



## **OVERCOMING BARRIERS TO COMMERCIAL PROPERTY OWNERS IMPROVING THE SEISMIC STRENGTH OF THEIR BUILDINGS: THE APPLICABILITY OF A NOVEL APPROACH TO FILLING THE KNOWLEDGE GAP TO 'AT RISK' TOWNS AND CITIES**

### **Felicity Powell**

Dr, Opus Research, Opus International Consultants, New Zealand  
*Felicity.Powell@opus.co.nz*

### **Jean Beetham**

Ms, Opus Research, Opus International Consultants, New Zealand  
*Jean.Beetham@opus.co.nz*

### **Jared Thomas**

Dr, Opus Research, Opus International Consultants, New Zealand  
*Jared.Thomas@opus.co.nz*

**ABSTRACT:** The Christchurch earthquake sequence of 2010-2011 has had an ongoing indirect but significant effect on building owners in other cities in New Zealand. Owners of buildings that fully comply with the current New Building Standard (NBS) are well placed to meet these challenges as their buildings are now in demand from tenants seeking high levels of seismic safety. Reduced demand for tenancies in commercial buildings that have lower NBS compliance has multiple implications for their owners, including lower property values; greater risk of low demand for their property; poor cash flow; and higher insurance premiums. In some places, this has meant that there are commercial properties that are now virtually worthless or worth only the value of the land, less demolition costs. As central and local governments seek to strengthen the regulation of earthquake prone buildings, there is a growing recognition that significant obstacles exist to owners' willingness or ability to strengthen. These obstacles include the owners' knowledge of the regulatory framework as well as their personal background and experience. In response, key stakeholders are looking for innovative ways in which to fill these knowledge gaps. One approach initiated in New Zealand's capital city, Wellington, is a collaborative project between Wellington City Council, Heritage New Zealand and the Victoria University School of Architecture, targeting owners of buildings in the Cuba Street heritage area. The primary objectives of this approach is to trigger the discourse relating to building strengthening, to raise building owners' awareness of the regulations, and the range of opportunities available to them to seismically strengthen their building. Dissemination to other jurisdictions of the Cuba Street project as a potential exemplar project reveals the applicability of this approach to other 'at risk' towns and cities that has potential relevance to the Canadian context.

## **1. Introduction: New Zealand**

### **1.1. Seismicity**

New Zealand is a seismically active nation, with over 15,000 earthquakes recorded every year, of which about 100 to 150 are large enough to be felt. Records show that the country "can expect several magnitude 6 earthquakes every year, one magnitude 7 every 10 years, and a magnitude 8 every century"

(GNS Science, 2015). The impact of a destructive earthquake on a densely built urban area was clearly demonstrated in New Zealand's most devastating recent earthquake sequence, which occurred in the Canterbury region near Christchurch city in 2010-2011. The most damaging shake in this sequence was a relatively shallow magnitude 6.3 earthquake that occurred on 22 February 2011, killing 185 people and causing widespread damage to local buildings and infrastructure. As of March 2015, the Canterbury earthquakes have resulted in the demolition of 1086 commercial buildings, the partial demolition of 158, and the repair of 50 (CERA, 2015), as well as damage to over three quarters of Christchurch's housing stock (Parker & Steenkamp, 2012). The New Zealand Treasury has conservatively estimated the public cost of the Canterbury earthquakes to be NZ\$20 billion (CAGNZ, 2014) and insured losses are estimated at an additional NZ\$30 billion (Parker & Steenkamp, 2012). Based on simulations, potential indirect and direct economic loss in B.C., Canada, after a large earthquake off the coast of Vancouver Island in the Cascadia subduction zone has been estimated as likely to be about CA\$75 billion, of which only about CA\$20 billion is insured (AIR Worldwide, 2013).

## **1.2. Building regulation**

The devastation associated with the Canterbury earthquake experience has raised government and public awareness of the need for improvements to built and societal resilience against inevitable future earthquakes. As such, New Zealand's central government is seeking to strengthen the regulation of earthquake prone buildings. Seismic standards for buildings were first introduced in New Zealand in 1935 following the magnitude 7.8 Napier earthquake on the country's northeast coast. Since then building standards have improved periodically to reflect changes in engineering knowledge and practice, as well as increased understanding of national variability to seismic risk. Currently, New Zealand regulates seismic risk in buildings through the Building Act 2004. This Act defines an 'earthquake prone building' as one that would have its ultimate capacity exceeded in a moderate earthquake and would therefore be likely to collapse causing injury or death to persons in the building, to persons on any other property, or damage to any other property. In practice, this means a building is earthquake prone if it does not meet more than a third of 'New Building Standard', which is the standard that would be required for a new building on the same site. The Act requires every territorial authority to have a policy on earthquake-prone buildings, but in so doing allows territorial authorities to decide on the approach, priorities and timetable to be followed. This has led to a nationally inconsistent approach to addressing risks posed by earthquake prone buildings.

The territorial authority for New Zealand's capital city, Wellington City Council (WCC), has taken a relatively proactive approach to ensuring the mitigation of the city's earthquake prone buildings ('EPBs'). This is perhaps due to the area's high level of seismicity and public awareness, as well as the city's central government tenants requiring buildings of a high seismic standard. Wellington's Earthquake Prone Buildings Policy was adopted in 2006 and amended in 2009. Under this Policy, WCC is assessing all of the city's pre-1976 commercial buildings, as well as residential buildings that are more than two storeys high and contain more than three household units. Initially, a desktop review of property and land files is used to identify buildings that require further assessment. WCC then uses the Initial Evaluation Procedure (IEP) developed by the New Zealand Society for Earthquake Engineering (2006) to assess the strength of the building to resist earthquakes as a percentage of New Building Standard (NBS). Buildings deemed to be one third or less of NBS are identified as potentially earthquake prone. The council writes to owners of these buildings, who then have 6 months to provide evidence that their building is not EQ prone at their own cost. Failing this, a notice is issued, declaring the building as earthquake prone and requiring it to be strengthened or demolished within a set timeframe. This timeframe is usually between 10 and 20 years depending on the building's use, importance, age and condition. The notice issued is bright yellow and must be prominently displayed for building users to see. If no action is taken within the allowed timeframe, a bright red notice is issued for display requiring immediate closure of the building.

Research and experience elsewhere have shown that regulation on its own may be insufficient to achieve high levels of EPB mitigation, due to a range of obstacles which may prevent or limit a building owner's ability or willingness to take action. This paper reviews the range of barriers that may prevent a building owner from earthquake strengthening and what we know about approaches to overcome these. It then evaluates the effectiveness of an exemplar approach using a Wellington case study, and discusses the applicability of the use of this type of approach for use in other places.

### 1.3. Barriers to seismic strengthening

Barriers to EPB mitigation can include building owners not knowing about, not understanding, or lacking confidence in relevant regulations (Powell et al 2010; Powell et al 2014; SEAU 2008), as well as not believing that the impact of non-compliance will eventuate (Alesch et al 2012; Egbelakin et al 2011; Powell et al 2014). For example, in New Zealand it has been shown that some building owners are delaying seismic strengthening based on the belief that regulatory deadlines are unlikely to be enforced in the future (Powell et al 2014). Financial barriers can also exist (Alesch et al 2012; CIR 2013; Egbelakin et al 2014; WEPBCT 2014), such as when a building owner perceives that they do not have access to funds, or have funds but are not willing to allocate them to seismic strengthening. Perceptions of unnecessary or cumbersome costs and 'red tape' can also be barriers to EPB mitigation, such as when mitigation work triggers compliance with regulations that could have otherwise been avoided (Egbelakin et al 2008).

Dominant social norms, which include the opinions and actions of others, can be a significant obstacle to building owners undertaking risk mitigation (Alesch et al 2012; Solberg et al 2010). If social norms dictate that mitigation is not necessary or desirable, this may discourage building owners from initiating actions. Social norms are particularly powerful if they belong to individuals and groups who are important to the building owner (Egbelakin et al 2011; Kohiyama et al 2008; Wolfe et al 2014). Personal perceptions shaped by past experience, beliefs and worldviews, can also prevent or limit a building owner's mitigation actions (Alesch et al 2012; Egbelakin et al 2011; Fujima & Tatano 2013; Matthews 2011; Powell et al 2010; Solberg et al 2010). Personal perceptions can be particularly preventative if the EPB owner:

- does not perceive a significant risk and therefore does not see a need to mitigate;
- perceives that mitigation costs will not outweigh the benefits;
- believes they are not responsible for their building's risk;
- does not trust the efficacy of seismic retrofitting as an effective mitigation measure, either due to particular worldviews or for other reasons.

However in terms of risk perceptions, it is important to note that only small correlations between perceptions of seismic risk and mitigation behaviour are identified in the natural hazards literature (Solberg et al 2010). Lastly, the influence of the aforementioned barriers influencing building owners' decisions can change dynamically in different places and at different times (Egbelakin et al 2014).

### 1.4. Overcoming barriers

Due to the variety and complexity of barriers that may exist, it is perhaps not surprising that regulations alone tend to be insufficient in achieving high levels of EPB mitigation. Based on a previous review of international literature and practice, Powell & Beetham (2014) developed a conceptual framework that may be useful in developing, as well as evaluating, the effectiveness of different approaches to EPB mitigation. Three main 'approach typologies' were identified, named, and defined: a comprehensive approach; a targeted approach; and, a complementary approach.

#### 1.4.1. A comprehensive approach

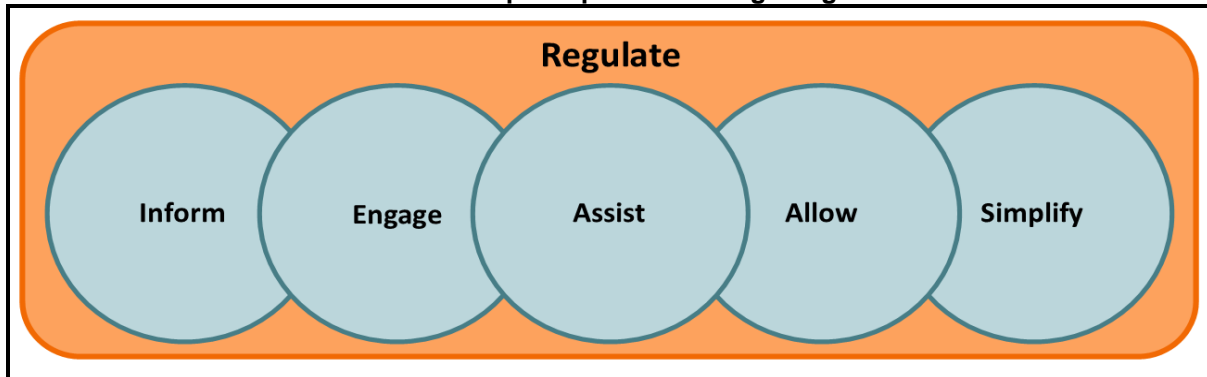
The literature documents that the use of financial or non-financial incentives alongside regulation may be more effective in encouraging EPB mitigation than regulation alone (EERI 1998; Egbelakin et al 2011, 2014; Kohiyama et al 2008). Such incentives can stimulate (or 'nudge') changes in behaviour (Thaler and Sunstein 2009). Incentives can be designed to directly address the variety of barriers associated with building owners' decisions and therefore may more strongly influence their choice of actions. The range of financial and non-financial incentives that may be effectively used alongside regulation were classified into five main types:

1. **Inform:** information and outreach targeted at building owners or other stakeholders to change the way that associated risks, and the costs and benefits of earthquake prone building mitigation are perceived (Bothara et al 2010; Egbelakin et al 2013; Paxton et al 2013; Powell et al 2010; SEAU & USSC 2008; WECC 2013; WEPBCT 2014).
2. **Engage:** proactively engaging and working closely with earthquake prone building owners from start to finish has proven to be an effective approach (Paxton et al 2013; SEAU & USSC 2008; WDC 2014).

3. **Assist:** financial assistance which reduces the costs or increases the benefits of earthquake prone building mitigation can be vital, especially for building owners for whom the economic viability does not otherwise stack up (Comerio 2004; Egbelakin et al 2011, 2014; SEAU & USSC 2008; WCC 2012a).
4. **Allow:** planning regulations can be modified to reduce compliance costs or to increase the potential return from mitigating an earthquake prone building (SEAU & USSC 2008).
5. **Simplify:** the process which building owners must go through to mitigate an earthquake prone building can be simplified and streamlined (Powell et al 2010; SEAU & USSC 2008).

The use of these incentives alongside regulation is termed a comprehensive approach (see Figure 1).

**Figure 1: A comprehensive approach: employs incentives alongside regulation in order to further motivate earthquake prone building mitigation.**



The timing and sequence of incentives is also important. Providing information and initiating engagement are fundamental first steps in taking a comprehensive approach to encourage the uptake of seismic strengthening, planting the seeds for change (Prochaska & Velicer 1997; Woolfe et al 2014). Information should be wide-ranging beyond simply increasing understanding of earthquake and other risks as this alone is unlikely to prompt a significant change in mitigation adoption (Solberg et al 2010). For example, the material provided can include information on regulations, as well as the incentives available to building owners. Information and outreach can also initiate engagement and build relationships with building owners. Providing information may increase building owners' awareness of the importance of seismic strengthening, and prompt them to initiate the process of strengthening their buildings.

#### 1.4.2. A targeted approach

A targeted approach to EPB mitigation is one where regulation or incentives 'target' a particular type of building or building feature, buildings with an important function, those with a particular economic need, or in a specific geographic area. For example, specific regulations and incentives could be directed at EPBs on key transport routes, buildings that house emergency services or hospitals, structures that hold significant cultural value, or particularly risky building features such as unsecured parapets.

#### 1.4.3. A complementary approach

A complementary approach is one that considers how EQB mitigation regulations and incentives may support (or otherwise) other local, or even national level policies. There may be opportunities to complement other objectives with EQB hazard mitigation. For example, in places where buildings are functionally or economically marginal, seismic mitigation could be combined with urban renewal or adaptive reuse policies that encourage the general upgrading and functional repurposing of these buildings in order to better meet current market needs (Nahkies 2011; Powell et al 2014).

## 2. Case study: The Cuba Precinct Programme

### 2.1. Overview

The Cuba Precinct Programme (2012-2013) took an integrated, innovative and novel approach to working with owners of earthquake prone heritage buildings. Efforts were directed specifically at Cuba Street in

Wellington's city centre which contains a significant number of heritage and character buildings that are also earthquake prone. Cuba Street is a Heritage Area listed in Wellington City's District Plan (WCC 2013a), and is also listed on the NZ Heritage List under the Heritage New Zealand Puhere Taonga Act 2014. Of the 67 buildings on Cuba Street, 39 are listed heritage buildings (Heritage NZ 2014) and 38 currently appear on Wellington council's list of earthquake prone buildings (WCC 2014a) making it a high risk area. The Cuba Precinct Programme was initiated by Heritage New Zealand and undertaken through an informal collaborative partnership with Wellington City Council and the Victoria University of Wellington School of Architecture. The partners contributed resources, advice and funding to the Programme in order to meet their organisational objectives for the Programme.

## **2.2. Objectives**

The primary objectives of the Cuba Precinct Programme were to trigger discourse relating to building strengthening, raising building owners' awareness of relevant regulations and the range of opportunities available to them to seismically strengthen their building. Additionally, Wellington City Council sought to foster relationships and stimulate discussions between adjoining building owners to work together on seismic strengthening solutions, and encourage joint seismic strengthening projects. They also sought to increase the uptake of available financial assistance and ultimately to reduce through strengthening the number of heritage buildings on the earthquake prone building list. Additional objectives of the University included for architecture students to undertake an applied research and design project on an urgent real world architectural problem (Southcombe et al 2014). Heritage New Zealand hoped the Programme would reduce the risk of losing 'heritage' in Wellington by helping owners to understand the different options available to them; reduce owners' barriers and anxieties related to strengthening; and provide owners with good examples of heritage building retrofit design.

## **2.3. Programme measures**

The Programme brought together several measures, targeting these at building owners in Wellington's Cuba Street area: (1) the council's Built Heritage Incentive Fund that can be used towards an initial engineering report/assessment or the actual strengthening work; (2) a collaborative project with Heritage New Zealand and Victoria University's School of Architecture, whereby supervised students prepared design or strengthening schemes of heritage or character buildings; and (3) a one-stop-shop approach to pre-application consent meetings with council in which owners are provided with information and advice on the various WCC grants and consenting procedures and to consult a heritage adviser.

The Cuba Precinct Programme was investigated by Opus Research as a research case study in order to better understand how an approach focussing on a geographic area could lead to a step change in levels of earthquake prone building strengthening, and how lessons and knowledge gained from the experience could usefully be transferred to other places. Data collected for use in the research included interviews with the Programme's collaborative partners, outcomes reported by partner organisations, and semi-structured interviews with six Cuba Street building owners. Our research focused primarily on the architecture students' project and the one-stop-shop approach for providing advice. Whilst these two initiatives were initially aimed at only owners in Cuba Street, the Built Heritage Incentive Fund is made available to all owners of heritage buildings in the city and therefore the Fund is not directly addressed in this paper. The Fund was, however, promoted by council to Cuba Street's building owners at the various engagement opportunities provided by the students' project and the one-stop-shops. The architecture students' project and the one-stop-shop measures are now discussed in more detail.

### **2.3.1. School of Architecture's student project**

The architecture student projects commenced in the second trimester of 2012, and was resourced by fourth year students studying two four month long papers running in parallel as part of the School's Master of Architecture (Professional) programme. The first of these was a design studio course in Architecture Design, and the second, Integrated Technologies, concentrated on the retrofitting and engineering of earthquake risk buildings. These two courses came together to focus on Cuba Street firstly to undertake architectural analysis and design, and secondly to design seismic retrofitting solutions.

The projects were run in a similar fashion in both 2012 and 2013, leading to each building being assessed and redesigned twice. In 2012, most students concentrated on the single building aspect of the project.

The following year, both courses were revised to create outcomes more focused on the retention of heritage fabric, the adaptive reuse of the heritage buildings, and on the potential of seismic retrofitting clusters of buildings. About 8 structural engineers provided advice to students so their retrofit design work was reasonably realistic. Approximately 70 students worked for 12 weeks in the second trimesters of 2012 and 2013, equating to 7 person years of full time research (Southcombe et al 2014). In addition to being supported by academic staff, students were assisted by professional architects and structural engineers. Building owners were informed of and engaged with the student projects via initial conceptual workshops, exhibitions and final presentations.

### 2.3.2. Council's one-stop-shop and other engagement

The second core element of the Programme targeting Cuba Street's building owners was the council's one-stop-shop. This was a process whereby prior to a formal consent application the council brought together all of the regulatory advisers who influence a strengthening proposal. At these meetings, free advice was provided to building owners about their proposal to strengthen. Essentially it was a forum whereby people could test ideas. Building owners were usually accompanied by their architect and engineer, and possibly a heritage architect. Council staff included people from planning, heritage, building consents, urban design, and building resilience as required. When the Cuba Precinct Programme started this was a relatively new approach from the council, but it is now customary across the city.

The council's Heritage Team also organised a Heritage Building Workshop in Cuba Street in September 2013 to assist building owners to overcome the barriers to strengthening and maintaining their heritage building. Support was available to building owners during the workshops for completing applications to the Council's Built Heritage Incentive Fund. Spot prizes were offered of free earthquake hazard assessment worth NZ\$160 (WCC 2013b). A council official attended meetings of the Inner City Association, an organisation for inner city residents and businesses, to brief them on the Victoria University's project and what the council was doing. The Council also had a part-time adviser who promoted Built Heritage Incentive Fund to the Cuba Street Heritage Area and other heritage buildings. Heritage New Zealand provided specialist heritage advisers for the Council organised workshops and 'clinics' for owners.

## 2.4. Financial assistance available

The council had, or has since put in place, a number of financial measures to incentivise owners of buildings in heritage areas and heritage listed buildings to seismically strengthen their buildings:

- a. *Built Heritage Fund grants* – As part of its urban planning, heritage and public spaces development work, the Council increased its annual funding of its heritage grants pool from NZ\$329,000 to NZ\$400,000 in 2014 (WCC 2014d). The focus of the fund is on remedying earthquake prone related features or securing conservation plans / initial reports from engineers. They also preserve the city's heritage through District Plan provisions and by providing grants to offset resource consent fees for minor changes to elements of heritage listed buildings. This acknowledges that protecting a heritage building by listing it in the District Plan can impose costs on building owners by restricting what they can do with the building (WCC 2012b).
- b. *Rates relief measures* – In July 2014, the Council announced the introduction of a rates relief policy aimed at the owners of buildings on its earthquake prone buildings list. Under this policy owners will not have to pay targeted rates during the work and their buildings are empty (Dominion Post 2014). Once the building is removed from the list (by seismic strengthening or due to building removal), heritage listed buildings will have their rates frozen for five years after strengthening while rates will be frozen for three years for non-heritage earthquake prone buildings.
- c. *Discounted resource consent fees* – Also in 2014, the Council introduced the discounting of resource consent fees by up to NZ\$2500 for owners of listed heritage items or items in listed heritage areas (WCC 2014c).

## 2.5. Evaluation of the Cuba Precinct Programme

Using the typology of incentives to encourage/motivate buildings owners to mitigate their earthquake prone buildings set out earlier, it is possible to assess the ways in which the Programme could potentially overcome barriers and encourage owners to take action (See Table 1).

**Table 1: Typology of incentives identified in the literature review and how these relate to the Cuba Precinct Programme**

Type of incentive	Description of purpose	The way in which the Cuba Precinct Programme meets this purpose
Inform	Information targeted at building owners or other stakeholders to change the way that associated risks, costs, and benefits of EQB mitigation are perceived.	In different ways both the VUW student project and one-stop-shop provided information. The student project showed owners the potential opportunities for the building that could be achieved by strengthening and remodelling/redeveloping a single or cluster of buildings. The one-stop-shop was a forum for owners to test ideas and to get feedback and advice on their proposal.
Engage	Proactively engaging and working closely with EQB owners from start to finish.	The one-stop-shop enabled owners to engage with council at the start of the process.
Assist	Financial assistance which reduces the costs or increases the benefits of EQB mitigation.	Promotion of the Built Heritage Incentive Fund was an important part of the programme. Additional forms of financial assistance were made available to owners in 2014.
Allow	Altering planning regulations to reduce compliance costs or to increase the potential return from mitigating an EQB.	Although regulations were not altered and were not part of the Programme, discounted resource consent fees were subsequently introduced in 2014.
Simplify	The process that building owners must go through to mitigate an EQB can be simplified and streamlined	The one-stop-shop approach to pre-consent meetings was introduced to simplify the process for building owners by getting key parts of the council around the table with owners, removing the need for separate meetings and streamlining the process.

Through its different components, the Cuba Precinct Programme had the potential to influence and encourage building owners across all but one of the incentive types. This suggests that the Programme took a reasonably *Comprehensive* approach to incentivising building owners that is advocated by the Earthquake Engineering Research Institute (1998) as being likely to be most successful. By focusing on a specific geographic precinct, the Cuba Precinct Programme also meets the definition of a *Targeted* approach, and by considering how earthquake strengthening complemented other local policies, such as heritage preservation, the Programme could also be described as *Complementary*.

## 2.6. Interviews with Cuba St Building owners

Perspectives on the Cuba Precinct Programme were sought from the owners of Cuba Street buildings. Six building owners (#1 - #6) were interviewed in the final stage of the research, using a semi-structured approach. Interviews were undertaken in order to gather in-depth information on: the extent of their engagement with the Programme; whether they had received financial assistance from the Council; and whether they had considered options in relation to working with the owners of neighbouring buildings.

### 2.6.1. Engagement with the different aspects of the Programme

The owners interviewed had all heard about the students' projects by various means: on-line information, flyers and promotional literature, or through direct contact from the School of Architecture or the council.

Two owners went to see the students' model of Cuba Street for themselves (#2 and 5), whilst the architect of a third owner took a look (#4). The students' designs had no impact on the approaches taken by the owners, either because their own plans were well on their way to being developed (#2, 4, 5), or because they hadn't seen the design (#1, #6), or they had decided not to upgrade for the time being (#3). Owner #4 commented that although the project had been peripheral to their thinking, she was pleased that the project was taking place for the wider benefit of the Cuba Street community. Likewise owner #2 said that the project had sounded interesting and worthwhile. Owner #6 said he had spoken to one of the course tutors and suggested that the students should also consider economic value as well as heritage value. Two of the owners (#1 and #3) attended the September 2013 workshop. Building owner #1 spoke to a variety of experts at the workshop, whilst owner #3 made contact with the insurance company representative. Owner #1 describes "*at the workshop they had three tables set up, insurance advisors, an engineer, and a table for the heritage team, and the council was floating around... there were lots of people there*".

The council's one-stop-shop approach to engaging with owners had been utilised by three owners (#1, #4 and #6). Owner #1 said that she'd been pleased with the engagement she'd had with the council; "*the council has been excellent... they obviously really care and that's come through, so they've been really good, you know, answering questions from small building owners like us. And, just helping to understand the processes*". When she had shown them her initial plans to redevelop her building, she had been given positive feedback. By contrast, owner #4 described the council's reaction to her redevelopment plans as 'very, very negative'. However she acknowledged that getting all the interested parties around the table would have been helpful for owners less knowledgeable than herself, and that "*it was like a leap of faith on behalf of the council and Heritage NZ to actually look at the street as a whole, we felt it was trying to keep the best for the street*".

#### 2.6.2. Financial assistance from the council

Four owners had applied for and received grants from the Built Heritage Incentive Fund (BHIF) (#1, #2, #4 and #5). Owner #6 had also applied to the Fund but his application had been turned down. Grants received did not cover the full costs of strengthening or professional fees, but were a contribution towards these;

*"I've applied for two Built Heritage Funds, and we've got two already. Our first one was for... an initial strengthening scheme, and assessment and a scheme, it covered 50% of the cost. That's their formula, to contribute not to cover.... that was all a result of attending the workshop"*

– Owner #1

Owner #3, who is not intending to strengthen his building at this stage, had spoken to a Heritage Adviser at the council to find out about the assistance available and observed that "*the assistance level is so low compared to the real cost, it's just like a tiny drop in a bucket*". Building owner #5 identified the types of assistance available before he bought his building so he could factor this into his due diligence. The other recent purchaser of a Cuba Street building (#1) had not learnt about the BHIF until after she had bought the building even though she had known that it was earthquake prone.

In addition to the BHIF grants, other forms of assistance offered by council have been accepted. Owner #5 is benefitting from the recently introduced rates relief measures. Owner #3 had also benefitting from the new assistance measures offered by council as his body corporate had had its resource consents discounted. This body corporate had also received specialist advice provided by council on their building value and possible finance mechanisms. Various viewpoints were offered on the assistance offered by council. Owner #6 judged that the council should be extending its rates remission policy to cover all rates rather than only to the uplift in rates due to higher property valuations following strengthening. Owner #5 said that he had suggested to council that it should lobby government to depreciate the costs of earthquake strengthening. Any assistance offered by council was welcomed by owner #4, as she believed it could help change people's attitudes towards strengthening;

*"So we actually went to the council and got a grant to look – it was \$12,000 – which was good, And we used that to get two structural engineers... We thought we might go back and apply for some money to do parapet strengthening within the next year or so. I wasn't aware of the new*



*rates remissions policy and reduced consents fees, but anything like that sort of positive help I think, even if it's quite small, it definitely changes people's attitudes" - Owner #4*

### 2.6.3. Consideration of working with neighbouring building owners

Some owners had actively looked into the possibility of strengthening their buildings in conjunction with their neighbours (#1, #2, #4 and #5) but not one of these had identified that this approach would work for them. In two instances, this was because there were gaps between the buildings, and in the other two cases, the adjoining buildings were constructed using different materials/techniques that made strengthening them together not feasible;

*"The project did raise some good questions about connections to other buildings which they did explore but were discarded... it wasn't viable as the two buildings were quite different so strapping them together wouldn't work" – Owner #2*

Owners #3 and #6, who are not proceeding with strengthening their buildings at present, both said that they were aware that working with their neighbour was not an option open to them. This was either because the buildings were of different heights or incompatible construction, or because there was no building on adjoining sections.

## 3. Outcomes of the Cuba Precinct Programme

Through programme evaluation and interviews with building owners, our research found that the Cuba Precinct Programme raised levels of awareness of seismic strengthening among building owners in the Cuba Street Heritage Area. The Programme also stimulated discussions between adjoining building owners to investigate working together on seismic strengthening solutions. Additionally, over the period of the Programme there was an increase in uptake of the Built Heritage Investment Fund, and through strengthening, the number of heritage buildings on the earthquake prone building list was reduced. The Programme stimulated building owners to seek advice from advisers in Council and Heritage New Zealand, and building owners accessed multiple communication channels and a range of fora to learn about the Programme.

An additional, and perhaps less expected, outcome of the Programme was the flow of information and feedback in both directions between building owners and Programme partners. This feedback helped contribute to the recent launch by Wellington City Council of two new incentives to motivate the seismic strengthening of earthquake prone buildings, namely 'rates relief' and discounted fees for resource consent fees (as described in Section 2.4). While our research cannot conclude that the above findings occurred as a direct result of the Programme, it would certainly have contributed.

## 4. Wider applicability of learnings

Dissemination to other jurisdictions of the Cuba Street project as a potential exemplar project reveals the applicability of this approach to other 'at risk' towns and cities that has potential relevance to the Canadian context. The evidence to date points to the Cuba Precinct Programme lending support to findings elsewhere that it is more effective to employ a *comprehensive* approach, whereby a range of financial and non-financial incentives are provided to complement regulation, than to regulate without the provision of incentives. It appears that the *targeted* 'precinct' approach has significant merits and could be more widely employed elsewhere. This approach allows efforts to be focused strategically on geographic areas most at risk. It also enables new incentives to be tested in one locality before more widespread adoption. Lastly, by designing the Programme so that it was *complementary* to other local objectives, such as heritage preservation, greater advances can be made in meeting all goals.

If considering adopting similar approaches, organisations should think creatively about potential partners and resources which may be available at a local and national level, especially where such arrangements could be a mutual win-win. When promoting a programme, multiple communication channels should be used to connect with building owners, and communication should be sustained for the duration of the project. Additionally there should be a range of opportunities for engagement in different fora, at different times of day and on different days of the week. This was effective in the Programme as it allowed a wide range of people to participate.

It should also be acknowledged that achieving mitigation of earthquake prone buildings in our towns and cities is a long-distance run and not a sprint. As such, success will require a long-term commitment and strategy. Future approaches should recognise that different owners are at different stages in the process at different times, and thus programmes should be designed to engage (and continue to engage) building owners over time until their goals are completed. While the most effective approach may be to provide a variety of incentive types, it appears that initially it may be most useful to inform and engage, and subsequently to assist, allow, and simplify. Lastly, it is likely that programmes will need to be appropriately adapted in order to meet the specific needs of different places.

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## 6. References

- AIR Worldwide. 2013. *Study of Impact and the Insurance and Economic Cost of a Major Earthquake in British Columbia and Ontario/Québec*. Study commissioned by the Insurance Bureau of Canada. October 2013.
- Alesch, D., Arendt, L., & Petak, W. (2012) *Natural Hazard Mitigation Policy: Implementation, Organizational Choice, and Contextual Dynamics*. Springer.
- Bothara, J., Jury, R., Wheeler, K., & Stevens, C. (2010) *Seismic assessment of buildings in Wellington: experiences and challenges*. Beca, Wellington.
- Canterbury Earthquake Recovery Authority (CERA). 2015. "Demolitions list". Accessed 2 March 2015 from <http://cera.govt.nz/demolitions/list>
- Colliers International Research (CIR). (2013) *Tenant earthquake risk assessment (TERA) survey*. Auckland, New Zealand
- Comerio, M. (2004) Public policy for reducing earthquake risks: a US perspective. *Building Research & Information*. 32(5), 403-413.
- Controller and Auditor-General New Zealand (CAGNZ) Tumuaki o te Mana Arotake. (2014). "Part 3: Public sector funding for the recovery in Canterbury". Accessed 21 July 2014 from <http://www.oag.govt.nz/2012/canterbury/part3.htm>
- Dominion Post (2014) Strengthening work rates relief welcomed. 5 July. <http://www.stuff.co.nz/dominion-post/business/commercial-property/10236030/Strengthening-work-rates-relief-welcomed> accessed 9 December 2014
- Earthquake Engineering Research Institute (EERI). (1998) *Incentives and impediments to improving the seismic performance of buildings*. EERI: Oakland.
- Egbelakin, T., & Wilkinson, S. (2008). Factors affecting motivation for improved seismic retrofit implementation. Paper presented at the *Australian Earthquake Engineering Conference (AEES)*.
- Egbelakin, T., Wilkinson, S., Potangaroa, R., & Ingham, J. (2011) Enhancing seismic risk mitigation decisions: a motivational approach. *Construction Management and Economics*, 29, 1003-1016.
- Egbelakin, T., Wilkinson, S., Potangaroa, R., & Ingham, J. (2013) Improving regulatory frameworks for earthquake risk mitigation. *Building Research & Information*, 41(6), 677-689.
- Egbelakin, T., Wilkinson, S., & Ingham, J. (2014) Economic impediments to successful seismic retrofitting decisions. *Structural Survey*, 32(5), 449-466.
- Fujima, T., & Tatano, H. (2013) Promoting seismic retrofit implementation through 'nudge': Using warranty as a driver. *Risk Analysis*, 33(10), 1858-1883.
- GNS Science. 2015. "New Zealand Earthquakes". Accessed 2 March 2015 from <http://www.gns.cri.nz/Home/Learning/Science-Topics/Earthquakes/New-Zealand-Earthquakes>
- Heritage New Zealand (NZ) (2014) Cuba Street fact sheet.

- Kohiyama, M., Kiremidjian, A.S., Meguro, K., & Yoshimura Ohara, M. (2008) Incentives and disincentives analysis for improving policy for seismic risk management of homeowners in Japan. *Natural Hazards Review*, 9, 170-178.
- Matthews, P. (2011) Death zone. The Press, 10 April. Retrieved 17 July 2014 from <http://www.stuff.co.nz/the-press/news/christchurch-earthquake-2011/4867859/Death-Zone>
- Nahkies, P. (2011). Retrofitting – CPR for the central city? Paper presented at the *Pacific Rim Real Estate Society (PRRES) 17th Annual Conference*. 16-19 January. Gold Coast: Australia.
- New Zealand Society for Earthquake Engineering. 2006. *Assessment and improvement of the structural performance of buildings in earthquakes: Prioritisation Initial Evaluation Detailed Assessment Improvement Measures*. Recommendations of a NZSEE Study Group on Earthquake Risk Buildings. June 2006 (Including Corrigenda N°s 1 & 2).
- Parker, M., & Steenkamp, D. 2012. “*The economic impact of the Canterbury earthquakes*”. Reserve Bank of New Zealand: Reserve Bank Bulletin. Accessed 2 March 2015 from [http://www.rbnz.govt.nz/research\\_and\\_publications/reserve\\_bank\\_bulletin/2012/2012sep75\\_3parkersteenkamp.pdf](http://www.rbnz.govt.nz/research_and_publications/reserve_bank_bulletin/2012/2012sep75_3parkersteenkamp.pdf)
- Paxton, B., Barber, S., Umland, C., & Elwood, K. (2013) Addressing URM seismic risk in Victoria, Canada. *12th Canadian Masonry Symposium. Vancouver, British Columbia*, 2nd -5th June.
- Powell, F., Beetham, J., Harding, A. (2014) Post-event business recovery: Varying recovery trajectories and perverse outcomes. Paper presented at the *Australian and New Zealand Disaster and Emergency Management Conference*. Surfers Paradise, Gold Coast (QLD), 5-7 May
- Powell, F., & Harding, A. (2010) *Business recovery and the rebuilding of commercial property*. In ‘Shaken Up’, the Published proceedings of a workshop on recovery following the Gisborne earthquake, 7 December 2009. Opus International Consultants Ltd: Lower Hutt.
- Prochaska, J.O., & Velicer, W.F. (1997) The transtheoretical model of health behavior change. *American Journal of Health Promotion*, 12(1), 38–48.
- Solberg, C., Rossetto, T., & Joffe, H. (2010) The social psychology of seismic hazard adjustment: re-evaluating the international literature. *Natural Hazards and Earth System Sciences*, 10, 1663-1677.
- Southcombe, M. and A. Charleson (2014) [Re] *Cuba: Renegotiating seismic resilience in Cuba Street Wellington*. Wellington: Victoria University of Wellington.
- Structural Engineering Association of Utah (SEAU) and the Utah Seismic Safety Commission (USSC). (2008). *Unreinforced Masonry Buildings: Don't Play the Odds*. Retrieved 16 July 2014 from [uthazardmitigation.files.wordpress.com/2012/12/killer\\_buildings.pdf](http://uthazardmitigation.files.wordpress.com/2012/12/killer_buildings.pdf)
- Thaler, R.H., & Sunstein, C.R. (2009) *Nudge: Improving Decisions about Health, Wealth and Happiness*. Penguin, New York.
- Wanganui Earthquake-Prone Buildings Community Taskforce (WEPBCT) (2014) *Report to Wanganui District Council*.
- Wellington City Council (WCC). (2012a) *Earthquake resilience: property owners' survey*. Summary of results.
- Wellington City Council (2012b) WCC Long Term Plan 2012-22, <http://wellington.govt.nz/your-council/plans-policies-and-bylaws/plans-and-reports/long-term-plan/long-term-plan-2012-22> accessed on 28 August 2014
- Wellington City Council (WCC). (2013a) Wellington City District Plan, Chapter 21 Heritage Rules, <http://wellington.govt.nz/~media/your-council/plans-policies-and-bylaws/district-plan/volume01/files/v1chap21.pdf> accessed on 21 August 2014
- Wellington City Council (2013b) Building owners of Cuba Street, here is your invite for free cash.
- Wellington City Council (WCC). (2014a) EQP Building List, 11th July.
- Wellington City Council (WCC). (2014b) 2014/15 Annual Plan.
- Wellington City Council (WCC). (2014c) Heritage resource consent fee reimbursement <http://wellington.govt.nz/~media/services/consents-and-licenses/resource-consents/files/heritage-reimb.pdf> accessed 9 December 2014

- Wellington City Council (2014d) Built Heritage Incentive Fund  
<http://wellington.govt.nz/services/community-and-culture/funding/council-funds/built-heritage-incentive-fund> accessed 9 December 2014
- Wellington Employers' Chamber of Commerce (WECC). (2013) Submission to the Ministry of Business Innovation and Employment building seismic performance proposals to improve the New Zealand earthquake-prone building system. March, 2013.
- Whakatane District Council (WDC). (2014) *Earthquake prone buildings programme*. Retrieved 16 July 2014 from <http://www.whakatane.govt.nz/eqpbp>
- Wolfe, A.K., Malone, E.L., Heerwagen, J., & Dion, J. (2014) *Behavioural Change and Building Performance: Strategies for Significant, Persistent, and Measurable Institutional Change*. Report prepared for the U.S. Department of Energy under Contract DE-AC05-76RL01830. Pacific Northwest National Laboratory, Richland, WA.