In April 2012, an internal Earthquake Programme for commercial and residential claims was instituted, adding over 100 people to this division. Vero's Earthquake Programme team currently employs 126 people; it peaked at 150 workers in June 2013.

Chart 4.1 displays Vero's total (i.e. Vero internal, contractors and PMO) resourcing patterns since the start of the series of earthquakes in Canterbury. As can be seen below, after an early ramp-up phase, earthquake response employment reached 350 FTEs, with fewer outstanding claims lowering resource requirements in more recent times.

**Chart 4.1: Vero's total earthquake response resourcing**

Source: Vero data

### Residential claims processing changes

Over the course of the recovery process, Vero found that the combination of the unique nuances of the New Zealand insurance market, complex post-disaster protocols and the sheer extent of the damage placed pressure on Auckland-based claim handlers. Many policyholders were unaware of the roles of government assistance and private insurers and the practical impacts of new policy decisions or changes in regulation. Leveraging off the experience of the Suncorp Group and the practices found to be most effective in past large-scale events, in October 2012, Vero's Earthquake Programme moved towards a more communicative and customer-centric model in an effort to expedite residential claims in particular.

The philosophy underlying Vero's case management residential model was to build closer and more trusting relationships with policyholders by involving them in solution development and the eventual resolution of their claims. To support this model, Vero increased its local presence, recruiting senior and experienced case managers who had deep, and often personal understanding about the impacts of earthquakes and stakeholder response roles.

The model involved a relocation of claim files from Auckland to Canterbury, with up to 50 overcap properties allocated to each case manager. Lead-in time was given to case managers to allow them to become familiarised with the details of their customers, the types of claims and possible next steps. In addition to this, case managers were empowered with the level of authority and accountability needed to close out claims. The Auckland-based claims handlers provided expert policy advice and oversight to support the claim resolution process.

Ultimately, this model provided customers with direct access to the claims handlers and case managers responsible for their claims, thus avoiding the need to implement a dedicated call centre for earthquake claims inquiries. Vero's learnings from previous disasters show that customers often feel frustrated when they have to explain their difficult circumstances each time to different operators who are not familiar with their claims.

As an extension of the client-focused framework adopted by Vero, the company made the decision in early 2013 to proactively take over the management of claims where the damages were believed to exceed the EQC cap. In most of these instances, EQC liabilities had not yet been determined or formally assessed. Vero has elected to assume the liability of the damage costs within the terms of the policy. Vero will look to settle the distribution of liabilities with the EQC at a later date.

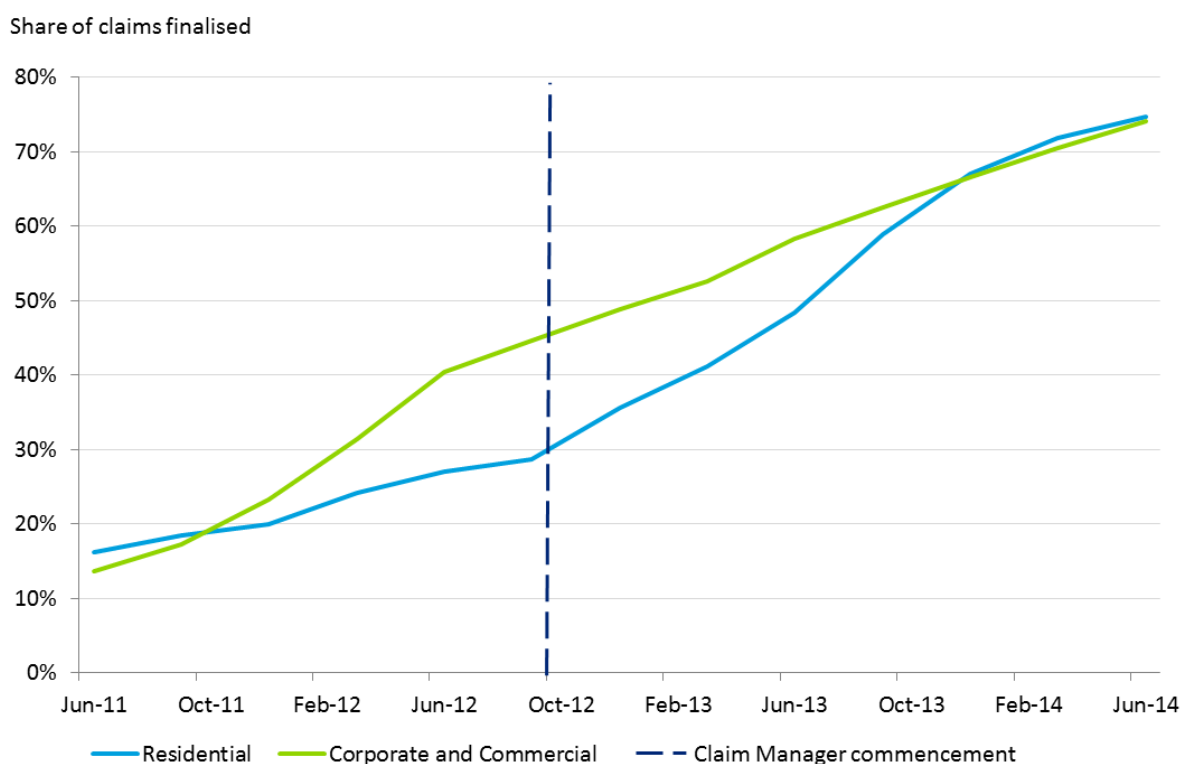
This action by Vero represents a movement away from the traditional chain of protocol where the EQC first assesses and manages damages within a limit of \$100,000, with private insurers handling damage assessments and repairs above this limit. The Declaratory Judgment after the Canterbury earthquakes, which saw the EQC cap made available for each separate event, further complicated the assessment and disaster-recovery task, prolonging time frames and coordination with insurers. Empathising that some customers felt confused and removed from EQC and overcap insurance liability rulings about their own properties, Vero authorised case managers to develop claim solutions with policyholders for properties deemed to be overcap in parallel to settlement discussions with the EQC.

In a region that has long been experiencing issues around the stock and affordability of housing prior to the earthquakes – a trend considerably amplified after the disasters – faster restoration of homes has positive spillovers for the Canterbury housing market and Canterbury's population. Swifter claims payments and insurance coverage clarity are likely to reduce anxiety levels and ease mental health pressures during an already testing time for policyholders.

While it is difficult to pinpoint the exact impact of case managers and the client-focused framework, since the shift towards a local empowerment framework, Vero's claims processing times have reduced. The share of finalised residential claims has more than doubled in percentage terms over the past 18 months. As shown in Chart 4.2, after making initial inroads in providing payments for superficial property damages or reimbursements for contents items, claim finalisation rates had slowed down until the implementation of the case management model, reflecting the complication of resolving settlements for properties that were damaged extensively. This is also true for the claims that remain outstanding: typically ones that involve multiple owners, shared assets and larger damage costs.

There are other external factors that are likely to have contributed to Vero's finalisation rate more than doubling in percentage terms over this period. CERA and Christchurch City Council communications on Port Hills slope stability and land mass movement, as well as the opportunity to work closely with EQC on its land cover, have helped Vero to gain a better appreciation of land characteristics. These findings supplemented the knowledge obtained from Vero's earlier geotechnical drilling programme and assisted in recognising certain 'at risk' regions on the basis of land viability and damage.

Chart 4.2: Vero's earthquake claim finalisation rates



Source: Vero data

### Corporate and commercial claims processing changes

As can be seen also in the above chart, Vero's earthquake-related commercial claim payouts have been finalised at a consistently faster rate than have those of residential policies over the period June 2011 to June 2014. Corporate policyholders can range from commercial entities, landlords and retailers, to government agencies and educational institutions that have a total of insured assets valued at over \$50 million. There are a number of key distinctions in the standard practice for Vero's corporate and commercial claims that facilitated faster resolutions after the Canterbury earthquakes, including the following:

- All corporate and commercial claims processes use an **external loss adjustment company**. This is driven by the larger value of assets and detailed (and specialised) engineering and mechanical intricacies involved in commercial repairs compared to those of residential claims. The professional services chain of surveyors, engineers and architects required to assess claims is commensurately larger.
- Vero assigns a **specialist claims management team** alongside external loss adjusters to deal with the company's biggest claims. This occurs when there is damage to an insured asset that is valued at more than \$250 million. These customers are usually government agencies (e.g. Ministry of Education), universities or large manufacturers and infrastructure facilities (e.g. LPC), each with unique building structures and business needs that require more experienced insurance personnel that are well-versed in the specific functions of client assets. Vero appoints a senior, experienced claims manager or specialist to control a claim and appoint the best experts for the particular type of asset. Together, the team chairs weekly meetings and closely manages the relationships with clients and experts throughout the claim life cycle.

- There is, typically, **less interaction with other stakeholders** during the management of commercial claims. For instance, EQCover does not typically extend to commercial assets. This allows Vero a lead role in claims management, providing more certainty around processing and construction time lines for policyholders.
- Unlike other general insurers operating in the New Zealand market at the time of the Canterbury earthquakes, Vero is a **locally led underwriter of insurance policies**, with local resourcing and a wide network of technical expertise readily available. The physical proximity of assessors and claims handlers in the aftermath of the Canterbury earthquakes was found to be invaluable in improving claim understanding and relationship development between concerned parties (e.g. co-insurers, reinsurers, government and the wider community) during the settlement and mediation process. Vero's local presence and internationally respected reputation allowed Vero to negotiate more timely and fair settlements (with reinsurer support) for its clients. This compares to other offshore insurers (some of which have since left the New Zealand market) that used a long-distance and clinical approach to resolving claims, relying more on written reports and conference calls rather than an on-the-ground accounts to make settlement decisions.

Despite the presence of a client-centric model already employed for Vero's commercial claims processing and the company's local presence, an event as catastrophic and unparalleled as the Canterbury earthquakes warranted changes on the corporate and commercial policy front too. The scale and forms of damage sustained to insured corporate assets from the earthquakes varied widely from business-as-usual commercial claims. For this reason, Vero made the decision to set up a dedicated Commercial Earthquake team in early 2012.

After experiencing some difficulties in assessing the primary disaster zone of the Christchurch CBD for more than two years and through working together with facultative reinsurers and other stakeholders such as the Christchurch Central Development Unit (CCDU), Vero has finalised 84.0% of its commercial earthquake-related claims.

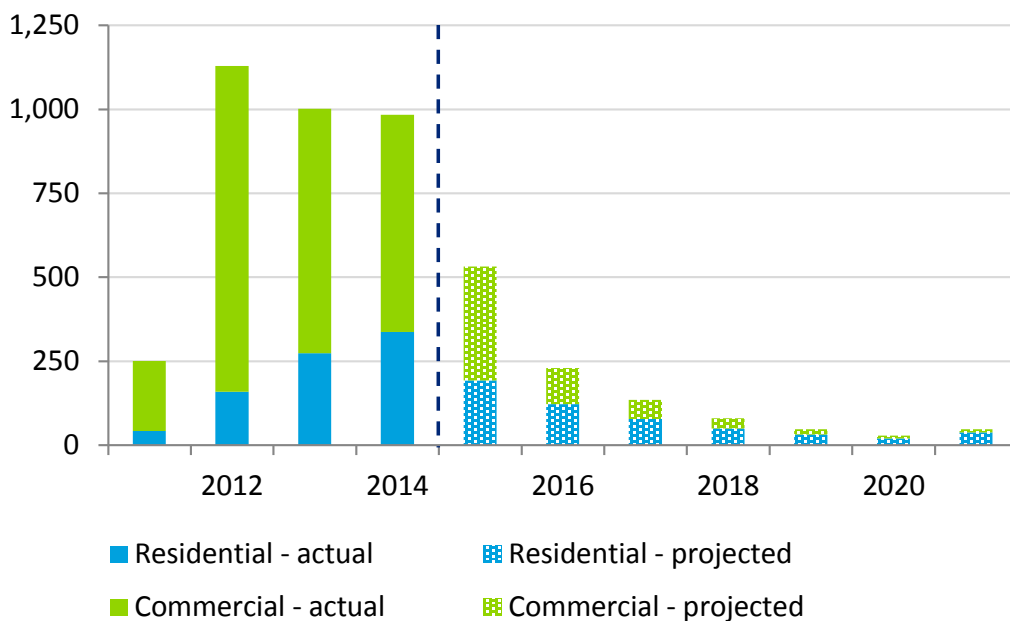
## 5 Economic impact of Vero’s claims payments

This chapter includes estimates of the economic impact of Vero’s claims payments. These estimates are based on claims data supplied by Vero relating to the Canterbury earthquake sequence discussed in Chapter 2. The data include estimates of past and future insurance payouts.

Vero has paid out more than \$3.8 billion in net present value (NPV) terms to residential and commercial policyholders already (Chart 5.1). This amounts to 80.0% of the \$4.8 billion Vero expects to pay out in relation to the Canterbury earthquakes (net of GST and facultative insurance). Commercial claims make up around 70.0% of Vero’s actual and projected payments depicted below.

2013–2014 represented the high-water mark in terms of claims paid, at \$330 million. The increasingly small projected payments out to 2020–2021 primarily represent allowances for delays in the receipt of claims, invoices for work done, potential issues with repairs already done and other non-customer-related payments.

Chart 5.1: Vero’s insurance payments



Source: Vero data

### 5.1 Profile of modelling regions

The direct and flow-on impacts of Vero’s claims payments are related closely to the size, structure and attributes of the Canterbury region. Where goods and services required for the construction and

rebuilding task can be efficiently sourced from the regions, the economic gains to suppliers in Canterbury will be higher. Where this is not the case, or constraints on businesses and the use of labour exist, resources will be drawn from other parts of the country that have a comparative advantage in demanded industries. The profiles of the Canterbury and rest of New Zealand economies are discussed below.

Canterbury's GRP accounts for 13% of the New Zealand total (Table 5.1). Both Auckland and Wellington have greater GRPs than does Canterbury; however, the gap between Wellington and Canterbury has been steadily decreasing over time. With a population representing slightly less than 13% of the New Zealand total, Canterbury's GRP per capita is greater than that of the rest of New Zealand.

**Table 5.1: Canterbury and the rest of New Zealand, as at financial year ended March 2013**

<b>Economic size metrics</b>	<b>Canterbury</b>	<b>Rest of New Zealand</b>
GRP (\$m)	\$27.8	\$183.8
Population ('000)	563.1	3,889.0
GRP per capita (\$)	49,447	47,254

Source: Statistics New Zealand (2014)

Note: Canterbury includes Chatham Islands

Canterbury has favourable employment figures when compared to the rest of New Zealand, with higher average ordinary weekly earnings and an unemployment rate that is 2.7 percentage points lower than is that of the rest of New Zealand (Table 5.2). However, in contrast to the rest of New Zealand, the working-age population and labour force have declined in the years since the earthquakes, a social consequence highlighted in Chapter 3.

Higher wages paid in the construction sector are also driving up the average wages in the Canterbury region.

**Table 5.2: Labour in Canterbury and the rest of New Zealand, 2014**

<b>Labour force metrics</b>	<b>Canterbury</b>	<b>Rest of New Zealand</b>
Working-age population ('000)	493.4	3,047.0
Labour force ('000)	350.7	2,082.0
Labour force participation rate (%)	71.1	68.3
Unemployment rate (%)	3.8	6.5
Average ordinary weekly earnings (\$)	1,027	978

Source: Statistics New Zealand Infoshare query

Like the rest of New Zealand, manufacturing is the dominant industry in terms of its contribution to GRP in Canterbury (Table 5.3). In contrast with the rest of New Zealand, where agriculture only makes up 5.0% of the value of output, it is the third most significant industry in Canterbury and makes up 8.0% of the region's gross product. Another feature of the Canterbury regional economy is that it is relatively diversified, evidenced by the balanced distribution of value added across sectors.

**Table 5.3: Industry GDP in Canterbury and the rest of New Zealand, 2011**

Industry	Canterbury	Rest of New Zealand
Manufacturing	3,143	19,278
Professional, scientific, technical, administrative and support services	1,984	15,808
Agriculture	1,834	8,618
Rental, hiring and real estate services	1,739	11,583
Health care and social assistance	1,591	10,768
All other	12,566	95,251
GST on production, import duties and other taxes	1,855	13,092
Gross domestic product	24,714	174,393

Source: Statistics New Zealand 2014

Note: All values are in 2014 NZ\$ terms

## 5.2 Our analytical approach

The macroeconomic stimulus impact of insurance payments following a natural disaster is not commonly well understood. There are principally two main benefits of insurance in the event of a natural disaster:

- The more documented **direct economic impacts** arise when policyholders receive their full entitlements for the physical damage and financial losses incurred.
- **Indirect economic impacts** are created in the sectors that are commissioned to undertake the rebuilding effort and for the chain of suppliers which provide the inputs and services to manage and deliver construction tasks.

Overall, the financial stimulus from insurance claims payments promotes a more rapid adjustment to normal economic functioning and growth patterns. The manner and degree to which Vero's claims payments to residents and commercial customers induced economy-wide impacts have been simulated through Deloitte Access Economics' in-house computable general equilibrium (CGE) model. This is based on detailed information from Vero regarding actual claims payments and projected claims to 2020–2021. As noted above, projected payments out to 2020–2021 primarily represent allowances for the timing in the receipt of late claims, invoices for work done, potential issues with repairs already done and so on.

Economic outcomes in Canterbury and New Zealand in the wake of the earthquakes already include the impact of Vero's claims payments. Deloitte Access Economics' modelling task has been to separate and investigate the degree to which Vero's claims payments aided the economic recovery process.

Specifically, this has been done by comparing a baseline in the absence of Vero's claims payments against a scenario where the stimulus from Vero's claims is injected into the economy. Comparing the two scenarios isolates the economic impacts of Vero's claims payments.

The model has projected changes in macroeconomic variables such as output, employment and household consumption at Canterbury and New Zealand levels, both retrospectively and into the future. More technical aspects of CGE modelling are outlined further in Appendix A.



### Some limitations

The analysis illustrates the important contribution made by Vero to the transitional dynamics of the regional economy following the Canterbury earthquakes, but there are some interpretative limitations.

While Vero is one of the largest general insurers in the Canterbury region (with higher market penetration for commercial properties in the CBD in particular) and covers earthquake risk as part of its general home and contents policy, it is not the only provider of broad risk management services. If Vero did not provide these services, it can be assumed that other insurers would absorb part of the market. Inferences about what would have happened in the absence of Vero's claims payment inflows cannot be made. It should be noted also that the analysis does not measure the broader impacts (such as the cost and other benefits of purchasing insurance) that insurance markets play in the economy.

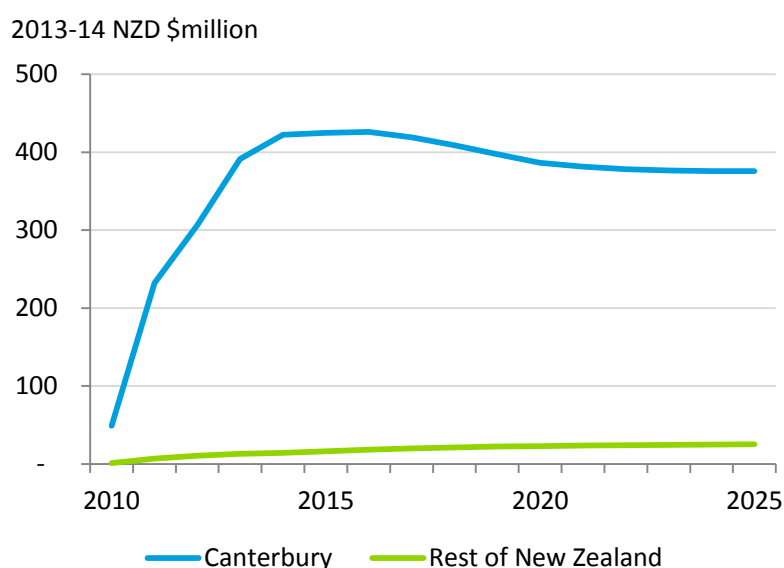
It should be noted that the economic modelling does not capture the social and welfare impacts of earthquakes on the community. Such issues have been canvassed qualitatively in Chapter 3.

## 5.3 Economic impact of Vero's claims payments

Vero's claims payments have had a substantial impact on economic outcomes in New Zealand. Chart 5.2 shows the positive impact that payments are projected as having from 2010 to 2030. Two features stand out from Chart 5.2. First, the economic impacts of Vero's payments are overwhelmingly found in the Canterbury region.

Second, the impact of Vero's claims payments are *enduring*. While payments have been modelled as ceasing in 2020–2021, by which time it is expected all of Vero's Canterbury earthquake-related obligations will be met, the region's GDP is permanently higher. This is because the payments immediately increase economic activity in the region and, whatever growth happens in future periods, that growth is coming off a higher level of economic activity than would have been in place in the absence of insurance payments.

**Chart 5.2: Real GDP impact of Vero's insurance payments**



Source: Deloitte Access Economics

The direct and flow-on economic contribution of Vero's claims payments are shown in Table 5.4. The positive impact on GDP to date from Vero's payments is \$1.7 billion. It is projected that ongoing payments and their impacts will have the effect of increasing Canterbury's GRP by \$3.1 billion, for a total increase of \$4.6 billion over the period 2010–2025.

As noted above, the impacts on the rest of New Zealand, though relatively smaller, are still material. In total, Vero's Canterbury earthquake claims payments are projected to have the effect of increasing national GDP by \$218 million over the period 2010–2025.

Positive impacts on the Canterbury and New Zealand economies are likely to persist beyond the modelling period to 2025.

**Table 5.4: Overall economic impact of Vero payments on GDP, 2010–2025**

Modelling regions	2010–2014	2015–2020	2021–2025	2010–2025
Canterbury	1,648	1,964	1,032	4,644
Rest of New Zealand	55	96	67	218
Total	1,704	2,060	1,099	4,863

Source: Deloitte Access Economics

Note: NPVs are expressed in real 2013–2014 NZ\$ million terms, using a discount rate of 7%

The temporal and geographical distribution of economic impact observed in Table 5.4 is generally repeated when looking at the impact of Vero payments on household consumption (a key measure of economic welfare), with one notable exception. Over half of the impact on household consumption in the Canterbury region has been realised already. In total, over the modelling period, Vero's payments are projected to increase household consumption by \$2.0 billion.

**Table 5.5: Impact of Vero payments on household consumption, 2010–2025**

Modelling regions	2010–2014	2015–2020	2021–2025	2010–2025
Canterbury	1,085	603	262	1,949
Rest of New Zealand	124	80	46	250
Total	1,209	683	308	2,199

Source: Deloitte Access Economics

Note: NPVs are expressed in real 2013–2014 NZ\$ million terms, using a discount rate of 7%

As with the impacts on GDP, Vero's payments have a sustained effect on employment across the Canterbury and New Zealand economies out to 2025 (Table 5.6). The increase in employment associated with Vero's payments is concentrated significantly in earlier periods. This means that the employment impact has, in fact, already peaked, at 1,367 in FTEs in Canterbury and 102 in the rest of New Zealand, in 2013. It is projected that Vero's residential and commercial insurance payments have contributed an additional 1,168 FTEs in 2014.

**Table 5.6: Additional FTE employment associated with Vero's payments, 2010–2015**

Modelling regions	2010	2011	2012	2013	2014	2020	2025
Canterbury	240	1,102	1,224	1,367	1,168	779	725
Rest of New Zealand	24	110	108	102	66	34	36
Total	264	1,213	1,332	1,469	1,234	813	761

Source: Deloitte Access Economics

## 6 Lessons learned from Vero's experiences

There is no question that the post-earthquake recovery process has been extremely complex and lengthy for Canterbury residents. Understandably, there has been vexation expressed by policyholders regarding the time taken to settle claims and repair properties. This is a sentiment acknowledged and shared by Vero.

One of the realities of dealing with multiple and large-scale events is that it takes time for all parties to comprehend the full extent of the damage and establish appropriate response protocols. Vero had the advantage of being a locally led underwriter of insurance policies, with an on-the-ground presence and ability to draw upon the experience of the Suncorp Group and the strategies found to be most effective in past mass disasters both in New Zealand and abroad. However, the **unique set of circumstances within the New Zealand insurance market and the catastrophic nature of the Canterbury earthquakes** meant that previous **best-practice approaches needed to be adapted**.

As discussed in Chapter 4, a number of factors contributed to delays in insurance payments and rebuilding activity, especially for residential policyholders. These include New Zealand's dual insurance model (and, in particular, how it has performed in the context of multiple overcap events and apportionment) and various regulatory issues that have arisen throughout the rebuild.

To the extent that these factors are under the company's control, **Vero has come to identify areas of improvement**. It has implemented a range of initiatives to improve customer relationships and drive resolution outcomes, including taking over management of claims expected to be overcap through a local case manager approach and the use of an experienced PMO (see section 4.4). Based on consultations with members of Vero's specialised earthquake response team, the following **key learnings are believed to hold the greatest potential** for reducing settlement times and improving customer satisfaction:

- **Setting up a separate Earthquake Programme:** Vero provides a range of different policy options for residential and commercial customers. Introducing a dedicated Earthquake Programme and team in April 2012 helped to provide a more-targeted approach to resolving the unique challenges that arose after the Canterbury earthquakes.

A dedicated Earthquake Programme (separate from normal business operations) was afforded by Vero's relatively large scale of operations in New Zealand compared to that of other insurers. This scale also allowed Vero to maintain stronger strategic oversight over its response effort and helped it to exercise greater control over solution development during coordination with external disaster support agencies.

- **Detailed damage assessments:** The quality of property damage assessments is critical for understanding how a building performed over a sequence of earthquakes. With the scale and volume of claims received by Vero, it was challenging to conduct detailed damage assessments for every residential and commercial property. However, the assessment information and data collected on residential properties by Vero after each major earthquake enabled Vero to have informative discussions with the EQC regarding those properties that were subjected to a Joint Review or Apportionment negotiation. This information allowed Vero to reach settlement with residential and commercial customers relatively earlier in the recovery process.

- **Building the right relationships:** The lessons learnt from the Suncorp Group disaster experience highlighted the critical need to identify and develop close relationships with government and local agencies involved in the disaster-recovery efforts. During the management of the Queensland floods in 2010–2011, Suncorp recognised the value of working closely with the Queensland Reconstruction Authority and other local councils to help rebuild the affected communities. Similarly, Vero worked closely with agencies such as CERA, MBIE and EQC and other locally based community groups on insurance-related matters as well as on broader recovery issues.
- **Geotechnical drilling programme:** While actuarial modelling had been undertaken around the risk and likely damage from disasters prior to the Canterbury earthquakes, limited information was available on the geological characteristics of the region. Indeed, these attributes have changed significantly after the earthquakes. In June 2012, Vero started a geotechnical drilling programme to better understand local land conditions, prioritise expenditure towards ‘at risk’ regions and develop more appropriate foundation design solutions. The purpose of the programme was to improve the structural integrity of new buildings and their resistance to future earthquakes.
- **Case management approach:** Recruitment of experienced and skilled case managers with clear accountability and understanding of disaster-response nuances was found to improve Vero’s communications and trust levels with policyholders. The face-to-face element of on-the-ground insurance personnel also provided reassurance. Case managers were empowered with the level of authority and accountability required to drive the finalisation of claims. Since February 2013, each Vero policyholder has been assigned a case manager to transparently synthesise information from technical assessments and outline policy options to achieve a mutually agreed resolution. Customers have had direct contact with their case managers who have understood the complexities and particular circumstances of each customer’s claim — they have not felt the need to ring a general call centre to get answers.
- **Customer Communication Programme:** Vero developed a targeted customer engagement programme in March 2013. This programme was designed to support the communications between Vero and its clients, enabling uncertainties and confusions around policy entitlements and claim outcomes to be better understood by customers. Vero previously found that often policyholders were unaware of the different forms of assistance available to them via the EQC and private insurers, the need for technical work after disasters and the meaning of changes to zoning. This was believed to perpetuate a sense of helplessness, anxiety and stress amongst policyholders. The communication programme and case management approach led to improved relations with policyholders as evidenced by reduced demand over time for information and answers.
- **PMO partner:** Selecting and setting up a Project Management Office provides critical infrastructure and scalability in disaster management. Vero engaged MWH following the September 2010 earthquake, which enabled it to respond more effectively following the February 2011 and subsequent earthquakes. The building and construction expertise complements the insurance response to disasters and, importantly, aligns company activity with desired outcomes for customers. The PMO relationship between Vero and MWH resembles one of a partnership, rather than of a supplier; this facilitates closer management and control over solution development and outcomes for policyholders.
- **Coordination with the EQC:** In August 2012, an informal agreement was reached with the EQC to provide additional resources to help resolve claims through the Joint Review process. This has helped to remove some administrative bottlenecks around agreement on claim ownership and response protocol. This led to a level of confidence with EQC on taking over the management of overcap properties, even where EQC liabilities had yet to be finalised.
- **Multi-unit industry approach:** In 2013, Vero recognised that a broader industry solution was required to manage the complex reinstatement of multi-unit properties. These properties often

involved large unit blocks and cross-leased properties that were insured by multiple insurers. To gain efficiencies around loss adjusting, damage assessments, design and contract management, a 'whole of building' approach was required that necessitated all insurers and EQC agreeing to a unified approach to resolving these complex claims. Vero also set up a specialised PMO to design and manage the contract development and reinstatement management of complex multi-unit properties. Vero also spoke to key stakeholders involved in the recovery efforts, including major reinsurers about the 'whole of building' approach to seek support and endorsement of the concept.

- **Management of supply chain:** A further learning gained from previous disasters focused on the effective use of the existing supply chain but also the ability to broaden supply capacity relative to demand. Vero recognised early in its recovery programme that the demand for building resources and supporting trades would come under pressure as building activity increased. The selection and awarding of contracts was spread between large, medium and small contractors with a focus on locally based suppliers. The use of locally based suppliers with proven reputations often can provide assurance on building issues long after the building activity has ended and other non-local suppliers have left.
- **Resolution reporting:** The complexities involved in resolving earthquake-damaged properties meant that a multitude of service providers and professionals needed to be engaged to help shape the particular reinstatement solutions for customers. These services would often involve geotechnical engineers, drilling companies, structural engineers, architects, quantity surveyors, building contractors, etc. Resolution time frames became dependent on the delivery (both time and quality) of work from each service provider. More importantly, where supply bottlenecks did occur, they were identified and unlocked. To support its claims-management system, Vero built a unique reporting mechanism, which enabled the reporting of properties within each stage of the resolution process. Vero was able to identify properties that were progressing as expected but also properties that were not progressing due to supply pressures. This reporting ability enabled Vero to confidently target resolution time frames and maintain the resolution expectations of customers.

It is noted that there is an important trade-off between the accelerated provision of insurance claims payments and undertaking the due diligence to fully investigate the extent of above-ground damages and geological damages. These processes, performed by both private insurers and government authorities, can improve resilience and safeguard against significant damage in future earthquakes.

Drawing on the benefits of hindsight and learning by doing, Vero intends to harness new information and its improved understanding of risks experience to encourage the building of stronger houses that will be more resilient against future events. Vero's understanding of key risks may be more important, considering the failure of some local insurers and the departure of offshore insurers from the New Zealand market (e.g. Ansvar), leaving a share of residents and businesses now looking for suitable disaster insurance policies.

Vero's commitment to the local market is underpinned by continued efforts to improve on relationships with stakeholders such as CERA, the EQC, Christchurch City Council and other parts of the New Zealand Government to develop mass disaster-response guidelines and facilitate the efficient and consistent sharing of information.

As a result, **Vero believes the company will be in a better position** to manage and accelerate the processing of claims in **the unfortunate event of another major disaster**. Though Vero's internal changes following the Canterbury earthquakes are certainly important to building the firm's productive capability, the continuation of the external impediments within New Zealand's insurance market

(primarily aspects of the dual insurance model and ensuing coordination challenges) is likely to play a much larger role in determining the effectiveness of future disaster-response efforts.

With this in mind, it is believed that, **if both Vero's current customer-centric model had been in place already and external barriers not existed, claim settlements and the economic gains associated with financial stimulus and rebuilding activities would have occurred sooner.**

Perhaps even more crucially, **the extent and duration of financial hardship, mental stress and poor welfare outcomes experienced by some policyholders would have been limited.** As the international literature demonstrates, it is usually these adverse social and wellbeing consequences that have longer-term impacts on community psyche, even after material possessions are restored.

## Appendix A: CGE modelling

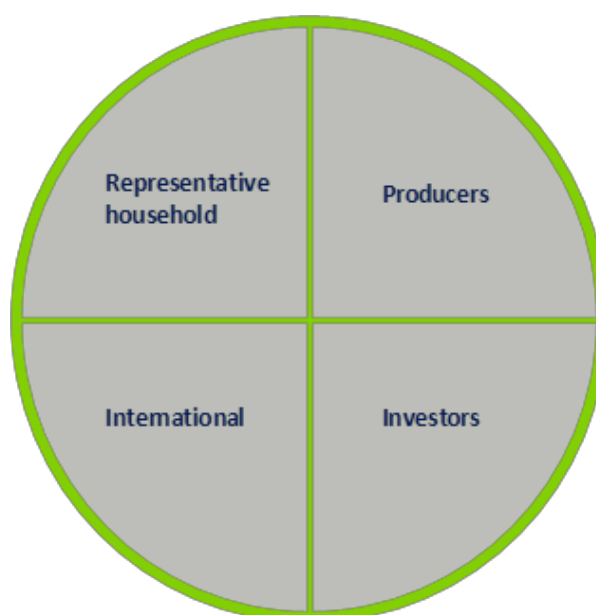
The Deloitte Access Economics – Regional General Equilibrium Model (DAE-RGEM) is a large-scale, dynamic, multi-region, multi-commodity computable general equilibrium model of the world economy. The model allows policy analysis in a single, robust, integrated economic framework. This model projects changes in macroeconomic aggregates such as GDP, employment, export volumes, investment and private consumption. At the sectoral level, detailed results such as output, exports, imports and employment are also produced.

For the purposes of this impact assessment, the DAE-RGEM has been customised to represent the interactions and dynamics of the New Zealand economy. Data from Statistics New Zealand has been used to disaggregate the model into the Canterbury and rest of New Zealand economies.

The model is based upon a set of key underlying relationships between the various components of the model, each of which represents a different group of agents in the economy. These relationships are solved simultaneously so there is no logical start or end point for describing how the model actually works.

Figure A.1 shows the key components of the model for an individual region. The components include a representative household, producers, investors and international (or linkages with the other regions in the model, including other New Zealand regions and foreign countries). Below is a description of each component of the model and key linkages between components. Some additional, somewhat technical, detail is provided also.

**Figure A.1: Key components of DAE-RGEM**



DAE-RGEM is based on a substantial body of accepted microeconomic theory. Key assumptions underpinning the model:

- The model contains a ‘regional consumer’ that receives all income from factor payments (labour, capital, land and natural resources), taxes and net foreign income from borrowing (lending).
- Income is allocated across household consumption, government consumption and savings so as to maximise a Cobb-Douglas (C-D) utility function.
- Household consumption for composite goods is determined by minimising expenditure via a CDE (Constant Differences of Elasticities) expenditure function. For most regions, households can source consumption goods only from domestic and imported sources. In the New Zealand regions, households can source goods also from interstate suppliers. In all cases, the choice of commodities by source is determined by a CRESH (Constant Ratios of Elasticities Substitution, Homothetic) utility function.
- Government consumption for composite goods, and goods from different sources (domestic, imported and interstate), is determined by maximising utility via a C-D utility function.
- All savings generated in each region are used to purchase bonds whose price movements reflect movements in the price of creating capital.
- Producers supply goods by combining aggregate intermediate inputs and primary factors in fixed proportions (the Leontief assumption). Composite intermediate inputs are also combined in fixed proportions, whereas individual primary factors are combined using a CES production function.
- Producers are cost minimisers and, in fulfilling this function, choose between domestic, imported and interstate intermediate inputs via a CRESH production function.
- The model contains a more-detailed treatment of the electricity sector that is based on the ‘technology bundle’ approach for general equilibrium modelling developed by ABARE (1996).
- The supply of labour is positively influenced by movements in the real wage rate governed by an elasticity of supply.
- Investment takes place in a global market and allows for different regions to have different rates of return that reflect different risk profiles and policy impediments to investment. A global investor ranks countries as investment destinations based on two factors: global investment and rates of return in a given region compared with global rates of return. Once the aggregate investment has been determined for New Zealand, aggregate investment in each New Zealand sub-region is determined by a New Zealand investor based on: New Zealand investment and rates of return in a given sub-region compared with the national rate of return.
- Once aggregate investment is determined in each region, the regional investor constructs capital goods by combining composite investment goods in fixed proportions, and minimises costs by choosing between domestic, imported and interstate sources for these goods via a CRESH production function.
- Prices are determined via market-clearing conditions that require sectoral output (supply) to equal the amount sold (demand) to final users (households and government), intermediate users (firms and investors), foreigners (international exports) and other New Zealand regions (interstate exports).
- For internationally traded goods (imports and exports), the Armington assumption is applied whereby the same goods produced in different countries are treated as imperfect substitutes. But, in relative terms, imported goods from different regions are treated as closer substitutes than domestically produced goods and imported composites. Goods traded interstate within New Zealand regions are assumed to be closer substitutes again.



## Households

Each region in the model has a so-called representative household that receives and spends all income. The representative household allocates income across three different expenditure areas: private household consumption; government consumption; and savings.

Going clockwise around Figure A.1, the representative household interacts with producers in two ways: first, in allocating expenditure across household and government consumption, which sustains demand for production; and, second, the representative household owning and receiving all income from factor payments (labour, capital, land and natural resources) as well as from net taxes. Factors of production are used by producers as inputs into production along with intermediate inputs. The level of production, as well as supply of factors, determines the amount of income generated in each region.

The representative household's relationship with investors is through the supply of investable funds – savings. The relationship between the representative household and the international sector is twofold. First, importers compete with domestic producers in consumption markets. Second, other regions in the model can lend (borrow) money from each other.

- The representative household allocates income across three different expenditure areas – private household consumption, government consumption and savings – to maximise a Cobb-Douglas utility function.
- Private household consumption on composite goods is determined by minimising a CDE (Constant Differences of Elasticities) expenditure function. Private household consumption on composite goods from different sources is determined by a CRESH (Constant Ratios of Elasticities Substitution, Homothetic) utility function.
- Government consumption on composite goods and composite goods from different sources are determined by maximising a Cobb-Douglas utility function.
- All savings generated in each region are used to purchase bonds whose price movements reflect movements in the price of generating capital.

## Producers

Apart from selling goods and services to households and government, producers sell products to each other (intermediate usage) and to investors. Intermediate usage is where one producer supplies inputs to another's production. For example, coal producers supply inputs to the electricity sector.

Capital is an input into production. Investors react to the conditions facing producers in a region to determine the amount of investment. Generally, increases in production are accompanied by increased investment. In addition, the production of machinery and construction of buildings and the like, which form the basis of a region's capital stock, are undertaken by producers. In other words, investment demand adds to household and government expenditure from the representative household, to determine the demand for goods and services in a region.

Producers interact with international markets in two main ways: first, they compete with producers in overseas regions for export markets, as well as in their own region; and, second, they use inputs from overseas in their production.

- Sectoral output equals the amount demanded by consumers (households and government) and intermediate users (firms and investors) as well as exports.

- Intermediate inputs are assumed to be combined in fixed proportions at the composite level. As mentioned above, the exception to this is the electricity sector that is able to substitute different technologies (brown coal, black coal, oil, gas, hydropower and other renewables) using the 'technology bundle' approach developed by ABARE (1996).
- To minimise costs, producers substitute between domestic and imported intermediate inputs, as governed by the Armington assumption, as well as between primary factors of production (through a CES aggregator). Substitution between skilled and unskilled labour is also allowed (again via a CES function).
- The supply of labour is positively influenced by movements in the wage rate governed by an elasticity of supply (assumed to be 0.2). This implies that changes influencing the demand for labour, positively or negatively, will impact both the level of employment and the wage rate. This is a typical labour market specification for a dynamic model such as DAE-RGEM. There are other labour market 'settings' that can be used. First, the labour market could take on long-run characteristics with aggregate employment being fixed and any changes to labour demand changes being absorbed through movements in the wage rate. Second, the labour market could take on short-run characteristics with fixed wages and flexible employment levels.

## Investors

Investment takes place in a global market and allows for different regions to have different rates of return that reflect different risk profiles and policy impediments to investment. The global investor ranks countries as investment destinations based on two factors: current economic growth and rates of return in a given region compared with global rates of return.

- Once aggregate investment is determined in each region, the regional investor constructs capital goods by combining composite investment goods in fixed proportions, and minimises costs by choosing between domestic, imported and interstate sources for these goods via a CRESH production function.

## International

Each of the components outlined above operates, simultaneously, in each region of the model. That is, for any simulation, the model forecasts changes to trade and investment flows within, and between, regions subject to optimising behaviour by producers, consumers and investors. Of course, this implies that some global conditions that must be met, such as global exports and global imports, are the same and that global debt repayment equals global debt receipts each year.

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