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Life Safety vs. Preservation of Community and Heritage Buildings in the Wellington Region



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WPI



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Abstract

Balancing risk against the preservation of earthquake prone buildings is a continuing struggle in Wellington, New Zealand. This project gathered and compared the perspectives of the general public, church communities, heritage specialists, professional engineers, and local authorities to assist GNS Science in balancing the interests of these stakeholders.

Recommendations include standardizing structural assessment processes and training, feasibility of additional public funding to upgrade buildings, new signage to increase public awareness of earthquake prone buildings, and regular communication among stakeholders to understand and resolve differences.

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Executive Summary

Due to its location on the Pacific Ring of Fire, New Zealand is very prone to earthquakes, experiencing approximately 15,000 each year. About 150-200 are strong enough to be felt and large, destructive earthquakes occasionally occur. On 22 February 2011, a magnitude 6.1 earthquake hit Christchurch, New Zealand causing \$40 billion in damages, 181 deaths, 1,500 injuries, and damaging approximately 100,000 buildings (U.S. Geological Survey, 2011; see also Kaiser et al., 2012).

The Christchurch earthquake served as a reminder to Wellington's engineers, politicians, building owners, and heritage preservationists to continue their efforts to preserve the city's structural assets. Many of Wellington's buildings have been assessed as earthquake prone, meaning they meet less than 33% of the New Building Standard (% NBS). Such buildings must be strengthened or destroyed, forcing a difficult choice upon owners who may lack funds for upgrades, especially owners of buildings with special cultural value, such as heritage, religious, or community buildings. Heritage buildings give Wellington a sense of identity, an aspect that the public does not want to lose.

This project assisted the Crown-Research Institute GNS Science by collecting the opinions of the greater Wellington public and supplementing them with the experiences and opinions of field experts in order to develop an overview of opinions, perspectives, and expertise from which to seek common ground. The opinions of the three main stakeholders (the public, engineers, and church communities) were collected through public surveys, interviews, and focus groups. The recommendations developed and presented to GNS Science aim to stimulate an increased collaborative effort between these stakeholders in the hopes that understandings can be reached surrounding the balance of life safety and building preservation.

Specifically, we fulfilled four objectives:

1. Establish public opinion on the monetary value and societal significance of both community and heritage buildings in the Greater Wellington Region (GWR).
2. Assess public perception towards buildings tagged as earthquake prone.
3. Collect the professional opinions of representatives of the structural engineering community concerning current building assessment techniques and future pending building code legislation.

4. Collect information on the experiences of church communities and the New Zealand Historic Places Trust to better understand the challenges associated with the preservation of heritage buildings.

From these objectives, we developed a method that guided our research and explored the tensions surrounding the need for life safety versus building preservation. Figure 1: Map of project objectives illustrates this process.

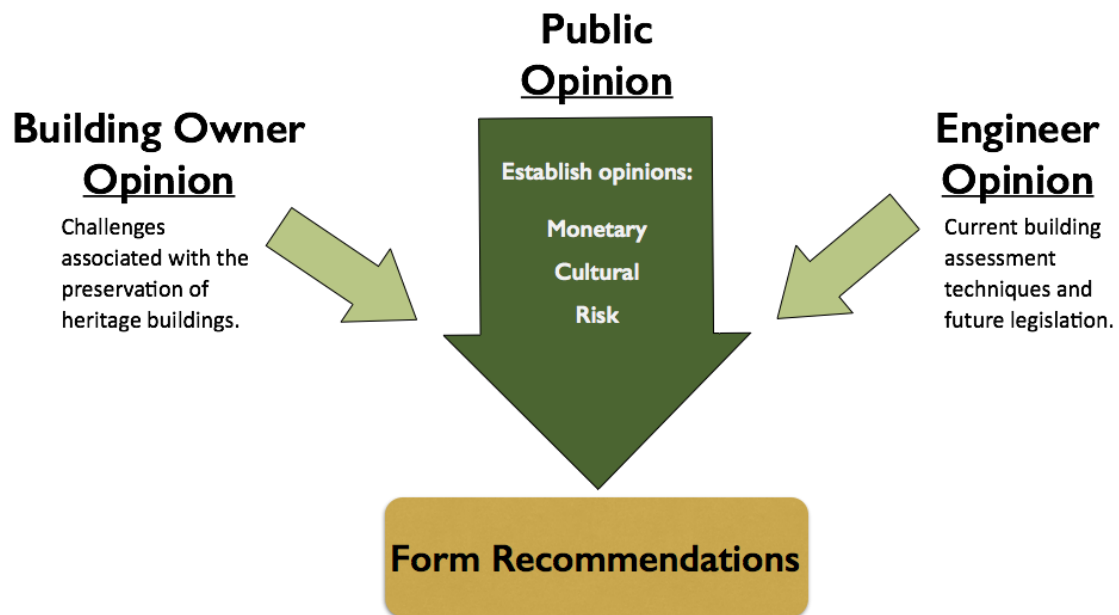


Figure 1: Map of project objectives

The middle arrow represents the first and second objectives. The right-hand arrow represents the third objective and the left-hand arrow represents the fourth object. The bottom box represents our final goal of developing recommendations.

Objective 1: Establish public opinion on the monetary value and societal significance of both community and heritage buildings in the Greater Wellington Region.

This first objective helped us determine where tensions in our project aligned. We developed a public survey and administered it to 200 respondents in various areas within Wellington, Lower Hutt, and Porirua. This data represents the core of our project.

Objective 2: Assess public perception towards buildings tagged as earthquake prone.

Meeting our second objective established the level of risk that people associate with being in or around a building that has been tagged as earthquake prone. This data was collected from a question on our public survey and from our focus groups.

Objective 3: Collect the professional opinions of representatives of the structural engineering community concerning current building assessment techniques and future legislation.

Our third objective developed a better understanding of the current engineering assessment techniques from those who conduct them and it gauged their opinions on how methods should change in the future. We discovered that a proposed amendment to current legislation could standardize the assessment process. To gain the professional opinion of engineers on potential benefits of the pending legislation we conducted two focus groups with structural engineers from the GWR and we interviewed a member of the New Zealand Society for Earthquake Engineering (NZSEE).

Objective 4: Collect information on the experiences of church communities and the New Zealand Historic Places Trust in an effort to better understand the challenges associated with the preservation of heritage buildings.

Our fourth objective explored some of the challenges building owners faced when upgrading their buildings. Heritage building owners are restricted in how they can change their buildings; structural and historical requirements can conflict. We conducted interviews and focus groups with heritage building owners, members of various church communities, the Wellington City Council (WCC) and members of the New Zealand Historic Places Trust (NZHPT).

In addition, we met with the Wellington Region Emergency Management Office (WREMO) and discussed ways to integrate our project with one of their ongoing pre-disaster projects addressing questions such as which buildings should be reestablished first after a big earthquake. Upon completion of the project we sent a concise set of recommendations and findings concerning community buildings to WREMO (see Appendix I).

Findings

Reviewing information collected from our public survey, focus groups, and interviews, led to several findings.

I. - The current building assessment practices are inconsistent, causing considerable variability in building assessment scores. In one focus group, a building owner in New Zealand had five different engineers conduct initial assessments on his building and received five different scores ranging from earthquake prone to very safe. It was discovered that each engineer used a different technique; some of these techniques included a street view assessment, an inspection of original building blueprints, and a detailed interior inspection of the building. Each of these assessment practices is valid with current legislation. Engineers we spoke with agreed that a standardization of inspection techniques is needed, noting they each had different methods they personally prefer.

II. - Heritage building owners are restricted in their ability to update buildings that are earthquake prone or at risk of earthquake damage (0-66% of New Building Standard). Before a significant change can be made to a heritage building, an owner must apply for permission from the NZHPT, which ensures that heritage value is not lost in the process. Preserving heritage value has become a challenge in the larger scope of improving a building's safety score. In a focus group, we learned that a church community wanted to remove a bell tower which was causing the building to be earthquake prone. However, due to its classification as a Category I heritage building, they could not remove the bell tower. In another case, a building owner was trying to lose the building's heritage status to have more freedom to upgrade the building.

III. - Despite the availability of multiple external funding options for upgrading heritage buildings, owners still find it difficult to afford retrofitting their buildings. Upgrading a heritage building can be very expensive due to its age and construction; most were not built up to current building standards, thus require a lot of retrofitting work. Currently, building owners can apply to receive a grant from different sources including the National Heritage Preservation Incentive Fund (from the NZHPT), the Wellington City Council Built Heritage Incentive Fund, and the Lottery Environment and Heritage Committee (from the Department of Internal Affairs). However, due to the demand for funding, these agencies in most cases can only partially fund any given retrofitting project. Building owners are left to cover

most, if not all of the funding. It can take owners years, sometimes decades, to acquire the necessary funds on their own accord. Meanwhile, their buildings pose a safety risk to those around them and the functionality of the building is significantly lessened.

IV. - The public wants to see heritage buildings preserved and values them most for their architectural, historical, and cultural significance. In our survey, we asked members of the public if they thought it was important to preserve heritage buildings and 69% agreed or strongly agreed with this statement. We then asked why they valued heritage buildings and the most common responses were for historical, cultural, and architectural reasons. Additionally we found that religious heritage buildings were more valued for these reasons than for religious ones. This indicates that even though members of the public may not value buildings for their intended function, the public still finds visual and cultural value in the city's religious heritage buildings.

In the open response section of the survey, members of the public expressed an interest in preserving the city's charm and character. Many expressed concerns that Wellington might become like Christchurch, which lost a majority of its heritage buildings in the 2011 earthquake. The public wanted measures to be taken now to better preserve the iconic buildings of Wellington.

V. - There are specific heritage buildings within the Wellington Region that the public would like to see preserved above all others. In our survey we asked members of the public if there were specific heritage buildings in the region they would like to see preserved above all others and four buildings topped the list: Wellington Town Hall, Saint Mary of the Angels, Old Saint Paul's church, and the Old Parliament Building.

VI. - The public is willing to contribute financially to upgrade heritage and community buildings if an increase in rates was established. In the public survey, we asked members of the public that if they had to use rates to contribute towards upgrading buildings, what percentage increase would they feel most comfortable accepting. Approximately 77% of those surveyed felt comfortable with at least a 1% increase in their rates for both heritage and community buildings. This finding illustrates how the public financially values the city's buildings through their willingness to expend money for a preservation fund.

VII. - The public does not have a common perception of safety risks associated with earthquake prone buildings. In a survey question, we asked members of the public to rate, on a scale of very unsafe to very safe, how they felt when in or around a building that was tagged as earthquake prone. In reviewing the data the most popular response was neutral, yet answers were distributed across all possible responses. This indicates that the public does not have a common perception of the actual safety risks associated with earthquake prone buildings. Additionally, in focus groups, we found that building owners had a wide range of responses to their buildings being assessed as earthquake prone. Some heritage churches continued to use their buildings and just increased the earthquake risk notices in and around their buildings, while others shut down their buildings until they were upgraded to a certain % NBS. In conclusion, the public has a wide mix of reactions to an earthquake prone status.

Recommendations

After reviewing our findings and background research, our team developed a list of recommendations for our sponsor, GNS Science, as well as for other stakeholders such as the WCC, the NZHPT, the WREMO, structural engineers and building owners:

1. That earthquake related building assessment practices be standardized in an effort to promote more consistent and thorough building evaluations. It is further recommended that city councils, the central government, and the New Zealand Society for Earthquake Engineering establish a regular assessment training course for all structural engineers who conduct Initial Evaluation Procedures (IEP) and Detailed Engineering Evaluations (DEE) to assess the status of a building.
2. That local authorities further research ways to involve public contributions in the preservation of heritage buildings.
3. That the Wellington City Council consider developing new earthquake prone building notices that are more noticeable and informative to increase the public's knowledge and awareness of earthquake prone buildings and the risks involved.
4. That all involved stakeholders increase their collaboration and communication through the creation of a forum where anyone can express their concerns, work through challenges, and develop solutions.

These recommendations are a step in the right direction towards defusing tensions between the major stakeholders as they seek to balance life safety and preservation of community and heritage buildings.

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List of Abbreviations

% NBS	Percent New Building Standard
DEE.....	Detailed Engineering Evaluation
GWR	Greater Wellington Region
IEP.....	Initial Evaluation Procedure
MBIE.....	Ministry of Business, Innovation, and Employment
NZHPT.....	New Zealand Historic Places Trust
NZSEE	New Zealand Society for Earthquake Engineering
WCC	Wellington City Council
WREMO	Wellington Region Emergency Management Office

1. Introduction

In the last twenty-five years, earthquakes have been accountable for eleven out of the top twenty most deadly natural disasters (Organisation for Economic Co-operation and Development, 2008). Each year, they account for approximately 60,000 deaths worldwide with the majority of earthquake related deaths resulting from building collapse or damage (Kenny, 2009). Due to its location on the Pacific Ring of Fire, New Zealand experiences approximately 15,000 earthquakes annually, of which 150-200 are strong enough to be felt. (Lowe, Smith, & Wright, 2012). In February 2011, a magnitude 6.1 earthquake hit Christchurch, New Zealand, the country's third largest city. The earthquake killed 181 people, injured an additional 1,500, and destroyed or damaged an estimated 100,000 buildings (U.S. Geological Survey, 2011; see also Kaiser et al., 2012). With damages estimated at \$40 billion, Prime Minister John Key described the restoration after the earthquake as "the largest and most complex, single economic project in New Zealand's history" (MediaWorksTV, 2013).

In response, the Prime Minister John Key established a Canterbury Earthquake Royal Commission to investigate and report on the causes of building failure as a result of earthquakes. The report also evaluated the strength of the remaining buildings (Canterbury Earthquakes Royal Commission, 2011). Prompted by the Commission's report, authorities across New Zealand, including those in the GWR, are assessing the capacity of older buildings to resist earthquakes. Current legislation requires that a building judged as earthquake prone either be strengthened by retrofitting or be demolished.

Such judgments threaten heritage and community buildings in Wellington since they often fall short of earthquake standards. Buildings are considered earthquake prone if they are assessed below 33% NBS (New Zealand Society for Earthquake Engineering [NZSEE], 2006). A building meeting 33% of the new standard is strong enough that people can escape safely, but not necessarily earthquake resistant. Restoring buildings is potentially expensive, demanding funds that the community or building owners may not have. Estimates suggest that restoring a building can cost 30-40% more than constructing a new building (Anonymous, 1994).

The Wellington community values heritage and community buildings differently; heritage buildings are reminders of history and identity while community buildings fulfill specific needs and services. A 2008 study from the Ministry of Culture and Heritage reported that 95% of the public at least slightly agreed that their historic buildings and places should be

protected (Ministry of Culture and Heritage, 2008). Additionally, the report of the Royal Commission on the Canterbury Earthquakes emphasized that all buildings should adhere to common building safety standards. Ultimately, tensions arise among culture, safety, and economics as citizens of Wellington – indeed all of New Zealand – seek to balance preservation of heritage and community buildings against the risks of earthquakes.

Insights into the conflicting viewpoints of stakeholders can help develop a middle ground among these tensions. To develop such understanding, this project assisted the Crown-Research Institute GNS Science by collecting the opinions of the general public in the Greater Wellington Region and comparing them with the experiences and opinions of field experts. An assessment of the differences in motivation, aim, and understanding has led to recommendations for new legislation, funding initiatives, and heritage preservation. Public surveys, interviews, and focus groups captured the opinions of three main stakeholder groups; the public at large, structural engineers, and church groups. The recommendations developed in this study aim to increase collaboration among the different stakeholders as they seek to balance life safety and building preservation.

2. Literature Review

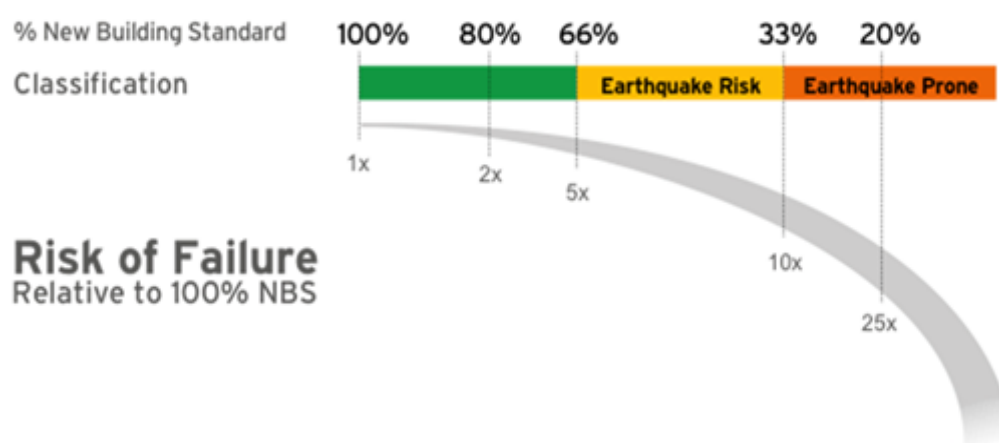
For New Zealand residents, earthquakes have become an everyday part of life, posing as a constant, silent threat. The vast majority of earthquakes that occur daily are too small to cause any harm and usually go unnoticed by the general population. However, every so often a high magnitude earthquake (greater than a 6.0 rating on the Richter scale) will result in the deaths of hundreds of people, reminding those affected of the terrible destructive capabilities characteristic of larger earthquakes. The Christchurch earthquake of 22 February 2011 is an example of the incredible damage that can result from large earthquakes, especially in urban areas with high population densities (Wellington City Council [WCC], n.d.-a). This chapter will focus on how engineers assess the different levels of earthquake prone buildings and give a brief summary of how and why buildings are classified as having heritage value. Additionally, it will cover how other communities around the world have handled the preservation of their heritage buildings, and conclude by examining a recent court case in Wellington which exemplifies the major tensions involved in the preservation of heritage buildings.

2.1 Building Assessments

Although there is no certain way to eliminate the risk of catastrophic building failure during an earthquake, the government of New Zealand and the Wellington City Council (WCC) have taken proactive measures to mitigate building damage and improve public safety. The WCC has implemented a two-step evaluation process to determine whether or not a building is adequately prepared for an earthquake. This includes an initial evaluation (the IEP) to establish the extent to which a building is earthquake prone, and a detailed follow-up evaluation (the DEE) which includes a more thorough investigation of the building and incorporates strengthening recommendations (WCC, n.d.-a). These evaluations are used to rate building safety with a percentage score. This score, commonly referred to as percent of New Building Standard (%NBS), compares the strength of the current building to the building safety expectations for a new building at the same location.

In an effort to better educate building owners and members of the general public, the Catholic Archdiocese of Wellington has developed posters which clearly convey the relationship of the assessed score to the building's earthquake risk. One example poster, shown in Figure 2:

Risk of building failure during earthquakes, summarizes the risk of buildings based on their %NBS. Buildings which fall below 66% NBS are classified as earthquake risks. A building which falls below 33% NBS is classified as earthquake prone and “will have its ultimate capacity exceeded in a moderate earthquake” (Building Act 2004, s. 122). Reg. 7 of the Building (Specified Systems, Change the Use, and Earthquake-Prone Buildings) Regulations 2005 defines a moderate earthquake as one that causes one-third the shaking and has the same duration as model earthquakes used when designing new buildings (New Zealand Society for Earthquake Engineering [NZSEE], 2006).



*Figure 2: Risk of building failure during earthquakes
(Catholic Archdiocese of Wellington, 2013)*

The risk of failure (collapse) of a building increases rapidly as the %NBS decreases. For example, a building assessed at 33% NBS would be 10 times more at risk of collapse than a building in the same location assessed at 100% of NBS, while a building assessed at 20% NBS would be 25 times more at risk (see Figure 2). In accordance with the Building Act 2004, the WCC requires that all buildings assessed below 34% of NBS be either demolished or retrofitted. Although buildings assessed at scores higher than 33% NBS are not legally obligated to be retrofitted, the council (along with the New Zealand Society for Earthquake Engineering) recommends that any building assessed as an earthquake risk (33-66% NBS) be further strengthened to no lower than 67% NBS (NZSEE, 2006). Buildings which exceed 67% NBS have a much lower risk of collapse and are more likely to experience only slight damage in a moderate earthquake. This recommendation is crucially important to local authorities when

considering the preservation of buildings which are valued for their architectural, cultural, or historical characteristics as their value cannot be replaced if the buildings are destroyed.

2.2 Significant Buildings

2.2.1 Heritage Buildings

In accordance with the Resource Management Act of 1991 the Wellington City Council has created a District Plan which provides the guidelines for the protection and conservation of heritage buildings in the Wellington area (WCC, 2012). These buildings, which are valued by the public for their “architectural, cultural, social, political, economic, scientific, technological, transportation, military, or maritime history” (WCC, 2012, pg. 20/1), are considered important landmarks which shape the character of Wellington City and its surroundings. After a building has been added to the Council’s heritage inventory, it is protected and any changes made to the building must first be approved by the Council. By utilizing the recommendations of the New Zealand Historic Places Trust (NZHPT), an advocacy group to the WCC whose responsibilities include the identification and protection of heritage places, the WCC supplements their efforts in the identification and preservation of these landmark buildings (WCC, 2012).

The Historic Places Act 1993 provides guidelines for which places can be deemed to have compelling heritage value and establishes the significance of their preservation. The Act also regulates the objectives of the NZHPT. Part of the Historic Places Act 1993 covers Historic Places, which are defined as places that possess aesthetic, archaeological, architectural, cultural, historical, scientific, social, spiritual, technological, or traditional significance or value. Items that fall within the Historic Places section are grouped into one of two categories. Category I includes places of special or outstanding historical or cultural heritage significance. Category II is the lesser of the two categories and contains the places of historical or cultural heritage significance (Historic Places Act 1993).

In order to classify a building as having heritage status, the New Zealand Historic Places Trust uses a process which considers public opinion and includes an application, evidence submission, and final review by the NZHPT Board. Anyone can apply to have a place put on the Register and if it is considered to be a good candidate for registration, the NZHPT will prepare a report to establish a case for the building. In order to determine whether a place is significant, the NZHPT will assess its physical features as well as investigate its history. Afterward, the NZHPT

Board will take all evidence and reach a final verdict about whether or not the place can be classified as a heritage building (New Zealand Historic Places Trust, n.d.-a).

[Funding availability for Heritage Buildings](#)

In an effort to help preserve the heritage buildings of the GWR, there are numerous funding options that can be applied for by building owners to aid in funding building upgrades. Some of these options include the National Heritage Preservation Incentive Fund, the Lottery Environment and Heritage Committee, and territorial grants such as the Wellington City Council Built Heritage Incentive Fund (New Zealand Historic Places Trust, n.d.-b).

The National Heritage Preservation Incentive Fund is administered by the NZHPT and is appropriated \$563,000 annually by Parliament. However, only properties that are registered as, or in the process of being registered as Category I historic places can apply to this fund. The National Heritage Preservation Incentive Fund will also pay no more than 50% of the cost of preservation work and usually no more than \$100,000 per building (New Zealand Historic Places Trust, n.d.-c).

The Lottery Environment and Heritage Committee's funding is used to increase New Zealand's cultural heritage, preserve and protect its natural environment, and preserve its history for future generations. Priority is given to places with heritage significance and a preference will also be given to earthquake strengthening projects (Department of Internal Affairs [DIA], 2011a).

The Built Heritage Incentive Fund, distributed by the WCC, is focused on earthquake strengthening projects. This fund can be used by building owners to help fund initial engineering assessments or strengthening work (WCC, n.d.-b). \$400,000 is distributed in three funding rounds throughout the year for accepted applicants.

While these funding options offer a great deal of help to those needing financial support to upgrade their heritage buildings, some upgrades can cost building owners millions of dollars. In these situations, the additional funds cover only a fraction of the upgrading costs. As a result, some owners are still left without the means to bring these buildings up to code.

2.2.2 Community Buildings

Independent of heritage value, buildings may also provide public facilities for recreational, social, and educational purposes to their respective communities. Examples of these buildings include public libraries, museums and galleries, community halls, sportsground buildings, community centers, and community swimming pools. As stated in the District Plan of Hastings, NZ, the availability of community facilities and recreational activities are “important for the maintenance and enhancement of the environment, the character and amenity of the District, and the community’s social, cultural, and economic wellbeing.” (Hastings District Council, 2013). Since many community buildings are not heritage buildings, their value instead lies in the services they provide to the public.

In addition to the facilities listed above, community buildings may provide different services in the event of a disastrous earthquake. One example of this is the use of community halls as Civil Defence Centres to coordinate emergency response planning. These Civil Defense Centres are part of WREMO’s plans to help protect those living in the region after a major natural disaster. While they may not be valued by the public for their historic and cultural value, community buildings offer services that aim to unite their respective community members; both recreationally and during a crisis.

2.3 Risk Management Case Studies

The risks involved with preserving older historic and heritage buildings have led other regions to use alternative methods to address the threats related to these buildings. Three places outside of New Zealand experiencing the risks of heritage buildings are Japan, Italy, and New Hampshire. These three regions are faced with unique issues concerning heritage buildings in their respective areas; earthquakes in Japan damage its cultural buildings, Italy's many churches are prone to weak structural components, and the age and material composition of New Hampshire’s buildings has resulted in their slow decay. These regions have identified the following successful risk management plans to address these problems.

2.3.1 Japan

Similar to New Zealand, Japan lies above two converging tectonic plates. Because of this, Japan experiences over 1,500 earthquakes per year and its 16 designated world heritage sites are under a constant threat of being damaged or destroyed (Fowler, 2002). Through the use of organizations and councils specifically created to preserve buildings, the Japanese government has contributed approximately 90% of the restoration costs of wood buildings (Brebbia, 2013). The fact that the government covers most of the expenses for retrofitting at-risk buildings leads to many being brought up to code.

One such building is the large wooden Gekko-den pavilion in Tokyo, a popular tourist attraction (Hozumi & Nishi, 1983). The Council for the Protection of Cultural Properties analyzed the pavilion's structural integrity and determined that there were several major structural flaws that could have led to its collapse in the event of an earthquake. Due to this risk and the heavy traffic that the pavilion receives, the council decided to completely demolish the pavilion and reconstruct it. Decisions like this are very common for the many wooden heritage buildings in Japan; they are often partially or completely rebuilt in order to protect the community (Brebbia, 2013). This illustrates the government's proactive approach to ensure the safety of the community by constantly upgrading or replacing existing buildings.

2.3.2 Italy

On April 6, 2009 a magnitude 6.3 earthquake struck the Aterno Valley and the city of L'Aquila in Italy, killing 305 people, injuring 1500 more and causing damage to over 10,000 buildings in the region (Lagomarsino, 2012). The heritage and cultural buildings in the region, especially churches, were more at risk of damage from this earthquake due to their old age. As a result, a method aimed at "recognizing collapse mechanisms" in church architecture has been adopted in order to help prevent future damage.

Many aspects of churches were identified as being prone to earthquake damage, but specific elements of church infrastructure, such as facade walls, were found to be commonly damaged features. Understanding which architectural elements are susceptible in the event of an earthquake leads to targeted retrofitting, which is much cheaper than a total renovation. Additionally, poorly engineered prior strengthening techniques made churches more vulnerable

to earthquakes. For example, timber roofs had been replaced by concrete slabs, which were not as resistant to seismic vibrations (Lagomarsino, 2012). Although much is still unknown about the causes of damage during earthquakes, examining past damages is a proactive approach to prepare buildings for future disasters.

The Italian government has taken a very active approach to post-earthquake building repairs; it will pay for any building, public or private, to be retrofitted in the event of an earthquake. Italy is a strong proponent of conservation, especially in terms of its cultural heritage because many historical monuments have symbolic value and are social gathering places for the public. The Ministry of Cultural Heritage strongly opposes demolition and rebuilding because it takes away from the building's cultural value. There is not a set procedure for reimbursements to be distributed after an earthquake; instead, the government disburses them on a case-by-case basis (Sergio Lagomarsino, Genoa University, personal communication, 6 March 2014).

2.3.3 New Hampshire

Unlike Japan and New Zealand, the threat of building damage from earthquakes in New Hampshire is minimal. Nevertheless, many older heritage buildings are becoming safety hazards as they fall into disrepair. Because of the historic and cultural significance of these buildings, some dating back to the 1600s, many cities are trying their best to keep the greatest number possible while maximizing the efficiency of repairs (National Park Service, n.d.).

Concord, New Hampshire has devised an effective method for determining whether an older historic building should be destroyed. After a demolition permit is applied for, other members of the community can file for a demolition review. If filed, this review will postpone the demolition of the building for thirty to ninety days. During this time period, community members will present information supporting their argument for either demolition or preservation of the building in a hearing of the demolition committee (*Demolition Review Committee*, n.d.). Information presented often includes the building's age, historic significance, and risk the building poses to its surroundings (Paulus 2007). This process encourages a very healthy and open relationship between the city council and the general public, and incorporates public opinion in the decision making associated with the preservation of culturally important buildings.

2.3.4 Harcourts Building (Wellington, NZ)

While it is widely accepted that the preservation of culture and public safety are both important aspects to consider when dealing with older buildings, decision-making concerning the preservation of heritage buildings often creates tensions between the groups of people involved. The tensions between economic viability, safety, and cultural heritage value arise when these heritage buildings are scheduled to be demolished because they are not deemed safe. Early in 2013, the WCC made a decision to preserve a local heritage building whose owner had applied to have it demolished. The Historic Places Trust recognized that the Harcourts building was a Category 1 listed heritage building and expressed its importance in New Zealand's mercantile and corporate history.

The building owner applied for an Environment Court appeal arguing that the building should be demolished for a number of reasons. First, the Harcourts building satisfied only 15 percent of current building standards. Second, it was not economically viable to bring the building to 100 percent of code. Additionally, the building was all but vacant, uninsured, and was not producing enough income to cover its annual expenses of approximately \$250,000 (Schouten, 2013a).

In October, the Environment Court ruled that the Harcourts building could not be demolished. It stated that despite the fact that the building could not support itself financially and make an acceptable return for its owner, demolition was not justified (Schouten, 2013b). The court was also not satisfied that the owner had explored all of the possible solutions for retaining the building, including bringing the building up to less than 100% NBS.

The Harcourts case is a good example of how the tensions associated with cultural preservation, public safety, and funding availability culminate in the decision to either retrofit or demolish a heritage building. The argument for the preservation of the Harcourts building is an example of the cultural tension of the issue; it is a significant part of New Zealand's history and therefore is too important to demolish. The case also exemplifies the tensions associated with funding and public safety; due to the unavailability of sufficient funding options, the retrofitting process cannot be paid for. If funds do not become available to retrofit the building it will continue to exist as a potential threat to public safety.

3. Methods

This project assisted the Crown-Research Institute GNS Science by collecting the opinions of the greater Wellington public and supplementing them with the experiences and opinions of field experts in order to establish a database of opinions from which we developed recommendations concerning new legislation, funding initiatives, and heritage preservation. To accomplish our goals, we addressed the following objectives:

- Establish public opinion on the monetary value and societal significance of both community and heritage buildings in the Greater Wellington Region.
- Assess public attitude towards buildings tagged as earthquake prone.
- Collect the professional opinions of representatives of the structural engineering community concerning current building assessment techniques and future legislation.
- Collect information on the experiences of church communities and the New Zealand Historic Places Trust in an effort to better understand the challenges associated with the preservation of both public and private heritage buildings.

The remainder of the chapter will provide specifics about the methods implemented to fulfill our objectives.

Section 3.1 states how we conducted public surveys in areas throughout the GWR to establish the public opinion on community facilities, heritage buildings, and earthquake prone buildings

Section 3.2 addresses how we conducted focus groups with local engineering firms to obtain their perceptions pertaining to building assessments and recent legislation

Section 3.3 states how we conducted group interviews and focus groups with church groups in order to increase the understanding of the difficulties they are facing when retrofitting their buildings

3.1 Collecting public opinions in the Greater Wellington Region

3.1.1 Survey Development

In order to determine the value that the members of the Wellington community attribute to community facilities and heritage buildings we conducted 200 five-minute public surveys in the GWR. We chose in-person surveys over other survey methods because of their increased response rate through the use of interpersonal skills (Denscombe, 2010, p. 17). The main drawback of in-person surveys is their increased cost, both in terms of time and money (Denscombe, 2010). As our costs were only limited to travel expenses, in-person surveys were the most appropriate choice.

We created the survey using input and recommendations from members of GNS Science and the WREMO. Both of these organizations made recommendations for the survey using knowledge obtained from previous experiences surveying in the Wellington region.

The survey finalization process included a five-day pilot test on 65 people from the Wellington area. The pilot survey (see Appendix A) helped us reword confusing questions and eliminate variation in the spoken aspect of the survey. Questions were also reworded to produce answers which were more relevant for satisfying project objectives. The final survey is included in Appendix B.

Following the advice of GNS Science and WREMO we divided the questions into six sections to gather public information about the following topics:

- Attitude toward earthquake prone buildings
- Monetary value of community facilities
- Societal significance of community facilities
- Monetary value of heritage buildings
- Societal significance of heritage buildings
- Demographic information

As shown in Table 1, the survey utilized a Likert scale, multiple choice, and short answer questions. A Likert Scale is used to allow an individual to more easily express their opinions on a particular statement. Using Likert scale and multiple choice questions, we could easily compile and analyze our results. The short answer questions enabled the respondent to “express

themselves in their own words” (Denscombe, 2010, pg. 165). The demographic information at the end of the survey was anonymous and used only to ensure a true coverage of the GWR’s population when compared with the New Zealand Census 2013 data (see Appendix C).

Table 1: Public Survey Breakdown

Focus of Question	Question Type	Question Relevance
Attitude toward earthquake prone buildings	Likert Scale	Establish public understanding of current building assessment practices
	Multiple Choice	
Monetary Value of Community Facilities	Multiple Choice	Participants views on payment responsibilities for community facility preservation
Societal Significance of Community Facilities	Likert Scale	Determine public perception on the value of community facilities
	Multiple Choice	
Monetary Value of Heritage Buildings	Multiple Choice	Participants views on payment responsibilities for heritage building preservation
Societal Significance of Heritage Buildings	Short Answer	Determine public perception on the value of heritage buildings
	Likert Scale	
	Multiple Choice	
Demographics	Short Answer	Participant information
	Multiple Choice	

3.1.2 Survey Administration

Following the advice of members of GNS Science we chose several locations to administer the surveys, ensuring a well-rounded set of demographics. These locations, shown in Figure 3, were:

- Lower Hutt: Civic Gardens, High Street, Queen’s Drive, Queensgate Mall
- Porirua: Alua Mall, Te Rauparaha Park, Wi Neera drive
- Wellington: Cuba Street, Lambton Quay, Oriental Parade, Waitangi Park, Wellington Harbor, Riddiford Street (Newtown)

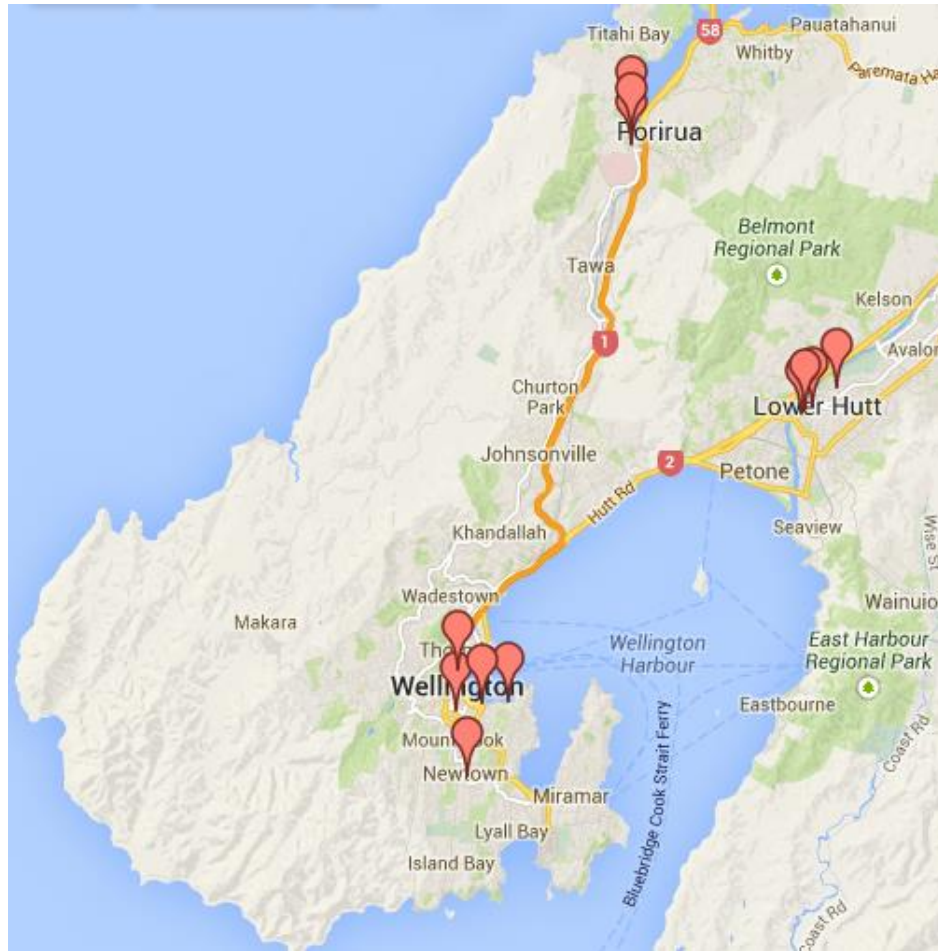


Figure 3: Surveying locations

We travelled in pairs while surveying, with each pair going to a different location. Within each pair, one person read the questions to the participant and the other recorded answers using a tablet. This eliminated the need for manually entering the data later, as it could be exported in an organized fashion to Excel for analysis. Following New Zealand law, we only surveyed members of the public who were over 16 years old. After stopping the individual we asked if they were residents of the GWR. If so, we explained the reason for the survey and an estimate of how long it would take. They only had to answer those questions that they were comfortable with and were allowed to stop the survey at any time. The survey concluded with the demographic questions, before which we reminded the survey respondent of their anonymity and status as a volunteer for our survey. After the survey we handed the person an information sheet which described our project in full detail and provided contact information for GNS Science (see Appendix D).

3.2 Collecting Professional Opinions of Engineers

To supplement the public's opinions with the engineering community's professional ones, we conducted focus groups with local engineers. These focus groups aimed to collect engineers' attitudes towards very recent updates in building code legislation and the current methods and standards used to evaluate risk in earthquake prone buildings. Focus groups were the most appropriate means to obtain this data because they allow for a debate of ideas instead of attempting to obtain a general consensus on the topic. "Instead of such conformity-producing goals as making decisions or reaching consensus, focus groups emphasize the goal of finding out as much as possible about participants' experiences and feelings on a given topic" (Krueger & Morgan, 1993). The discussion among engineers helped them to recall experiences that may have been forgotten during an individual interview (Fontana & Prokos, 2007).

The engineers participating in our focus groups included engineers from the GWR and those who had worked extensively in the Canterbury region following the Christchurch Earthquakes. Table 2 summarizes relevant information for each focus group and its significance to our project. We structured the focus group using a list of engineering questions and topics (listed in Appendix E). We chose one person to moderate each focus group and took minutes on each engineers' responses. Each focus group was recorded to ensure that no data was forgotten or lost. Follow up emails containing the meeting minutes and relevant quotes were sent to those present at the meetings to ensure that no information gathered was used without permission.

Table 2: Engineering Focus Groups

	Organization Information	Organization Purpose	Focus Group Purpose	Date of Focus Group
Focus Group A	Various structural engineering organizations	Earthquake preparation, building assessments, and retrofitting	Collect professional engineering opinion on building assessment procedures and updates to legislation	12 February 2014
Focus Group B	Prominent engineering firm in the GWR	Earthquake preparation and building assessments		14 February 2014

We prepared the agendas with help from engineers at GNS Science in order to overcome our lack of structural engineering experience. We also used the New Zealand Society for Earthquake Engineering's *Assessment and Improvement of the Structural Performance in Earthquakes* (NZSEE, 2006) supplied by GNS Science to better understand and communicate with the engineers.

3.3 Collecting experiences dealing with heritage building preservation

In order to collect the experiences with heritage buildings we set up interviews and focus groups with the New Zealand Historic Places Trust (NZHPT) and building owners. As with engineers, the reasoning behind using focus groups was to gather more information through facilitated discussions of people with similar experiences. Interviews helped us collect additional background information on the project and were conducted in both formal and informal settings. Interviewers followed a predetermined list of questions but used their own discretion to keep the conversation flowing naturally (Fontana & Prokos, 2007). Structured interviews allowed for the collection of comparable answers while more detail could be gathered through the use of open ended questions.

We met with representatives from four Christian church denominations; Catholic, Anglican, Methodist, and Presbyterian. We contacted many different groups but were only able to set up meetings with these Christian denominations. Every group that we contacted either owned heritage buildings or had experience with earthquake prone buildings in order to connect their knowledge to the results obtained through the public survey.

3.3.1 Interviews

Interviews were conducted with members of the community experienced with the preservation of heritage buildings, shown in Table 3. The table also shows the organizations' purposes in the Wellington Region and our main contact with each organization.

Table 3: Heritage Building Interviews

Organization	Organization Purpose	Contact	Interview Purpose	Date of Interview
New Zealand Historic Places Trust	Classification and protection of heritage buildings	Allison Dangerfield <i>Heritage Advisor of Architecture</i>	Background research on heritage building classification, funding options for heritage buildings, and working with building owners	28 January 2014
Catholic Archdiocese	Preservation of parishes and churches in the Wellington area	Dave Mullin <i>Property Manager and Director of Support Services</i>	Summary of previous experiences in dealing with the retrofitting of earthquake prone buildings.	5 February 2014
Wellington Cathedral of St. Paul	Anglican Church and category 1 heritage building	Tony Fryer <i>Lay Canon/ Cathedral Warden</i>	Gather the experiences of an Anglican church in dealing with upgrading their building and working with different heritage and engineering organizations.	18 February 2014
Anglican Diocese	Manages and supervises the maintenance, repair and insurance of Diocesan properties.	Rob Moonlight <i>Property Manager of Anglican diocese</i>	Summary of previous experiences with working with engineers, heritage trust and earthquake prone buildings.	20 February 2014

The interview with the NZHPT gathered firsthand knowledge about heritage buildings, specifically focusing on how they determine heritage value in buildings and what types of funding options are available for these buildings.

Each religious interview followed a similar agenda to learn:

- How to avoid the demolition of churches
- How to find and efficiently using funding for preservation
- How interviewees receive information about building assessments
- What course of action they take to address each level of safety – below 33%, 34-67%, or above 67% NBS
- Heritage safety standards compared to other buildings
- Relationships with the NZHPT
- Which heritage building(s) to preserve above others

Several of us attended each meeting in order to have one of us act as interviewer, one assist the interviewer, and one take minutes. This allowed for the accurate collection of information and kept the meeting flowing in an organized manner. Some of the contacts gained through the interviews were used to set up the focus groups of different church communities.

3.3.2 Focus Groups

Because many religious communities have different experiences when preserving their heritage churches, we held focus groups with members from a variety of different church communities. We conducted focus groups with four Christian denominations; Anglican, Catholic, Methodist, and Presbyterian. We held three focus groups, shown in Table 4, to gather the experiences of these groups in working with engineers, funding building restoration, and preserving heritage.

Table 4: Heritage Building Focus Groups

Organization	Organization Purpose	Contact	Focus Group Purpose	Date of Interview
All Saints Parish	Anglican Church that is very close to earthquake prone at 36%NBS.	Basil Wakelin <i>Vicar's Warden of All Saints Parish</i>	Summary of experiences with working with engineers, the NZHPT, and efforts to obtain funding.	13 February 2014
Mt. Victoria Parish - St. Joseph's	Preservation of parishes and churches in the Wellington Area	Dave Mullin <i>Property Manager and Director of Support Services (Catholic Archdiocese of Wellington)</i>	Determine how this specific parish funded a new building, why they decided to demolish their old building, and how they preserved heritage in the process.	18 February 2014
Miramar Uniting Church and St. Christopher's Church	Methodist and Presbyterian congregations with earthquake buildings.	June Stewart <i>Treasure of Miramar Uniting Church</i>	Find out how Methodists and Presbyterians work with their earthquake prone buildings in regards to engineers, money, NZHPT, and WCC.	21 February 2014

Each focus group was completed with one moderator, one assistant, and one person taking minutes. The topics covered in the focus groups were the same as those listed above for the interviews. As with the engineering focus groups, all meetings were recorded. For a full list of questions asked see Appendix F.

4. Findings

After surveying the public and supplementing this knowledge with information gathered from focus groups and interviews in the Wellington Region, we developed a set of findings about building assessments, building preservation, and funding. From these we produced a set of recommendations outlining the actions different stakeholders such as GNS Science, the Wellington Region Emergency Management Office (WREMO), the Wellington City Council (WCC), Ministry of Business, Innovation, and Employment (MBIE), and building preservation groups should take as a result of our findings. A list of our main project findings follow; all are further explained later in this section. For plots of additional survey results, see Appendix G.

1. Current building assessment practices are inconsistent, causing considerable variability in building assessment scores.
2. Heritage building owners are restricted in their ability to update buildings that are earthquake prone or at risk of earthquake damage (0-66% NBS).
3. Despite the availability of multiple external funding options for upgrading heritage buildings, owners find it difficult to afford to retrofit their buildings.
4. The public wants to see heritage buildings preserved and values them most for their architectural, historical, and cultural significance.
5. There are specific heritage buildings within the Wellington Region that the public would like to see preserved above all others.
6. The public is willing to contribute financially to upgrade heritage and community buildings and would rather see them upgraded than demolished or replaced, even though this option is generally more expensive.
7. The public does not have a common perception of safety risks associated with earthquake prone buildings.

1. Current building assessment practices are inconsistent, causing considerable variability in building assessment.

In order to assess the risks to public safety associated with older buildings in Wellington, the WCC requires that each building have an initial building assessment to determine its ability to withstand earthquake damage. But due to variations in standard building assessment techniques,

various structural engineers can come to different conclusions on Initial building evaluations. The varying conclusions can be quite significant and can categorize the same building as anything from safe to earthquake prone. In one specific example, brought up by a senior structural engineer in one of our focus groups, a building owner in New Zealand had five assessments done on his building by five different engineers. The scores varied from 17% NBS (earthquake prone) to 129% NBS, (above the minimum standards current buildings are built to). When the engineers were brought together to discuss the difference, they found that they each used different building assessment techniques, all of which were considered acceptable assessment practices. The following assessment techniques were used by the engineers:

- Visual assessment from the street
- Examination of original construction drawings of the building
- Reviewed plans of prior strengthening work done to the building
- Internal investigation of the building (this engineer found that a number of elements which had previously been implemented for strengthening were no longer being used)

Each of these processes is considered legitimate as long as it is noted in the engineer's base assessment. Although this is considered to be an extreme case, it highlights the need for a standardized methodology for initial building assessments.

Engineers have also expressed a need for a more standardized Detailed Engineering Evaluation (DEE). In a second engineering focus group, a senior structural engineer shared a report he had written on the importance of a standardized methodology for the detailed building assessment. In the report, he outlined the steps and sub-steps that should be taken at each step of the evaluation process, followed by how to finalize the score for a building. Multiple engineers present recognized that assessments and retrofit solutions rely heavily on an individual engineer's capabilities, and that currently there is too much acceptable variability in the abilities of structural engineers.

These concerns have also been recognized in updated legislation being considered for New Zealand Parliament. A review of the Royal Commission Reports on the Canterbury Earthquakes and an investigation conducted by the MBIE came to a similar conclusion about building assessments. In a proposed amendment to the Building Act, they suggest that a national

standard method for building assessments be developed to ensure a stricter standard practice (NZ Parliamentary Library, 2013).

Note that all of the opinions obtained from the engineering focus groups are personal opinions and do not necessarily represent the procedures of the institution/firm they represent.

2. Heritage building owners are restricted in their ability to update buildings that are earthquake prone or at risk of earthquake damage (0-66% of New Building Standard, NBS).

Using the recommendations and advice provided by the NZHPT, the WCC makes decisions to preserve and protect heritage buildings. However, occasionally this protection prevents building owners from making alterations to their buildings. Data collected from some of our focus groups with church communities further supports this conflict.

One such church group, whose church is classified as a Category I heritage building, made efforts to make the building safer by deciding to remove aspects which encompass these heritage values. In this specific case, the church bell tower was deemed an unessential feature by the parish and they were willing to demolish because its demolition would drastically increase the safety of the church. However, due to its heritage category, the New Zealand Historic Places Trust established that the tower must remain and therefore be upgraded: a more costly option that the parish cannot afford.

In fact, other church groups are looking into removing their heritage classification in the hopes that they will have more freedom to make the changes they desire. One church leader stated that “Churches are about people, not buildings.” Data collected from our focus groups suggests that church congregations care more about the function and safety of these churches and less about preserving the heritage captured in the buildings themselves.

Other larger church communities avoid these difficulties because their congregations can fund the upgrading of their buildings relatively quickly. One church, for example, has approximately 1,000 parishioners and was built to very high earthquake safety standards. While this church community might not be as restricted because they’re able to more easily fundraise for upgrades, many smaller church communities cannot afford to upgrade their heritage buildings and thus are left with unsafe buildings. In many cases these stagnant buildings are closed to the

public due to public safety concerns. Building owners are thus forced to maintain buildings which cannot be used by the public, and cannot be upgraded or demolished.

3. Despite the availability of external funding options for upgrading heritage buildings, some owners still cannot afford to retrofit their buildings.

Despite the availability of a number of external funding initiatives for heritage buildings (refer to section 2.2.1 of literature review), many building owners still cannot afford to retrofit their earthquake prone buildings. It was estimated in a detailed engineering evaluation that the retrofitting process of the All Saint's Church in Haitaitai would cost approximately \$800,000. The church applied for funding through the NZHPT, but the application was denied. The building owners also applied for funding from the WCC and a lottery, but those applications were denied as well. This left the congregation with one option; to gather the necessary funds by fundraising internally. With limited parishioners and other financial setbacks, the church estimates that it will not be able to start fundraising for retrofitting operations for another ten years.

Many other heritage church building owners are facing similar funding concerns. In one case a smaller heritage church opted to dissolve their congregation instead of retrofitting the church. The decision to dissolve the congregation was made because the parish could no longer afford to sustain itself financially, let alone fund its retrofitting process. It is still unclear what will be done with the building, which has been assessed at 20% NBS (earthquake prone).

4. The public wants to see heritage buildings preserved and values them for their architectural, historical, and cultural value.

Residents of the GWR believe that it is important to preserve heritage buildings. As shown in Figure 4, according to the data compiled from public survey question 13, approximately 70% of participants agreed or strongly agreed that it was important to preserve heritage buildings in their communities. As shown in Figure 5, when asked the reasons why respondents valued various types of heritage buildings, the three most popular answers were for their architectural, historical, and cultural value.

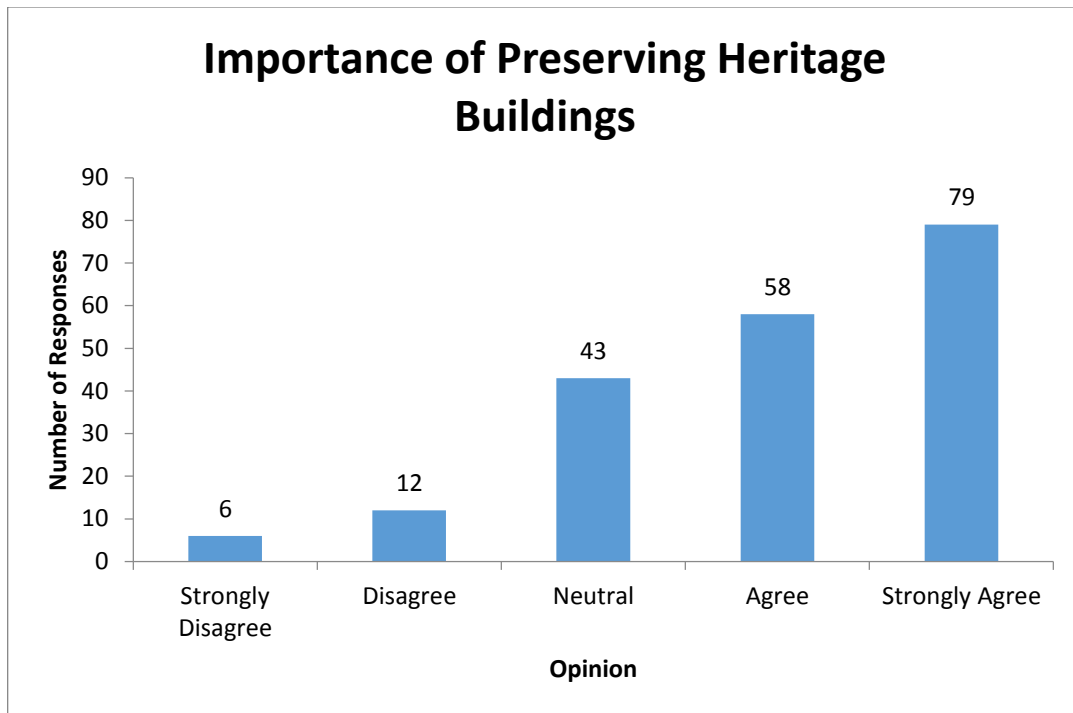


Figure 4: Survey results for importance of preserving heritage buildings

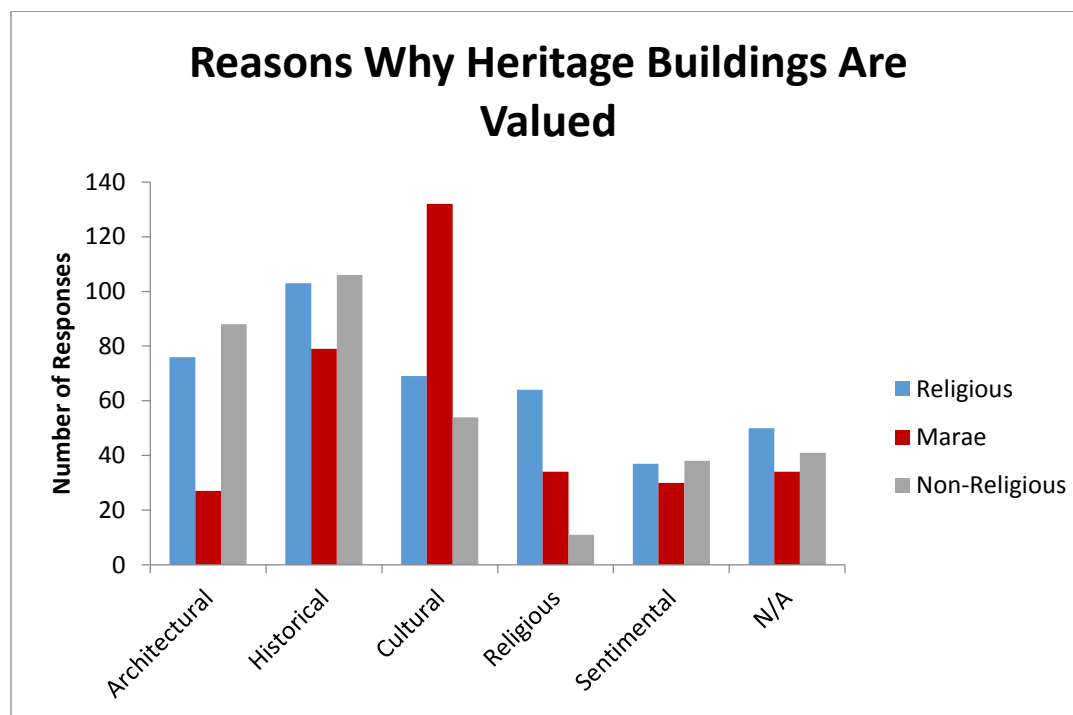


Figure 5: Survey results for reasons why heritage buildings are valued

Another indication of the importance of heritage buildings to the community can be found in the more articulate open ended responses taken from the additional comments section of the public survey. Table 5 contains public survey responses which we consider to be directly relevant to our project focus. The data suggests that the public has a strong connection to the character of the city and part of that character is manifested in the unique architecture and structures of the city. By removing the buildings, the public believes part of the city's charm will be lost. Many people surveyed expressed concerns of Wellington becoming like Christchurch, which has lost many of its heritage buildings due to the 2011 earthquake.

Note that the diverse spread of open-ended responses also accurately represents the viewpoints of those respondents who do not value heritage buildings. Those that argued against the preservation of heritage buildings tended to be more concerned with public safety and economic feasibility of upgrades.

Table 5: Responses to Additional Comments Question

Significant Responses to Additional Comments Question	
Arguments For Preservation	Arguments Against Preservation
"[It is] important to keep history of a place...you can't replace history"	"Safety is more important...you can always rebuild"
"[Heritage buildings are an] important part of city fabric...the buildings deserve to be protected"	"Refurbish is preferred only if economically feasible...if not cut losses"
"I suspect earthquake regulations are being used as an excuse to demolish heritage buildings. We saw that in Christchurch where building owners wanted to knock down their buildings. Retention of heritage buildings is fundamental to the quality of life in the city, if we demolish them we will lose something irreplaceable"	"The cost of keeping them is just too high...there is an age limit on everything"
"Heritage is important to the self-identity of a city"	"If they kill people, they have to go"

5. There are specific heritage buildings within the Wellington Region that the public would like to see preserved above all others.

Despite their possible earthquake prone status, there are significant buildings within the GWR that the public wants to see preserved more than others. Table 6 contains a list of responses to an open-ended public survey question that asked respondents to name specific heritage buildings that they would like to see saved above all others. In the pilot survey we used the phrase “at all costs” which we realized was somewhat unrealistic; in some cases the retrofitting process can become so expensive that it is not economically feasible to save the building. However, by rephrasing the question in our finalized survey, we could determine which buildings are most important to the public without the ambiguity.

Table 6: List of Valued Heritage Buildings

Most Valued Heritage Buildings	
Building	Number of Responses
Wellington Town Hall	20
Old Saint Paul’s Church	18
Saint Mary of the Angels Church	15
Old Parliament Building	9

The fact that members of the public were able to identify these buildings emphasizes their importance to the community and reinforces our previous finding that the public considers heritage buildings to be a valuable community asset.

6. The public is willing to contribute financially to upgrade heritage and community buildings if an increase in rates was established and would rather see them upgraded than demolished or replaced, even though upgrading is generally more expensive.

When asked in the public survey whether they would prefer to upgrade, replace, or demolish heritage and community buildings, participants indicated that they would prefer to see buildings upgraded (see Figure 6). Unfortunately, the question was somewhat vague and left much up to the interpretation of the responder. The retrofitting process for heritage buildings varies extensively on a case by case basis. Depending on the amount of strengthening required and current condition of the building, the upgrading process can be either more or less expensive than replacing the building. In future studies, it may be beneficial to see how public opinion varies when considering heritage preservation in multiple different financial scenarios.

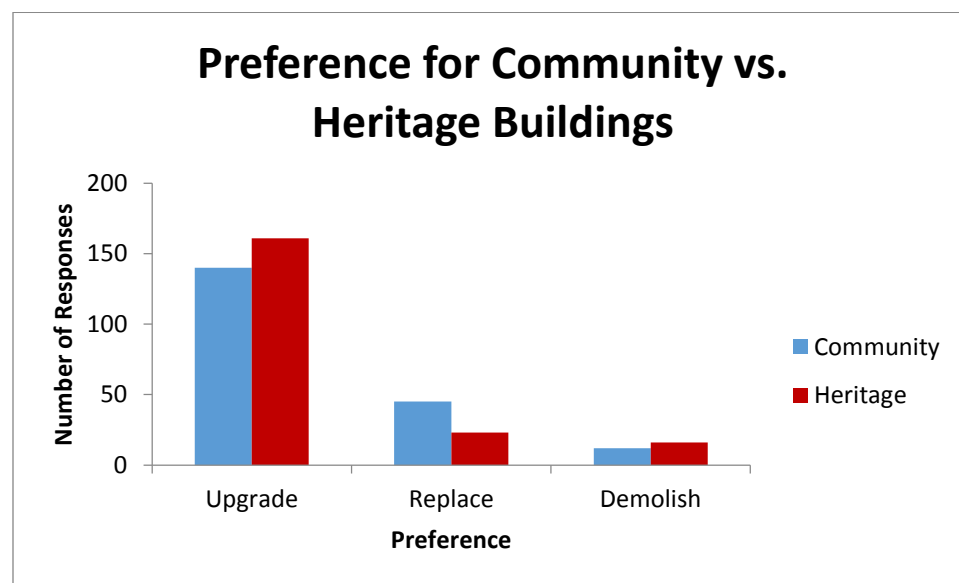


Figure 6: Survey results for how earthquake prone buildings should be addressed

According to our public survey data shown in Figure 7, the public would be willing to contribute financially to the upgrading of heritage and community buildings if an increase in rates was established. At least 77% of those surveyed would find 1-3% an acceptable increase in their rates for the purpose of heritage and community building upgrading. This further supports our previous finding that the public values Wellington's heritage buildings because the data suggests that they would be willing to pay to preserve these heritage buildings.

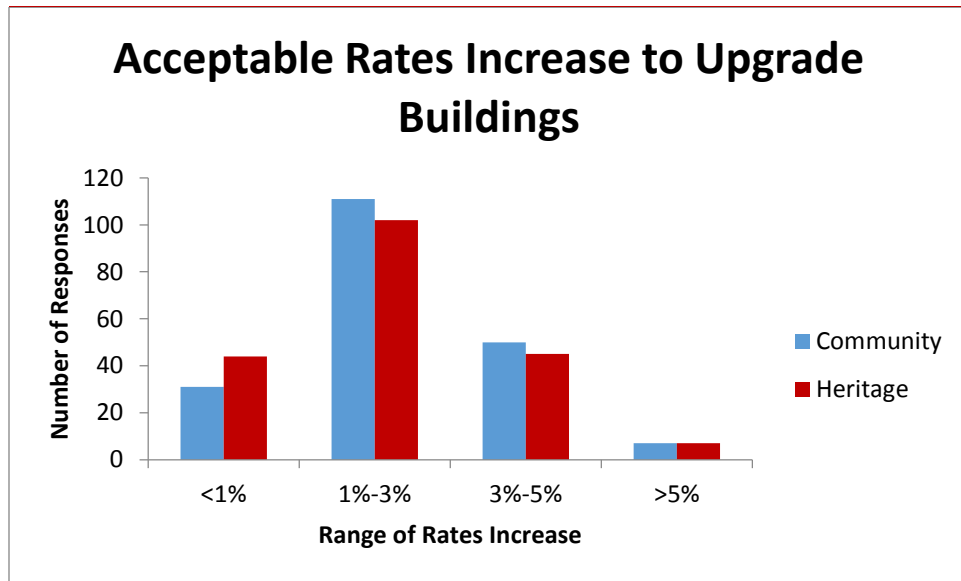


Figure 7: Survey results for public rates increase

7. The public does not have a common perception of safety risks associated with earthquake prone buildings.

Public safety was a primary focus of this project, yet our survey data suggests that the public does not have a common perception of the safety risks associated with earthquake prone buildings. Figure 8 displays the results of a survey question, which asked participants how safe they felt when in or around a building labeled as earthquake prone.

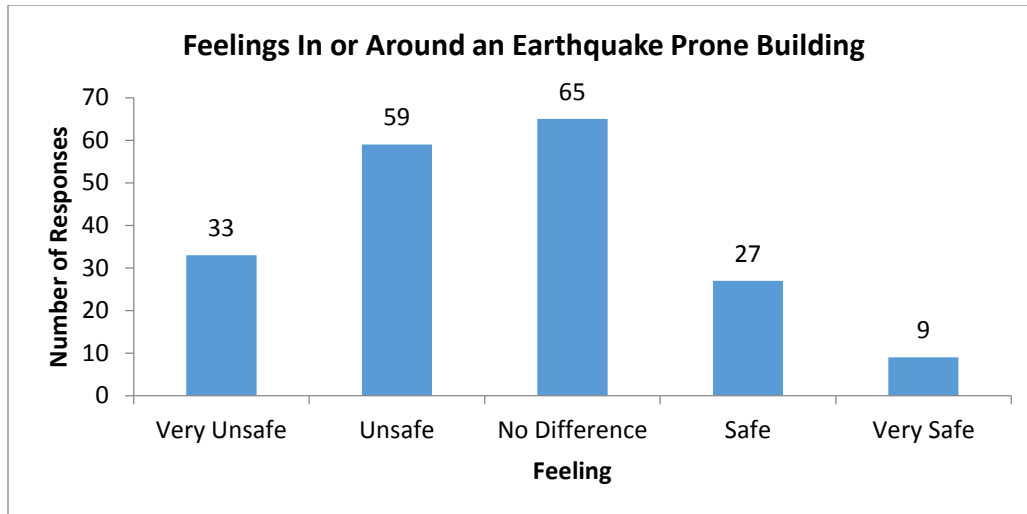


Figure 8: Survey results for public feeling about earthquake prone buildings

The responses to the survey resulted in an average score of approximately 2.5; this question asked participants on a five-point Likert scale that ranged from very unsafe to very safe. This indicates that there was a slight lean towards an unsafe feeling but survey answers were spread all across the spectrum. Does this data imply that people do not have a well-established feeling of risk associated to earthquake prone buildings? Or does it indicate that public knowledge about the implications of an earthquake prone building is lacking? More research is required to resolve this uncertainty.

5. Conclusions and Recommendations

Based on our findings from the public survey, supplemented with data collected from engineering focus groups and interviews with church communities, we have developed recommendations and conclusions that aim to bridge the gaps between these major stakeholders. Moreover, these recommendations aspire to standardize building assessment techniques, explore the possibility of using the public as an additional method of funding, and increase public awareness and involvement in the preservation of their earthquake prone buildings.

5.1 Recommendations for Building Assessment Procedures

Current building assessment techniques often vary from engineer to engineer, resulting in an inconsistent system of assessing building strength during earthquakes. Data collected from various focus groups with both structural engineers and building owners has supported this finding. In multiple focus groups, building owners expressed their frustration with the usefulness of both steps (IEP and DEE) of the building assessment process. Engineers that attended our focus groups were in agreement that the current accepted assessment techniques allow building assessors too much leeway when conducting both steps of the evaluation process.

For these reasons, **we strongly recommend that earthquake related building assessment practices be standardized to promote more consistent and thorough building evaluations.** Finding #1 of our Findings chapter addresses various issues with the current assessment procedures and incorporates information collected from background research, focus groups, and interviews with building owners and engineers.

The various accepted assessment techniques of both the Initial Evaluation Procedure and the Detailed Engineering Evaluation result in inconsistent assessment scores between engineers. Although the Initial Evaluation Procedure is considered a screening process to determine which buildings should be further evaluated, inconsistencies in building assessments can lead to misrepresentations of the extent to which a building is earthquake prone. A more standardized method of conducting IEPs which focuses on giving engineers similar resources for their assessments could result in consistent evaluations that are more useful to building owners. Engineers have also indicated that the process for conducting a Detailed Engineering Evaluation should be restructured to promote a more standardized methodology. By outlining the steps that

should be taken during each phase of the assessment process, different engineers should be able to come to similar conclusions about a specific building.

Engineers present at our focus groups also agreed upon another common theme; upgrade recommendations rely extensively on the experience and capabilities of the individual assessing the building. Many agreed that the variability in the qualifications of structural engineers which assess buildings is unacceptable. In response, **we propose that local authorities and the central government collaborate with the New Zealand Society for Earthquake Engineering to establish a regular assessment training course for all structural engineers who conduct Initial Evaluation Procedures and Detailed Engineering Evaluations.** By requiring that all building assessors be certified on a yearly basis, the implementation of a standardized system of building assessment may be more easily integrated. Additionally, the certification system could be used to keep assessors up to date on new legislation concerning building code requirements.

5.2 Recommendation for Public Involvement in Funding for Heritage Buildings

The data collected from the public survey and interviews/focus groups with church communities suggests that members of the public value heritage buildings for different reasons than congregations and building owners. The building owners, in this case the church communities, value the function of the building. On the other hand, the general public values these buildings most for their historical, architectural, and cultural heritage. Because in many cases heritage building owners cannot afford to pay to retrofit their buildings, and because the public both values and would like to see the buildings saved, **we recommend that local authorities explore ways to raise and allocate public funds to the preservation of heritage buildings.**

A common theme discussed in our interviews and focus groups with church communities was that they value their churches because they provide central locations for prayer and worship. These parishioners see their churches as community gathering points rather than architectural or historical landmarks. Building owners of heritage churches are restricted in the ways they can retrofit their buildings because in many cases they must preserve specific aspects of the building's architecture. In some cases, church communities cannot afford to pay to retrofit their

heritage buildings, and are left with vacant earthquake prone buildings. Thus, alternative funding options must be discussed in order to save these buildings.

Finding #6, on page 26, indicates that if required, the public would be willing to contribute financially to retrofit heritage buildings in the Wellington Area via their rates. Given the extent to which the public values heritage buildings, and the amount they would be willing to pay should an increase in rates be established, we recommend that the Wellington City Council (WCC) consider further research into public contributions towards heritage building preservation. This additional research could be implemented in the form of a follow up public survey of the GWR focusing on costs to upgrade heritage buildings. One specific goal of the survey should be to determine if the public would still be willing to contribute to the preservation of community and heritage buildings in situations where replacing the building is more economically feasible.

5.3 Recommendation for Improving Public Knowledge of Earthquake Prone Buildings

Based on the results from the public surveys, the public does not have a common perception of safety risks associated with earthquake prone buildings. In order to help remedy this problem, **we recommend that the Wellington City Council develop new earthquake prone building notices that are more visible and informative than the current signs.**

These safety notices are required to be displayed by building owners in a visible location on their earthquake prone building. The intentions of these notices are to indicate that the building has been assessed as earthquake prone and to let people using the building know about this assessment. However, based on our results we believe the current signs do an inadequate job of communicating these intentions effectively. We acknowledge the importance of the technical information included in current signs, but feel that the information is confusing and unappealing to the general public.

In order to design a notice that more adequately communicates these intentions, we suggest the WCC use a sign similar to the one currently being used by the Catholic Archdiocese of Wellington. Figure 9 is the sign currently used by local authorities to warn that a building is earthquake prone and Figure 10 is the sign used by the Catholic Archdiocese of Wellington. Using guidelines for making effective warning signs (Appendix H) to compare the notices in

Table 7, it is apparent that the sign used by the Catholic Archdiocese is the better of the two at communicating target objectives. It is more noticeable and communicates the earthquake prone status in a way that is easily understood by the public. It also features a graphic that depicts both the building's % NBS and what this value means in terms of the building's relative risk in the event of an earthquake.

The alternative design used by the Catholic Archdiocese can provide the WCC with a good example of a sign that will fully inform the public at a passing glance. This could improve public knowledge of earthquake prone buildings and the potential dangers associated with the various levels of earthquake risk.

EARTHQUAKE PRONE BUILDING
Notice pursuant to S124(1)(c) of the Building Act 2004

To:
the owners of the building;
the occupiers of the building; and
every person who has an interest in the land on which the building is situated, under a mortgage or other encumbrance registered under the Land Transfer Act 1952; and every person claiming an interest in the land that is protected by a caveat lodged and in force under section 137 of the Land Transfer Act 1952.

This notice is for the building situated at ADDRESS, more particularly being described as Lot DP, and being all the land comprised in Certificate of Title NUMBER.

The above building has been classified by the Wellington City Council as earthquake-prone under the Building Act 2004.

The meaning of earthquake-prone is defined by section 122 of the Building Act 2004 in conjunction with clause 7 of the Building (Specified Systems, Change the Use, and Earthquake-prone Buildings) Regulations 2005.

For further information please refer to the Wellington City Council's Earthquake-prone Buildings Policy 2008 (Policy). You can view the policy at www.wellington.govt.nz.

As the building is classified as earthquake-prone, and in accordance with the Policy, the owners of the building are required by DATE to either:

- a) strengthen the building to a sufficient degree so that it is not earthquake-prone; or
- b) demolish all or part of the building, so that the remainder of the building (if any) is not earthquake-prone.

A building consent must be obtained prior to strengthening or demolition work being undertaken. The building consent must be obtained and the work must be completed before the date noted above.


If you disagree with the classification of this building as earthquake-prone you may apply for a determination from the Department of Building and Housing under section 177(e) of the Building Act 2004.

If you fail to comply with this notice the Wellington City Council will consider exercising further enforcement powers under the Building Act 2004 which includes restricting access to the building and/or putting up a hoarding or fence to prevent people from approaching the building nearer than is safe, or initiating a prosecution under the Building Act 2004.

Under Section 368 of the Building Act 2004, it is an offence to remove or deface notices

- (1) A person commits an offence if the person –
 - a. wilfully removes or defaces any notice published under this Act; or
 - b. incites another person to do so.
- (2) A person who commits an offence under this section is liable to a fine not exceeding \$5,000.00.

Dated: INSERT DATE


Roger Gurnsey
Manager Compliance (Building)
Building Consents and Licensing Services
Wellington City Council

Absolutely POSITIVELY
As Seen at Places
Wellington City Council Wellington

P.O. Box 2158, 101 Wakefield Street, Wellington 6140, New Zealand
Ph 64 04 439 4444, Internet www.Wellington.govt.nz

Figure 9: Current earthquake prone building sign used by local authorities (Wellington City Council, n.d.)

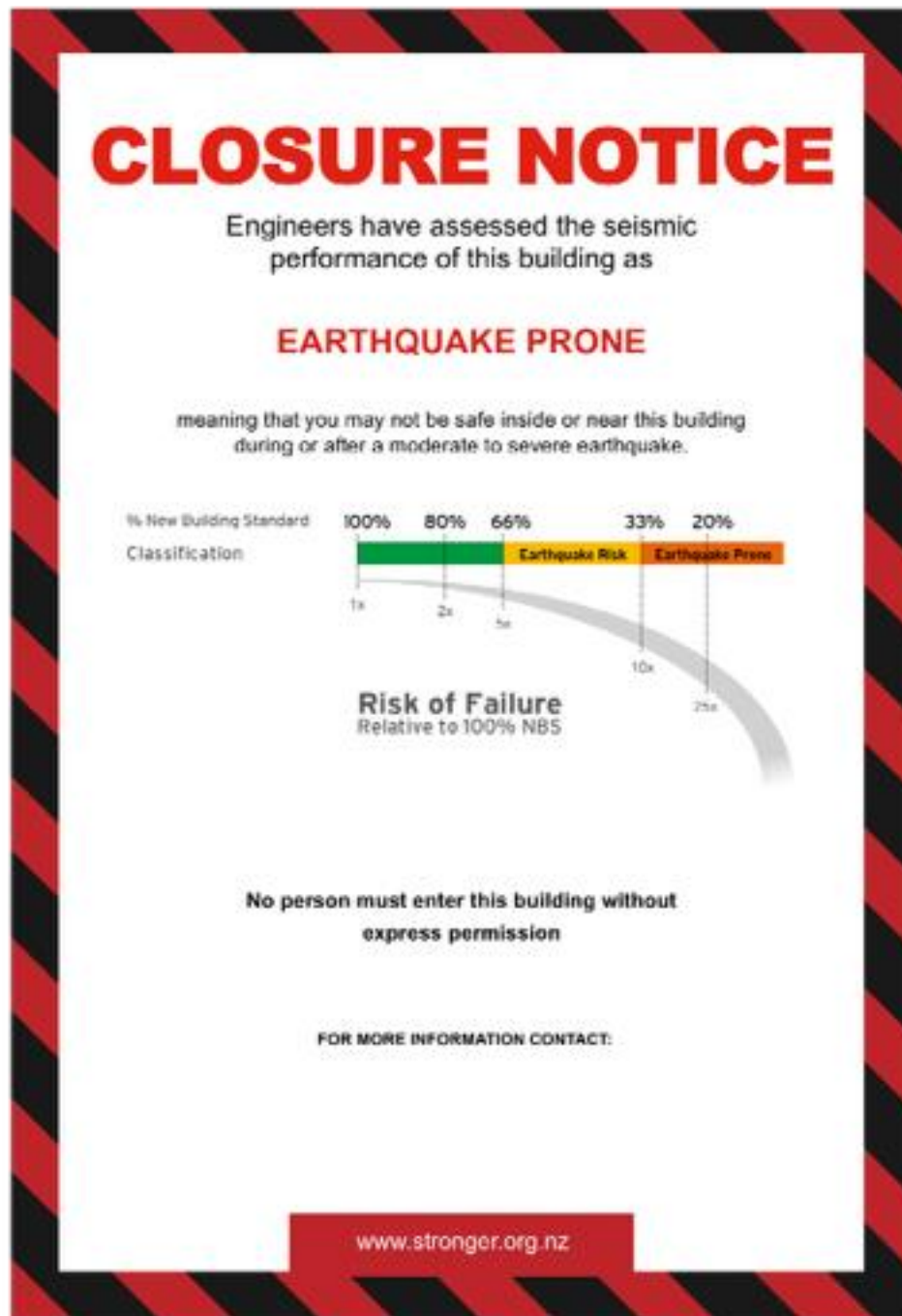


Figure 10: Earthquake prone building sign used by Catholic Archdiocese of Wellington (Catholic Archdiocese of Wellington, 2013)

Table 7: Differences Between Earthquake Warning Signs

Guideline	Current Notice Sign used by Local Authorities	Current Notice Sign used by Catholic Archdiocese of Wellington
Wording	Explanations are too technical	Simple Explanations
Pictorial Symbol	No pictures or images	Picture of %NBS vs. Risk Level
Layout	Layout is too wordy and cluttered	Uncluttered Layout
Salience	No borders or color scheme	Good use of border and color scheme
Salience	Text too small	Easier to read

5.4 Recommendation for improved communication between stakeholder groups

Throughout the data collection stages of our project we observed discrepancies surrounding expectations and communication among the various stakeholders regarding the topics of building standards, heritage preservation, and public safety. Because of these mismatches, **we strongly recommend that the stakeholder groups targeted by our project better communicate the issues surrounding earthquake safety and building preservation.**

The improvement in the communication among stakeholders will be able to clarify misinterpretations that currently exist. One example is that building owners and members of the public do not have an accurate interpretation of the roles of the WCC and the New Zealand Historic Places Trust in the preservation of Heritage Buildings in the Wellington area. During focus groups and interviews, building owners commonly associated the New Zealand Historic Places Trust with the preservation of heritage buildings, but misinterpreted their role in the building protection process. Although the NZHPT serves as an advocacy group to the WCC, they possess no legal power to restrict the upgrading of heritage buildings; it is the responsibility of the Council to take legal action in instances where they feel the heritage value of a building may be compromised. However, the WCC recognizes the national standing of the NZHPT and considers their recommendations extensively when making decisions concerning heritage buildings.

According to our focus groups, many building owners also misunderstand the goals of both the Initial Evaluation Procedure (IEP) and the Detailed Engineering Evaluation (DEE).

Because the IEP is a much cheaper assessment than a DEE, some building owners attempt to rely solely on the IEP assessment when trying to determine how best to retrofit their buildings. Many expressed frustration that the initial report provides confusing or inadequate information about upgrading their buildings without fully understanding its purpose; to screen older buildings quickly and flag those that are earthquake prone. Before any upgrades are considered, it is crucial that a Detailed Engineering Evaluation of the building be completed to determine the most effective means to retrofit the building.

One method of improving communication within and among stakeholder groups could be to establish a quarterly or yearly public forum that is open to all stakeholders involved in the building preservation project. In the forum, representatives of organizations such as the WCC, NZHPT, WREMO, and the engineering community could better educate building owners and the public on topics associated with building assessments and heritage preservation. By establishing a more open system of communicating information between stakeholder groups we can help alleviate the frustrations of the various stakeholders involved.

5.5 Additional Conclusions and Future Research Questions

At the beginning of our project, we presented our research goals and potential survey to members of WREMO and received feedback on altering our survey to acquire information both parties could use. WREMO is specifically interested in learning how the public values community buildings, an important aspect of pre-disaster planning. Appendix I contains specific recommendations for WREMO.

Given the large scale of this project, there are many research questions and possible future projects that can be investigated to further address the problem of life safety vs. the preservation of local heritage and community buildings. These research questions and projects could be addressed through further collaboration between WPI and GNS Science and include:

- To what extent do demographic distinctions (age, ethnicity, income, etc.) have an effect on opinions about building safety and heritage protection?
- Which taxation and allocation mechanisms can be used to involve the public more in financing the retrofitting process for heritage buildings?
- Designing an online forum for the major stakeholders to address issues
- Design and distribute new earthquake prone building signs to the public
- Work with engineers to develop a building assessment training course

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Appendices

Appendix A – Pilot Public Survey



Questionnaire on Risk in Preserved buildings in the greater Wellington region



1. What suburb do you live in? _____

2. How long have you lived in the Wellington region?
_____ years _____ months

3. How do you feel when you are in or around a building that has been tagged as 'earthquake prone'? (very unsafe/very safe)
☐ N/A ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5

Community Building Section

4. How much do you value the following community facilities?

a. Public Libraries

☐ N/A ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5

b. Community swimming pools

☐ N/A ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5

c. Community Halls

☐ N/A ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5

d. Community Centers and small community buildings

☐ N/A ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5

e. Museums and galleries

☐ N/A ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5

f. Sportsground buildings e.g. grandstands, clubrooms

☐ N/A ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5

g. Other (Please specify) _____

5. If these facilities became unavailable in the event of an earthquake, which one would you choose to be reestablished first?

- ☐ 1 Public Libraries
- ☐ 2 Community swimming pools
- ☐ 3 Community Halls
- ☐ 4 Community Centers and small community buildings
- ☐ 5 Museums and galleries
- ☐ 6 Sportsground buildings e.g. grandstands, clubrooms
- ☐ 7 Other (Please specify) _____

6. If you were to permanently lose any of these community facilities, would you consider moving to another suburb?

☐ 1 Yes ☐ 2 No

7. If yes, which facilities would make you consider moving your place of residence? (You can select more than one)

- ☐ 1 Public Libraries
- ☐ 2 Community swimming pools
- ☐ 3 Community Halls
- ☐ 4 Community Centers and small community buildings

- ☐ 5 Museums and galleries
- ☐ 6 Sportsground buildings e.g. grandstands, clubrooms
- ☐ 7 Other (Please specify) _____

8. If a community building has been tagged as 'earthquake prone', would you prefer to:
☐ 1 Upgrade it ☐ 2 Replace it ☐ 3 Demolish it

9. Who should be held responsible for paying to upgrade community buildings? (You can select more than one)

- ☐ 1 Government ☐ 2 Councils
- ☐ 3 The Public ☐ 4 Building Owners
- ☐ 5 Other (Please specify) _____

10. If the public had to pay to upgrade the building, what payment method would you prefer?

- ☐ 1 Your Taxes ☐ 2 Your Rates
- ☐ 3 Donations ☐ 4 Other (Please specify) _____

11. What is the maximum percentage increase of your rates that you would find acceptable for this purpose?

- ☐ 1 <1% ☐ 2 1-3% ☐ 3 3-5% ☐ 4 >5%

Heritage Building Section

12. How much do you value the following heritage/old buildings? (no value/significant value)

a. Old Religious buildings (churches, synagogues, mosques, etc.)

☐ N/A ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5

Why? (Tick all that apply)

- ☐ 1 Architectural ☐ 2 Historical
- ☐ 3 Cultural ☐ 4 Religious ☐ 5 Sentimental

b. Marae (Ma-rye) - Pa

☐ N/A ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5

Why? (Tick all that apply)

- ☐ 1 Architectural ☐ 2 Historical
- ☐ 3 Cultural ☐ 4 Religious ☐ 5 Sentimental

c. Those of architectural/historic/cultural significance

☐ N/A ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5

Why? (Tick all that apply)

- ☐ 1 Architectural ☐ 2 Historical
- ☐ 3 Cultural ☐ 4 Religious ☐ 5 Sentimental

13. Is it important to preserve heritage buildings? (strongly disagree/agree)

☐ N/A ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5

14. What specific heritage/old building would you like to preserve at all cost in the Wellington region? Why? **Answer (Open ended write in)**

15. Would you consider moving to another suburb if you lost certain heritage, religious, or cultural buildings? (strongly disagree/agree)

☐ N/A ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5

16. If a heritage building has been tagged as 'earthquake prone', would you prefer to:

☐ 1 Upgrade it ☐ 2 Replace it ☐ 3 Demolish it

17. Who should be held responsible for paying to upgrade **privately owned** heritage buildings?

☐ 1 Government ☐ 2 Councils
☐ 3 The Public ☐ 4 Building Owners
☐ 5 Other (Please specify) _____.

18. Who should be held responsible for paying to upgrade **publicly owned** heritage buildings?

☐ 1 Government ☐ 2 Councils
☐ 3 The Public ☐ 4 Building Owners
☐ 5 Other (Please specify) _____.

19. If the public had to pay to upgrade a heritage/old building, what payment method would you prefer?

☐ 1 Your Taxes ☐ 2 Your Rates
☐ 3 Donations ☐ 4 Other (Please specify)

20. What is the maximum percentage increase of taxes that would you find acceptable for this purpose?

☐ 1 <1% ☐ 2 1-3% ☐ 3 3-5% ☐ 4 >5%

21. Should heritage buildings be held to the same building safety standards as commercial and residential buildings?

☐ 1 Yes ☐ 2 No

22. Any additional comments you would like to share about heritage buildings? **Answer (Open ended write in)**

The next set of questions concerns information about you and your household so we can determine how representative our sample is. Information will be kept anonymous and we will only report on general trends.

23. Which best describes the situation you are living in now?

☐ 1 Family with children
☐ 2 Family without children
☐ 3 Single person household
☐ 4 With other people, not family
☐ 5 Other (Please specify) _____

24. Which ethnic group(s) do you belong to?

☐ 1 Māori ☐ 2 Pacific Islander
☐ 3 Pākehā/European ☐ 4 Asian
☐ 5 Other (Please specify) _____

25. Gender

☐ 1 Male ☐ 2 Female

26. How old are you?

☐ 1 < 20 ☐ 2 21-30 ☐ 3 31-40
☐ 4 41-50 ☐ 5 51-60 ☐ 6 60-70 ☐ 7 > 70

27. Are you?

☐ 1 Employed full-time
☐ 2 Employed part-time (but not studying)
☐ 3 Studying part- or full-time at any level
☐ 4 Not in paid employment and not studying
☐ 5 Retired

28. What was your household's total 2013 income (before tax)?

☐ 1 \$0 to \$20 000
☐ 2 \$20 001 to \$40 000
☐ 3 \$40 001 to \$60 000
☐ 4 \$60 001 to \$80 000
☐ 5 \$80 001 to \$100 000
☐ 6 Over \$100 000

29. What is your highest educational qualification?

☐ 1 No educational qualifications
☐ 2 Secondary school qualifications
☐ 3 Trade certificate, professional certificate or diploma
☐ 4 University undergraduate degree (e.g. diploma or bachelor's degree)
☐ 5 University postgraduate degree (e.g. a Master's or Ph.D. degree)
☐ 6 Other (please specify) _____



Questionnaire on Risk in Preserved buildings in the greater Wellington region



1. What suburb do you live in? _____
2. How long have you lived in the Wellington region?
_____ years _____ months
3. How do you feel when you are in or around a building that has been tagged as 'earthquake prone'? (very unsafe/very safe)
☐ N/A ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5

Community Building Section

4. How much do you value the following community facilities?
a. Public Libraries
☐ N/A ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5
- b. Community swimming pools**
☐ N/A ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5
- c. Community Halls**
☐ N/A ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5
- d. Community Centers and small community buildings**
☐ N/A ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5
- e. Museums and galleries**
☐ N/A ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5
- f. Sportsground buildings e.g. grandstands, clubrooms**
☐ N/A ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5
- g. Other (Please specify) _____.**
5. If these facilities became unavailable in the event of an earthquake, which one would you choose to be reestablished first?
☐ 1 Public Libraries
☐ 2 Community swimming pools
☐ 3 Community Halls
☐ 4 Community Centers and small community buildings
☐ 5 Museums and galleries
☐ 6 Sportsground buildings e.g. grandstands, clubrooms
☐ 7 Other (Please specify) _____.

6. If you were to permanently lose any of these community facilities, would you consider moving to another suburb?
☐ 1 Yes ☐ 2 No

7. If yes, which facilities would make you consider moving your place of residence? (You can select more than one)
☐ 1 Public Libraries
☐ 2 Community swimming pools
☐ 3 Community Halls
☐ 4 Community Centers and small community buildings

- ☐ 5 Museums and galleries
☐ 6 Sportsground buildings e.g. grandstands, clubrooms
☐ 7 Other (Please specify) _____.

8. If a community building has been tagged as 'earthquake prone', would you prefer to:
☐ 1 Upgrade it ☐ 2 Replace it ☐ 3 Demolish it

9. Who should be held responsible for paying to upgrade community buildings? (You can select more than one)
☐ 1 Government ☐ 2 Councils
☐ 3 The Public ☐ 4 Building Owners
☐ 5 Other (Please specify) _____.

10. If the public had to pay to upgrade the building, what payment method would you prefer?
☐ 1 Rates ☐ 2 Donations ☐ 3 Other
(Please specify) _____.

11. What is the maximum percentage increase of your rates that you would find acceptable for this purpose?
☐ 1 <1% ☐ 2 1-3% ☐ 3 3-5% ☐ 4 >5%

Heritage Building Section

12. How much do you value the following heritage/old buildings? (no value/significant value)

a. Old Religious buildings (churches, synagogues, mosques, etc.)

☐ N/A ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5

Why? (Tick all that apply)

- ☐ 1 N/A ☐ 2 Architectural ☐ 3 Historical
☐ 4 Cultural ☐ 5 Religious ☐ 6 Sentimental

b. Marae (Ma-r-ye) - Pa

☐ N/A ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5

Why? (Tick all that apply)

- ☐ 1 N/A ☐ 2 Architectural ☐ 3 Historical
☐ 4 Cultural ☐ 5 Religious ☐ 6 Sentimental

c. Those of architectural /historic/cultural significance

☐ N/A ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5

Why? (Tick all that apply)

- ☐ 1 N/A ☐ 2 Architectural ☐ 3 Historical
☐ 4 Cultural ☐ 5 Religious ☐ 6 Sentimental

13. Is it important to preserve heritage buildings? (strongly disagree/agree)
☐ N/A ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5

14. What specific heritage/old building would you like to preserve above all else in the Wellington region? Why? **Answer (Open ended write in)**

15. Would you consider moving to another suburb if you lost certain heritage, religious, or cultural buildings?

☐₁ Yes ☐₂ No

16. If a heritage building has been tagged as 'earthquake prone', would you prefer to:

☐₁ Upgrade it ☐₂ Replace it ☐₃ Demolish it

17. Who should be held responsible for paying to upgrade **privately owned** heritage buildings? (You can select more than one)

☐₁ Government ☐₂ Councils
☐₃ The Public ☐₄ Building Owners
☐₅ Other (Please specify) _____.

18. Who should be held responsible for paying to upgrade **publicly owned** heritage buildings? (You can select more than one)

☐₁ Government ☐₂ Councils
☐₃ The Public ☐₄ Building Owners
☐₅ Other (Please specify) _____.

19. If the public had to pay to upgrade a heritage/old building, what payment method would you prefer?

☐₁ Rates ☐₂ Donations ☐₃ Other
(Please specify) _____.

20. What is the maximum percentage increase of rates that would you find acceptable for this purpose?

☐₁ <1% ☐₂ 1-3% ☐₃ 3-5% ☐₄ >5%

21. Compared to the current safety standards of commercial and residential buildings, should the safety standards of heritage buildings be:

☐₁ Higher ☐₂ The same ☐₃ Lower

22. Any additional comments you would like to share about heritage buildings? **Answer (Open ended write in)**

The next set of questions concerns information about you and your household so we can determine how representative our sample is. Information will be kept anonymous and we will only report on general trends.

23. Which best describes the situation you are living in now?

☐₁ Family with children
☐₂ Family without children
☐₃ Single person household
☐₄ With other people, not family
☐₅ Other (Please specify) _____.

24. Which ethnic group(s) do you belong to?

☐₁ Māori ☐₂ Pacific Islander
☐₃ European/ Pākehā ☐₄ Asian
☐₅ Other (Please specify) _____.

25. Gender

☐₁ Male ☐₂ Female

26. How old are you?

☐₁ < 20 ☐₂ 21-30 ☐₃ 31-40
☐₄ 41-50 ☐₅ 51-60 ☐₆ 61-70 ☐₇ > 70

27. Are you?

☐₁ Employed full-time
☐₂ Employed part-time (but not studying)
☐₃ Studying part- or full-time at any level
☐₄ Not in paid employment and not studying
☐₅ Retired

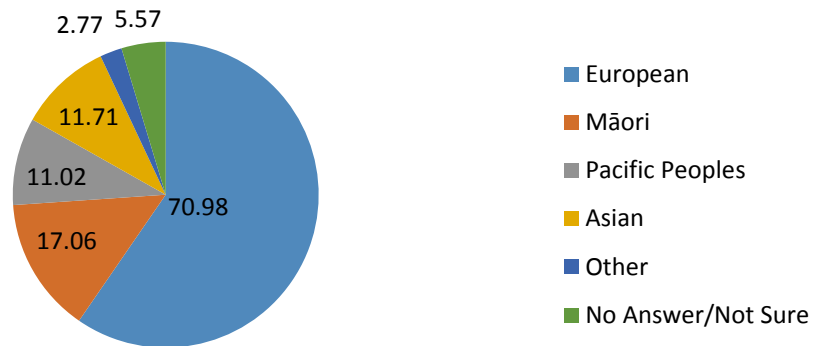
28. What was your household's total 2013 income (before tax)?

☐₁ \$0 to \$20 000
☐₂ \$20 001 to \$40 000
☐₃ \$40 001 to \$60 000
☐₄ \$60 001 to \$80 000
☐₅ \$80 001 to \$100 000
☐₆ Over \$100 000

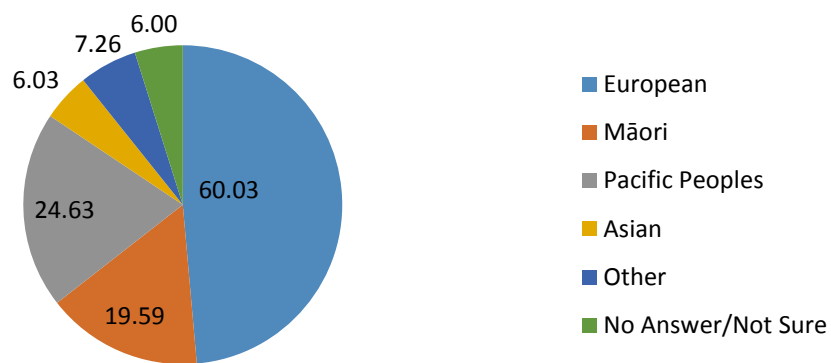
29. What is your highest educational qualification?

☐₁ No educational qualifications
☐₂ Secondary school qualifications
☐₃ Trade certificate, professional certificate or diploma
☐₄ University undergraduate degree (e.g. diploma or bachelor's degree)
☐₅ University postgraduate degree (e.g. a Master's or Ph.D. degree)
☐₆ Other (please specify) _____.

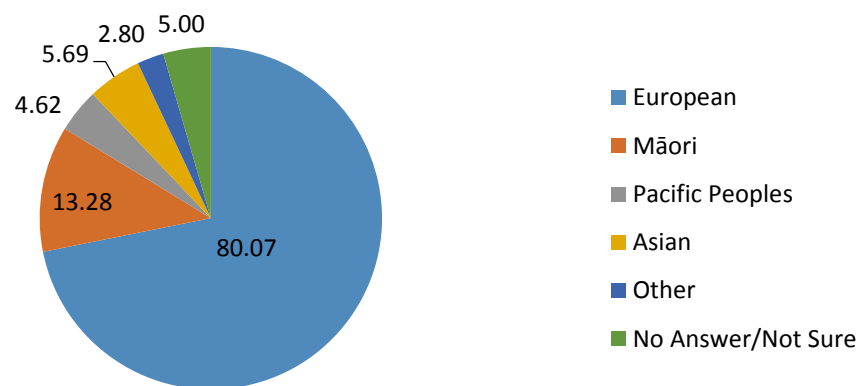
Wellington City Ethnic Distribution



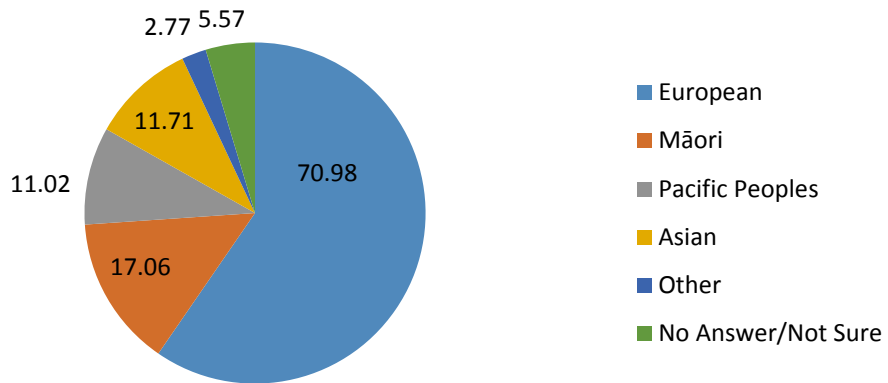
Porirua City Ethnic Distribution



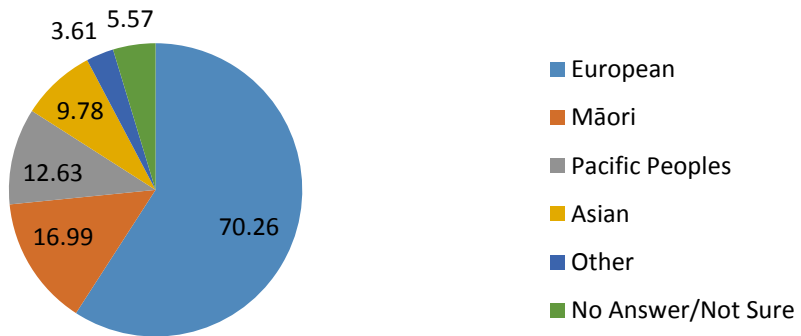
Upper Hutt City Ethnic Distribution



Lower Hutt City Ethnic Distribution



Greater Wellington Region Ethnic Distribution



Questionnaire on Risk in Preserved buildings in the greater Wellington region



INFORMATION SHEET



Project description

This project intends to assist the New Zealand Crown Research Institute GNS Science (www.gns.cri.nz) to gauge the dispositions of local government officials, engineering firms, and the greater Wellington community surrounding the cultural and monetary value captured in local heritage and community buildings versus the need for public safety in the Wellington, New Zealand region. This will be accomplished through the implementation of surveys, interviews and focus groups to capture the opinions of these three main stakeholder groups. The results of this project are aimed to assist the local authorities and decision-makers so that they may make fact-based decisions regarding the dilemma of heritage and community buildings versus life safety.

We are a group of students from Worcester Polytechnic Institute, working alongside GNS Science researchers, based in Avalon (Lower Hutt), who are carrying out a field survey in the greater Wellington region between the 27th of January and the 14th of February 2014. We are randomly approaching people within Wellington and the surrounding areas of Lower Hutt and Porirua asking them if they are willing to answer our survey questions. The questions relate to the participant's personal opinions on the values they assign to local heritage, cultural and community buildings versus the need for public safety during earthquakes. Participation is voluntary.

This is a formal invitation to participate in this research project.

Our approach

The project is being carried out by randomly approaching community members in the greater Wellington region and asking them if they would be willing to participate in the study. All we seek are the answers to a ten minute questionnaire, along with some brief verbal questions. Our goal is to conduct approximately 200 surveys for our project which GNS Science feels represents an acceptable sample size.

There is no obligation to take part in this project and participation is entirely voluntary. In the unlikely event that a question causes any discomfort, then you can refuse to participate, or withdraw from the questionnaire at any time (see participant's rights below).

Data Management

Once the data has been collected, it will be imported into SurveyMonkey (survey creation tool) and then exported to SPSS (Statistical Package for Social Science) software for further analysis. The results will be submitted to GNS Science so they may present them to the proper authorities and decision-makers. Your identity will be kept confidential at all times. No personal details (name, contact details, address number) will be published anywhere.

Participant's Rights

You are under no obligation to accept this invitation. If you decide to participate, you have the right to:

- decline to answer any particular question;
- withdraw from the study at any time;
- ask any questions about the study at any time during participation;
- be given access to a summary of the project findings when the study is completed

Project Contacts

The leader of this project is Dr. Tatiana Goded, from GNS Science. If you have any questions about the project you can contact her at T.Goded@gns.cri.nz

Additionally you can also contact David Johnston from the Joint Centre for Disaster Research at GNS Science/Massey University on david.johnston@gns.cri.nz

Ethics Information

This project has been evaluated by peer review and judged to be low risk. This means that the project itself has been evaluated as unlikely to pose any risk or harm to the participants. Consequently, it has not been reviewed by a Human Ethics Committee. The researcher(s) named above are responsible for the ethical conduct of this research.

If you have any concerns about the conduct of this research that you wish to raise with someone other than the researcher(s), please contact Professor John O'Neill, Director, Research Ethics, telephone 06 350 5249, email humanethics@massey.ac.nz.

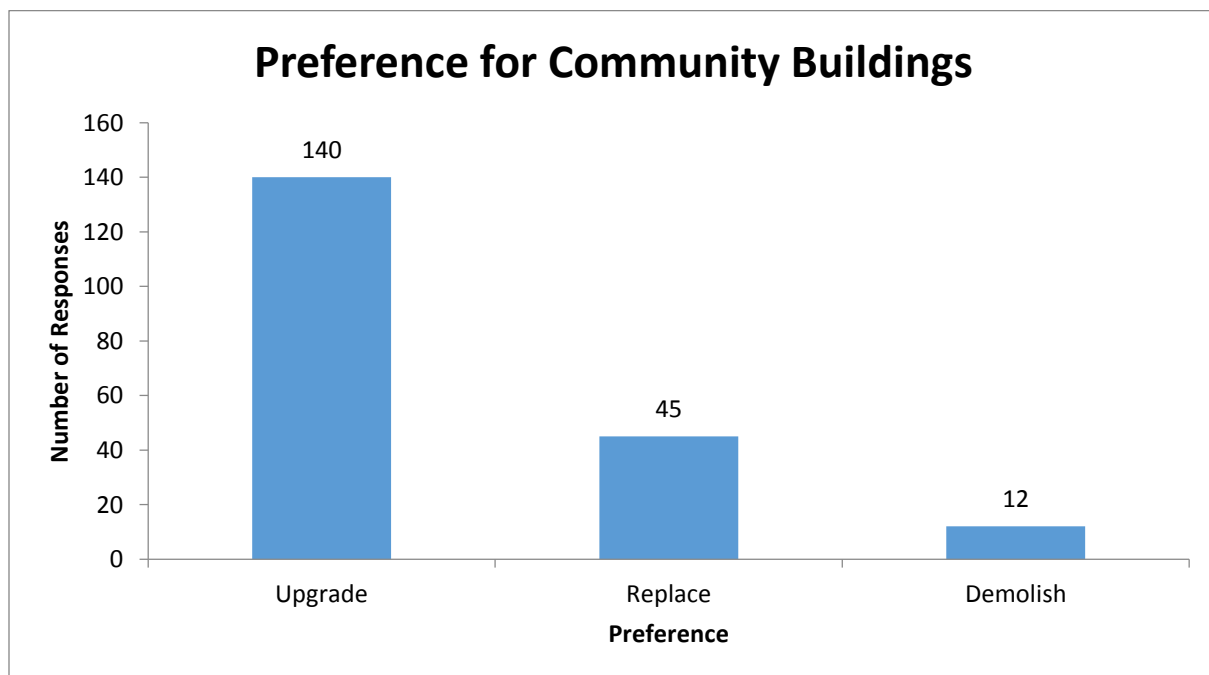
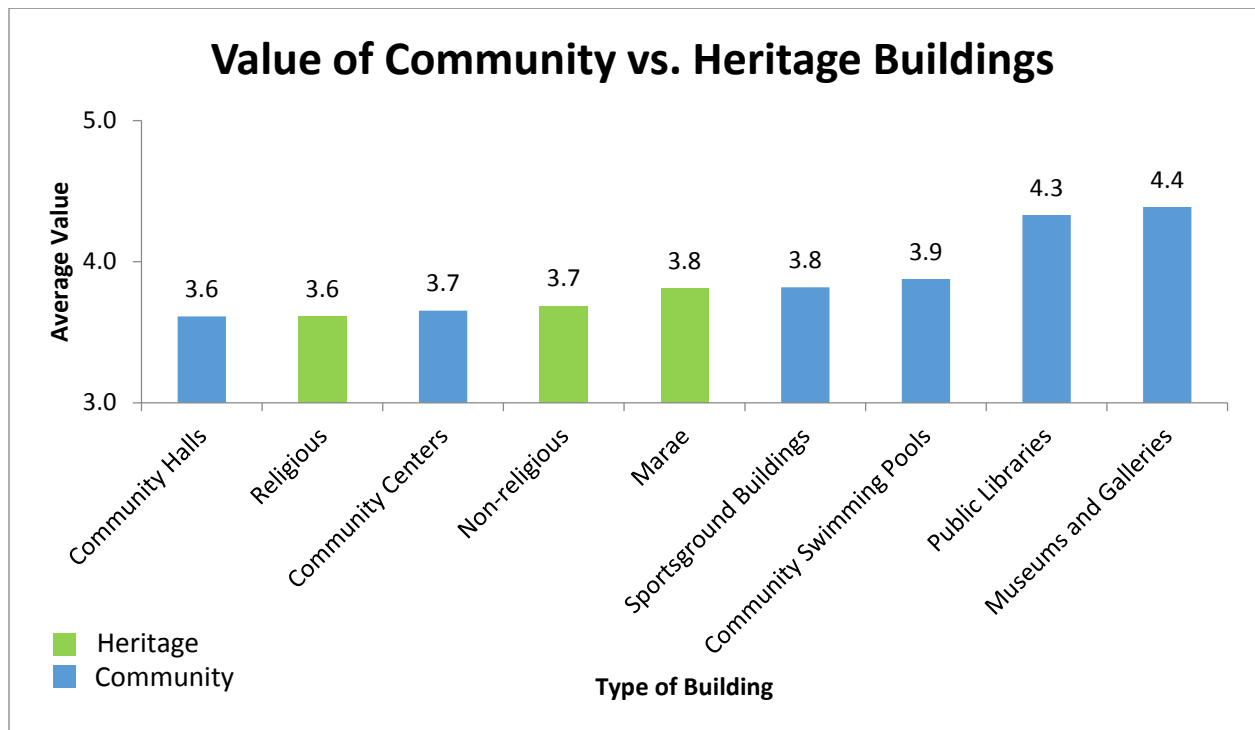
Appendix E – Detailed Engineering Focus Group Question Analysis

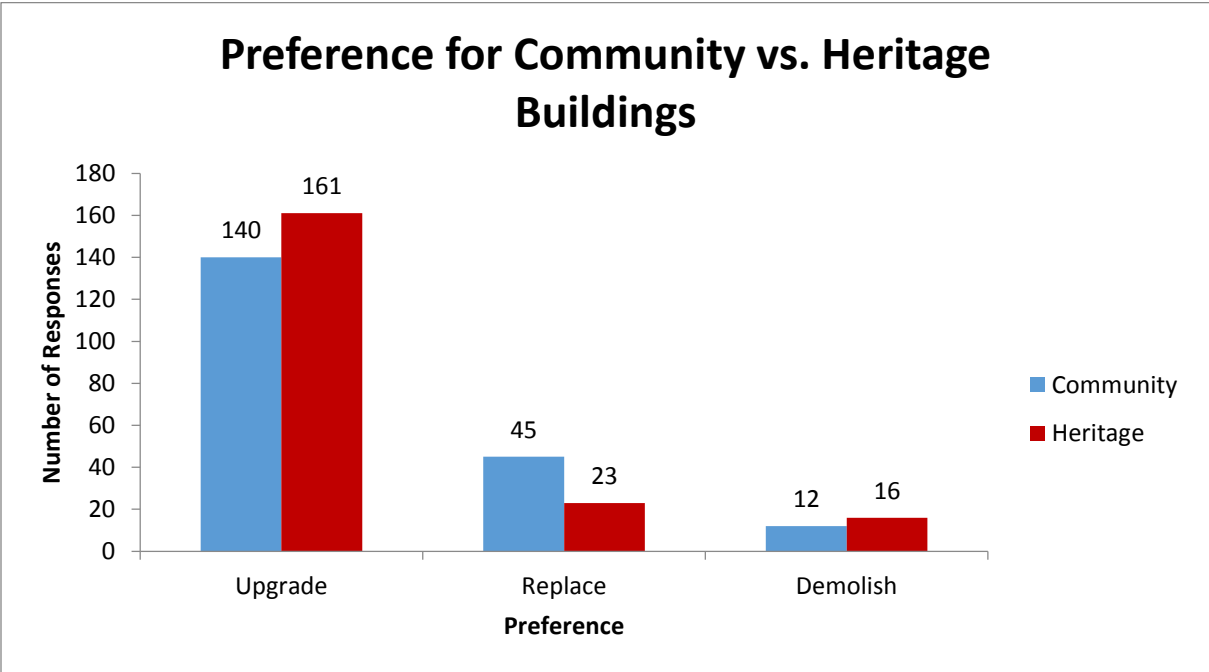
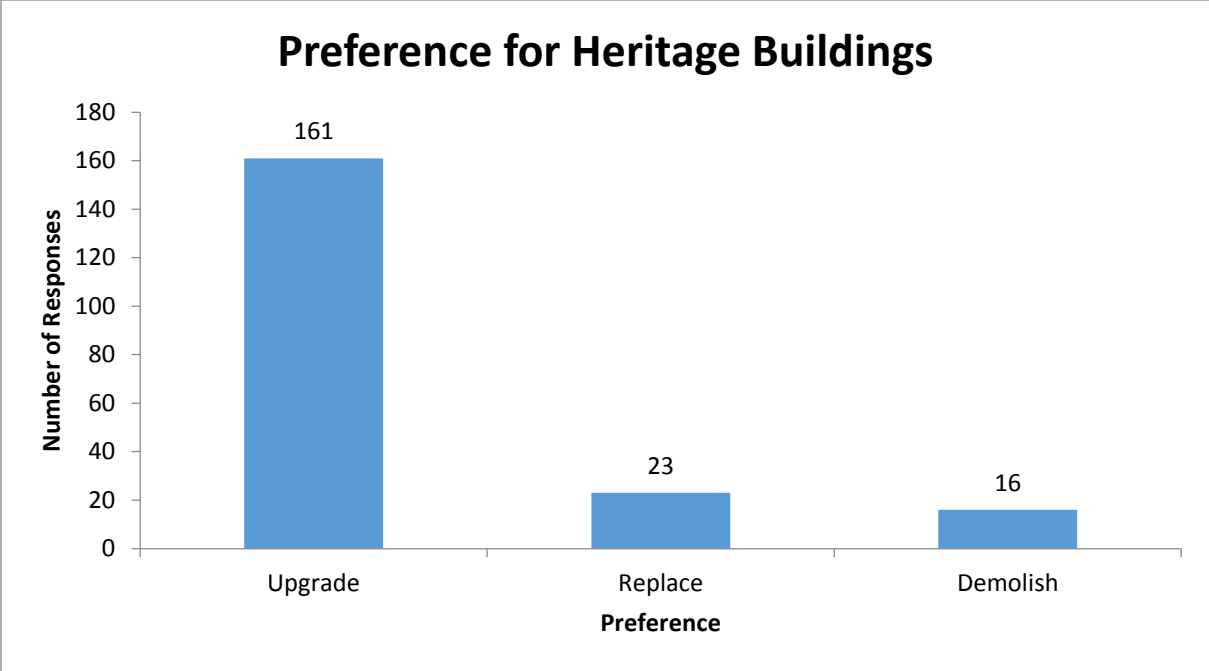
Focus of Question	Question Relevance
To what extent should upgrading earthquake prone buildings be considered before they are replaced or demolished?	Gain understanding on the current building assessment practices
How does cost impact decisions around whether to upgrade, replace, or demolish a heritage building?	Establish relationship between cost and building preservation decisions
Do you feel that building assessment techniques are adequate for accurately determining a building's NBS safety score? Why or why not?	Gain opinion on whether current building assessment techniques are standardized
What impacts do you think the new legislation will bring?	Gain understanding of new legislation and impacts it might have on building assessment techniques and the NBS (New Building Standard)
In what ways will new legislation affect the process for classifying buildings?	Establish impacts of new legislation on classifying buildings as being "heritage buildings"
How much do you consider building occupancy, location, and heritage status when conducting building assessments?	Establish if certain factors affect building assessments
Compared to current safety standards of commercial and residential buildings, should the safety standards of a) heritage and b) community buildings be higher, the same, or lower?	Gain opinion on the current safety standards of heritage buildings in relation to commercial and residential buildings
Should heritage buildings constitute a special case in the building codes? Why?	Gain opinion on whether heritage buildings should be different than all other buildings in terms of safety standards
Have you ever been involved in a situation where multiple evaluations were conducted by different engineers on the same building?	Gain knowledge on what occurs when multiple evaluations are done on a building
How can current assessment techniques be changed to promote a more standardized process of evaluation?	Gain opinion on how current assessment techniques can be made more standardized
Is it reasonable that heritage buildings should be held to 67% of the NBS instead of 34%?	Gain opinion on whether heritage buildings should be held to a higher percent of NBS

Appendix F – Detailed Religious Focus Group Question Analysis

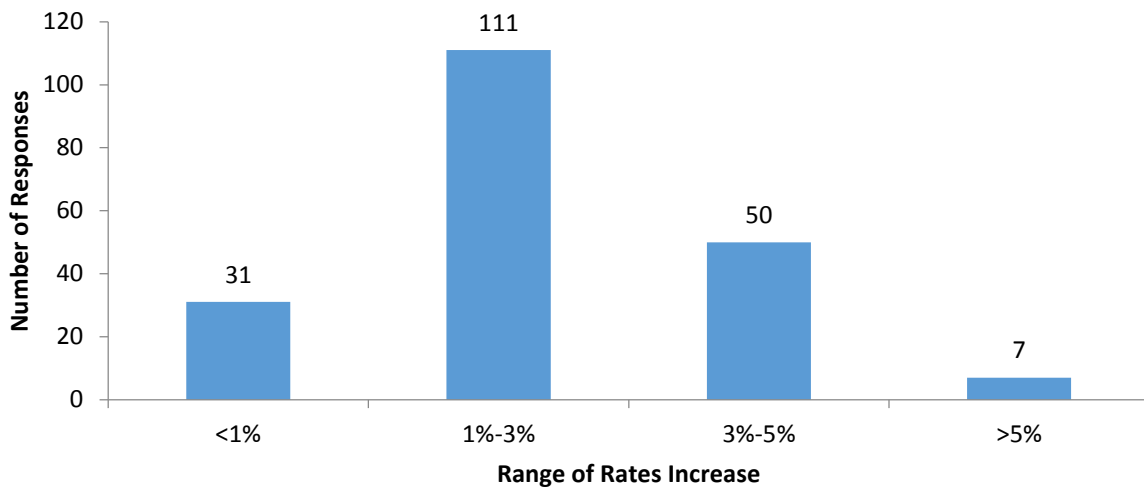
Question	Question Relevance
Should churches be kept at the same building safety standards as commercial and residential buildings?	Establish where religious groups believe their buildings should be in relation to building code.
What is your understanding of building codes and how do you get information about the building codes?	To get an understanding of the disconnection between the engineering community and religious groups with respect to building codes.
Who do you feel is responsible for paying to upgrade Churches? How did you upgrade your own building?	To establish who should have the monetary responsibility for paying to upgrade buildings.
Do you think the members of the church would donate money contributing towards retrofitting of the church? To what extent?	Establish a source of money for the church and if people would pay to upgrade these church building.
How can we avoid the demolition of churches in the Wellington region?	Gain background knowledge around the current building problems of religious communities and some solutions they see applicable.
What were some challenges you faced during the process of upgrading your building? Or what challenges are you facing to get your building upgraded?	Gain an understanding of problems church groups face and how they are overcoming them with respect to upgrading their buildings.

Appendix G – Survey Graph Analysis

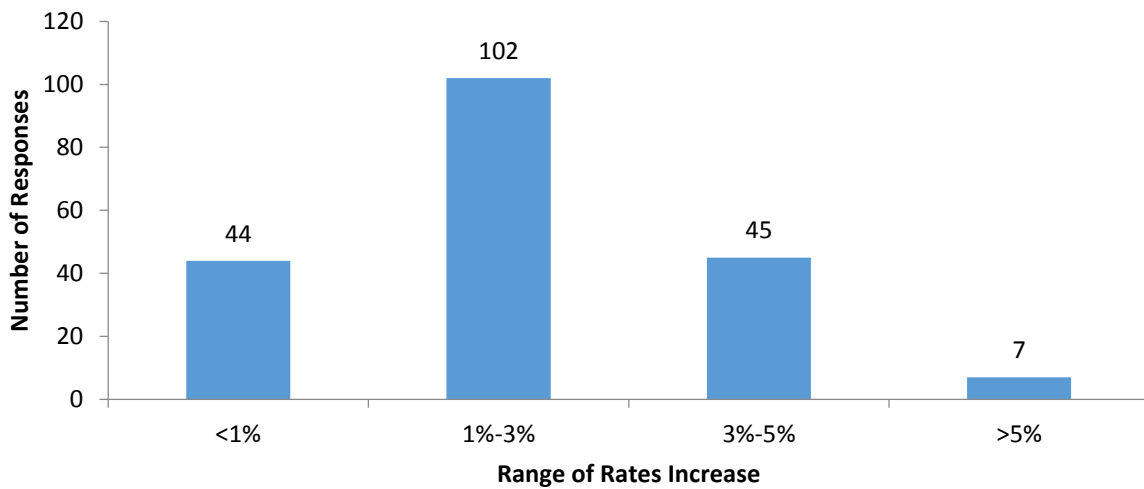




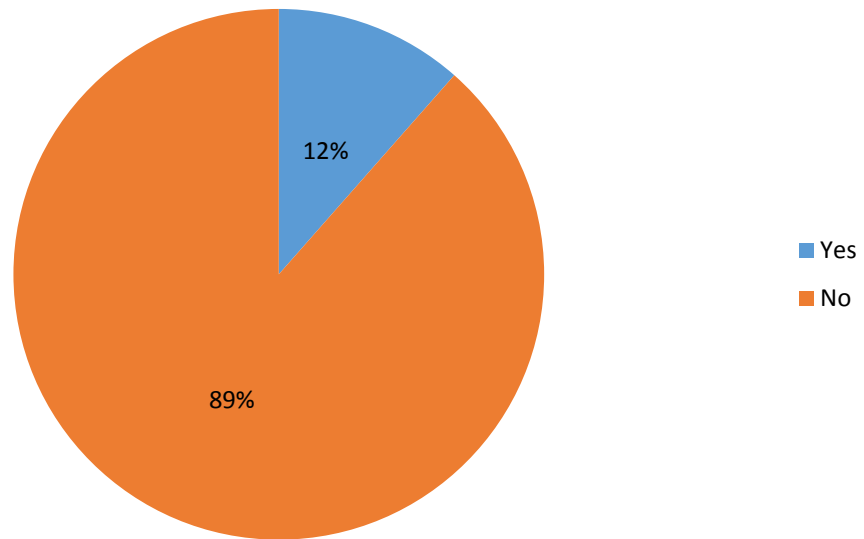
Acceptable Rates Increase for Community Buildings



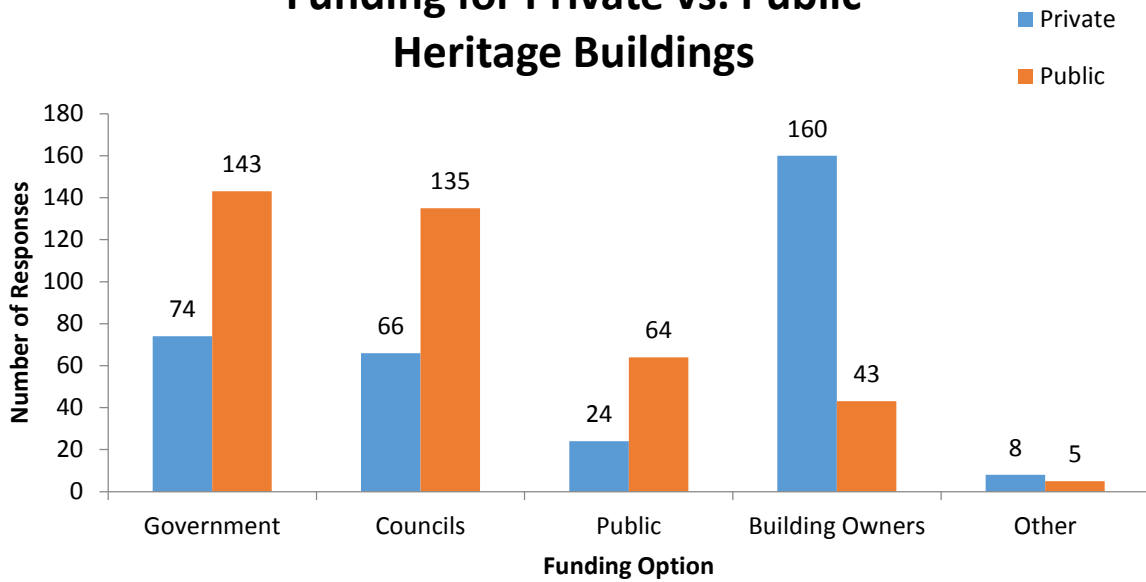
Acceptable Rates Increase for Heritage Buildings



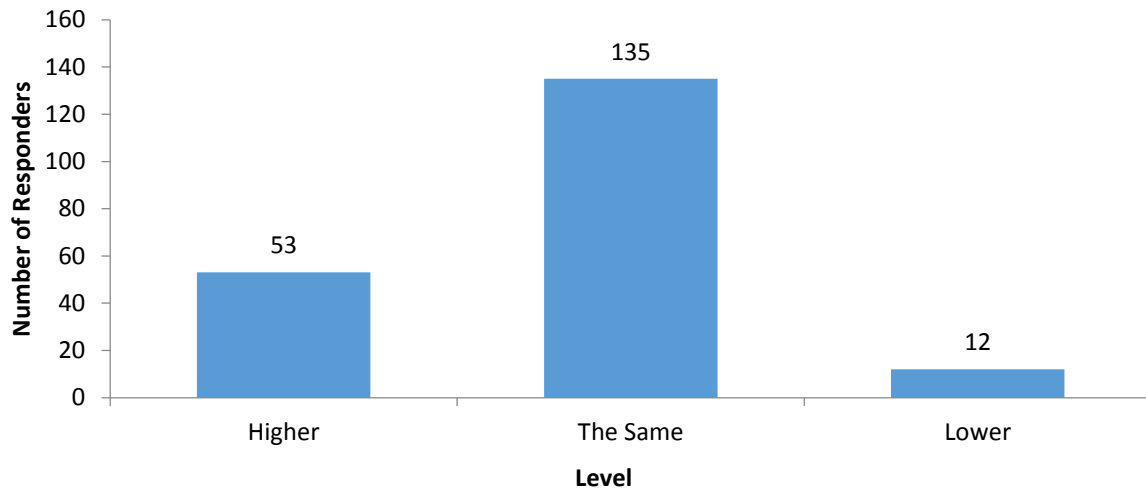
Consider Moving if a Heritage Building was Lost



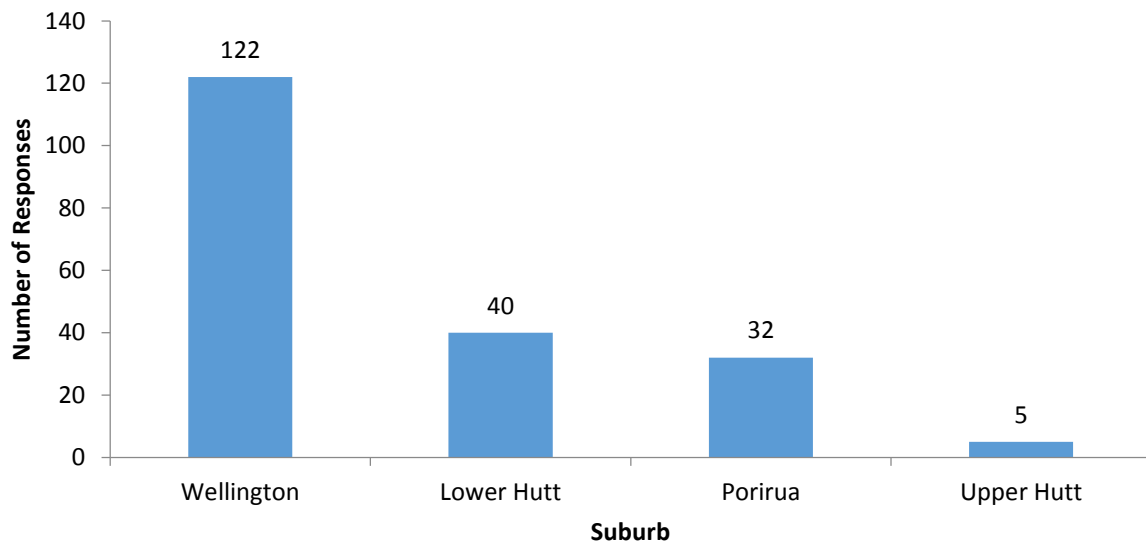
Funding for Private vs. Public Heritage Buildings

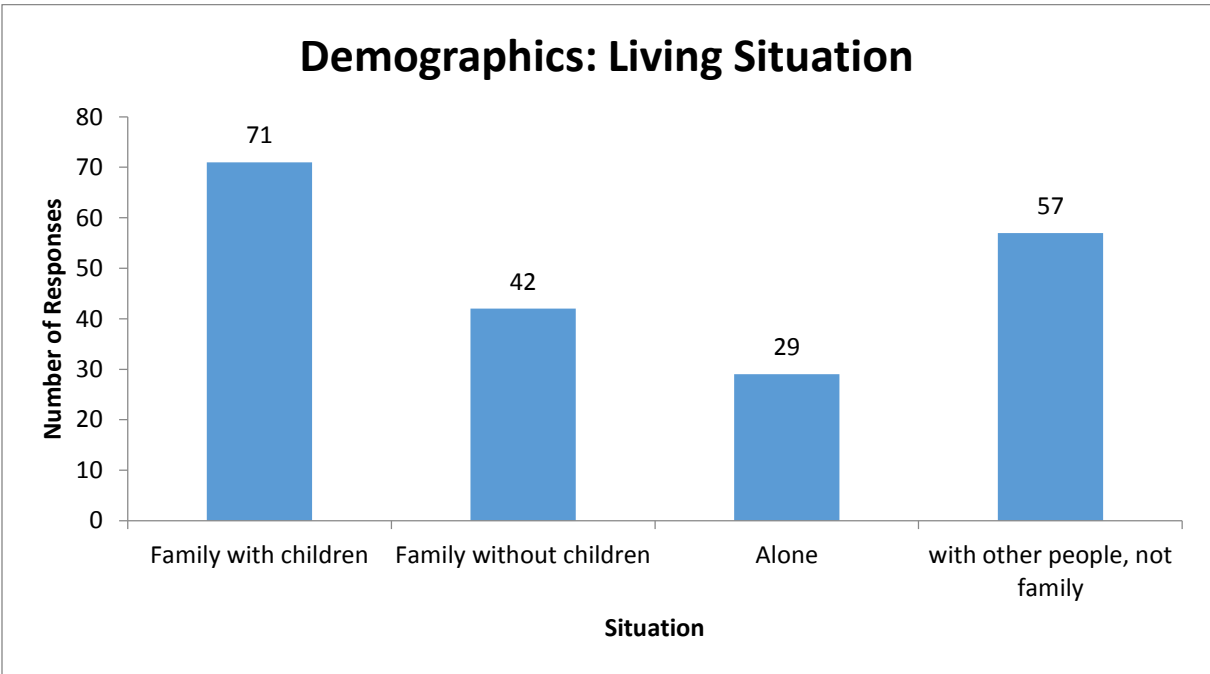
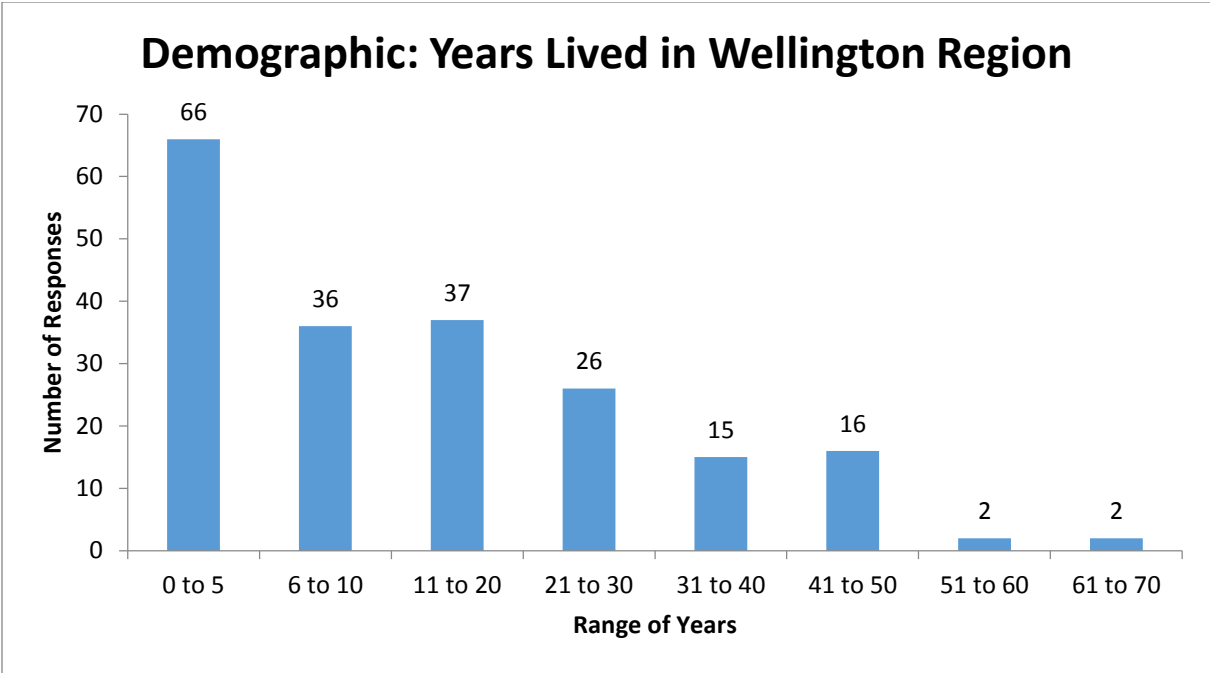


Safety Standard of Heritage vs. Residential/Commercial Buildings

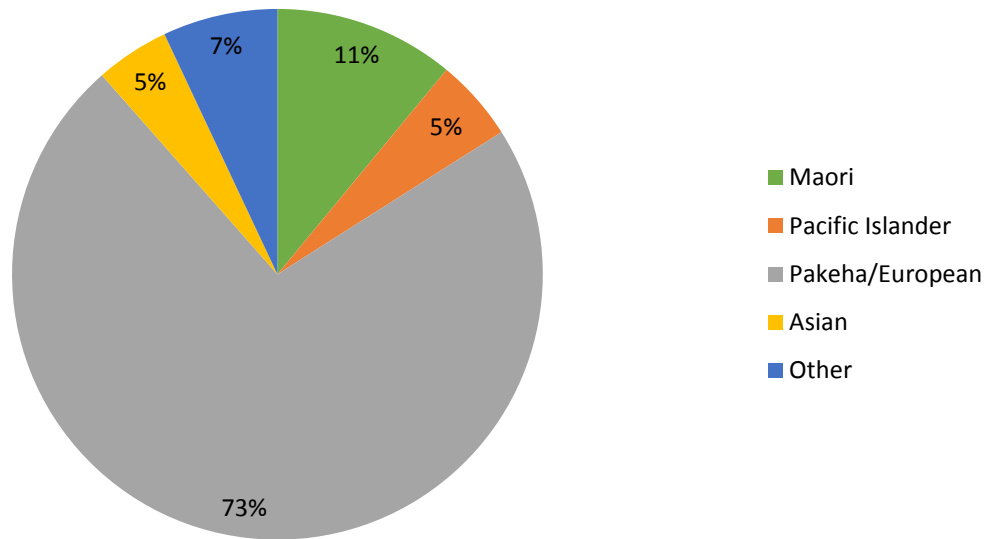


Demographic: Suburb

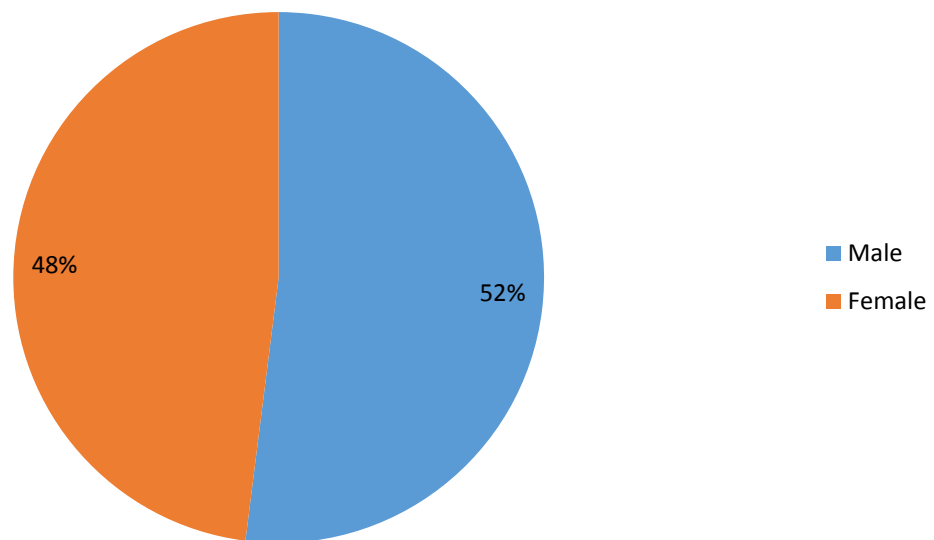


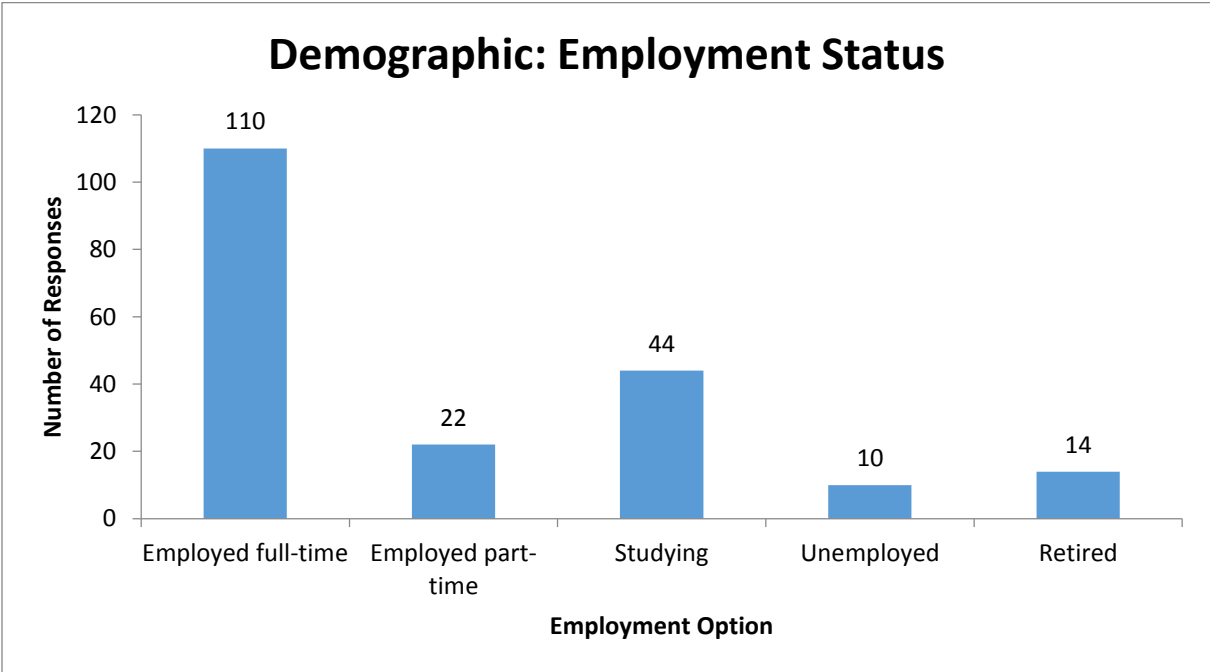
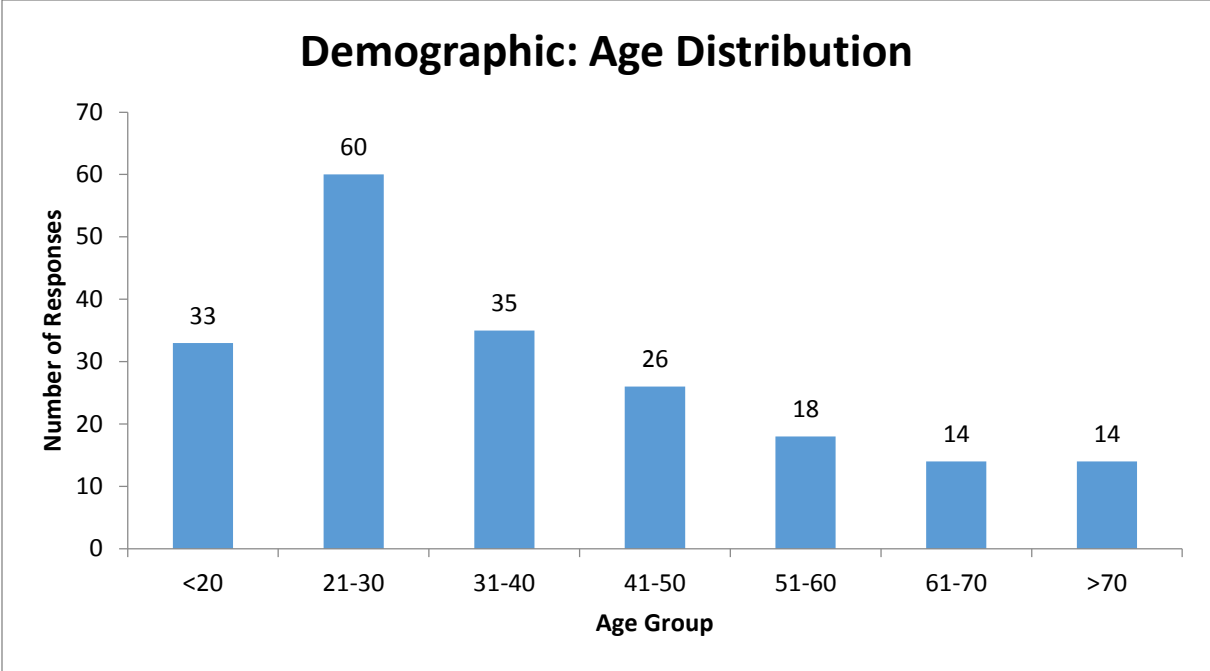


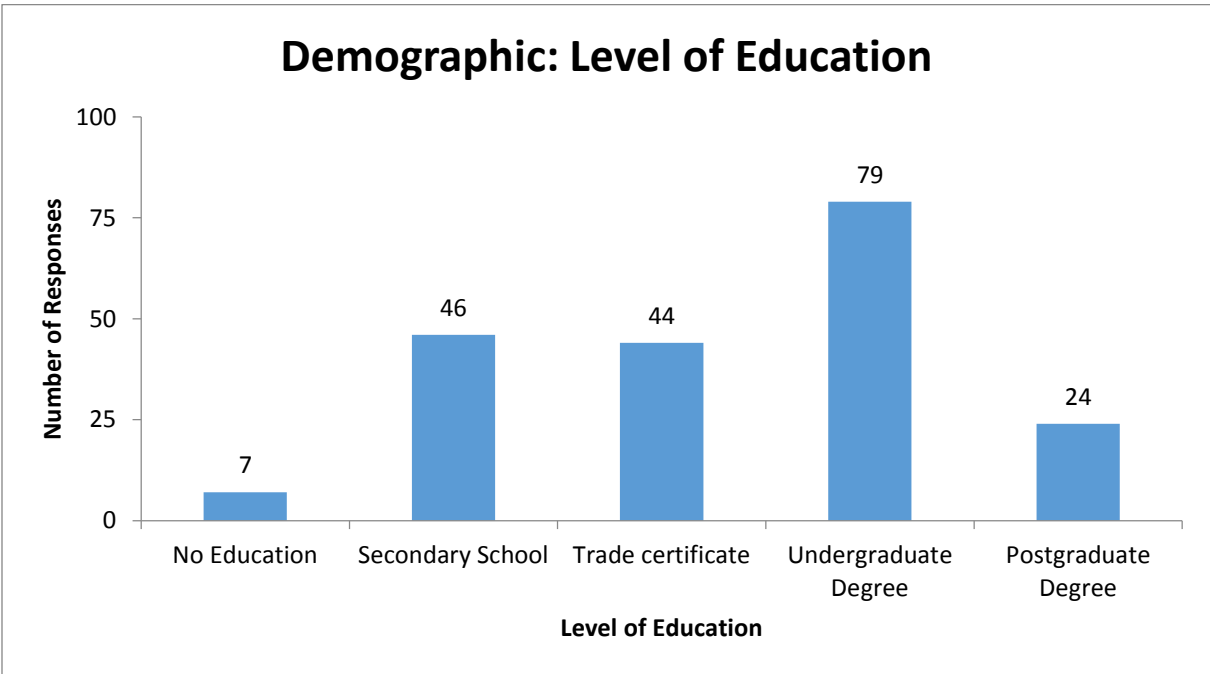
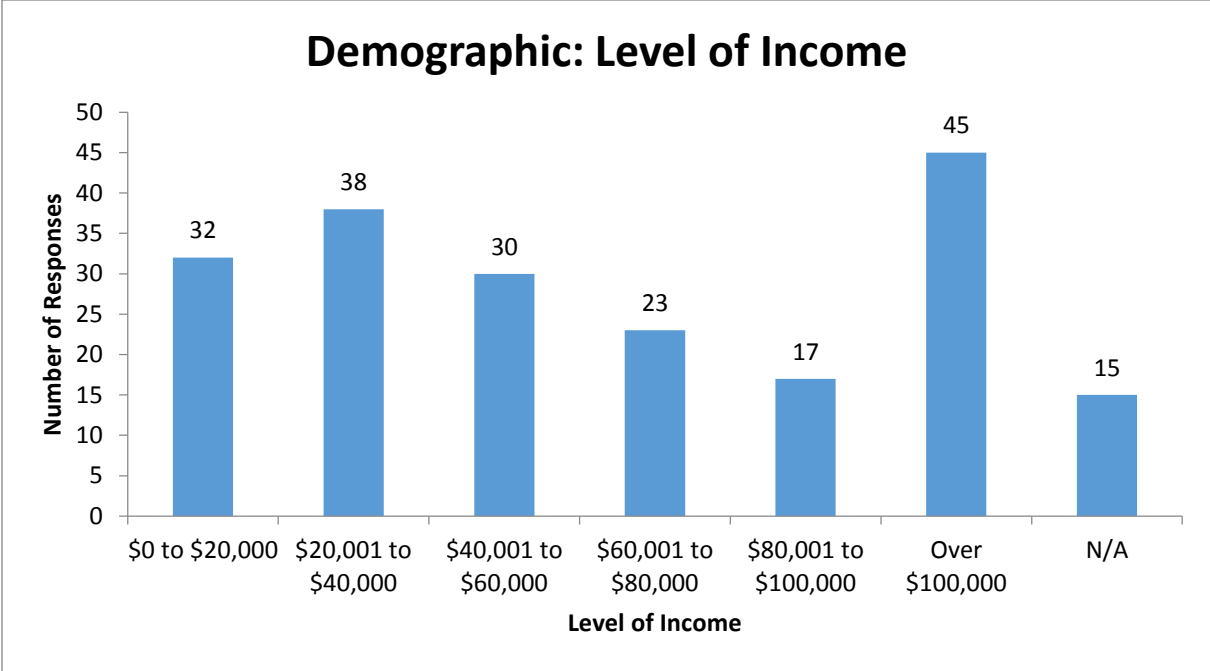
Demographic: Ethnic Group



Demographic: Gender







Appendix H – What Makes a Good Warning Sign

Guidelines for Warning Design			
Salience	Wording	Layout	Pictures
Large Print	Signal Word	Bullets	Legibility
Bold Print	Identification of Hazard	Outline Format	Size
High Contrast	Explanation of Consequences	Alternative Labels	Comprehension
Color	Directives for Avoiding	Placement	
Borders			
Special Affect			

(Conzola, Smith-Jackson, & Wogalterm, 2002)

“Life Safety vs. Preservation on Community and Heritage

Buildings in the Wellington Region”

October 2013 – March 2014

Worcester Polytechnic Institute (WPI) and GNS Science

Proposal by Tatiana Goded, Andrew King and Kim Wright (GNS Science)

The Wellington Region Emergency Management Office (WREMO) expressed their interest in receiving recommendations that could be useful for their pre-disaster planning using data gathered from this project. For this purpose, we explain below some of the notable community facility findings.

The first question posed to the public focused on how much they valued the functions community buildings provide on a five-point Likert scale, 1 being no value and 5 being significant value. The data suggests that people value the functionality of museums and public Libraries the most (see appendix 1). Since both museums and public libraries have over a 4.0 rating, people seem to lean towards valuing these buildings significantly. It is also worth mentioning that community halls and community centers were valued the least on the list.

The following question asked which of those buildings would the respondent like to see reestablished first in the event of an earthquake. As the data suggests, people value community buildings differently after an earthquake. In this circumstance, people would like to see libraries reestablished first, followed by community centers and halls (see appendix 2). This is interesting because of the greater value associated with community centers and small community halls compared to the previous question.

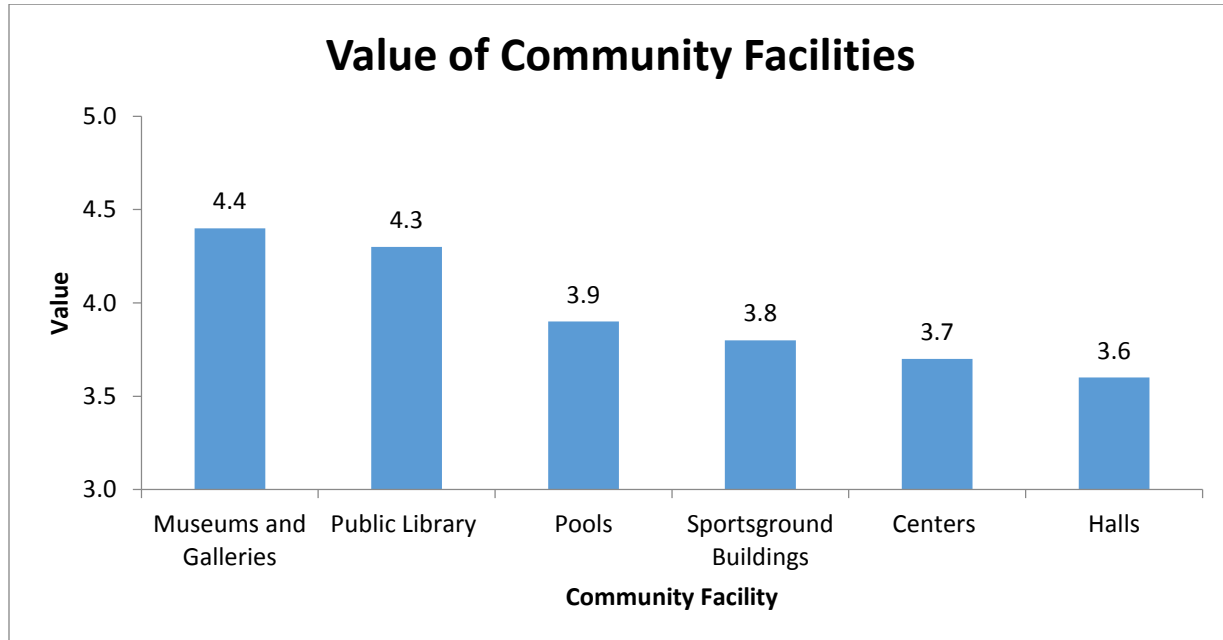
While it's evident that the public values community buildings, when asked would you move if you were to permanently lose any of these community facilities, only 24% would move away (see appendix 3). Of the 24%, the majority stated that the loss of public libraries would make them move their place of residence. (see appendix 4).

Another question posed was, “If an increase in rates was established to upgrade community facilities, what percentage increase of your rates would you find acceptable?” 84% of the people responded with at least a 1% increase (see appendix 6). More specifically, 25% of people would take an increase of 3-5 % of their rates. This shows that if they had to, the public would be willing to contribute a significant increase in their rates to upgrade community facilities.

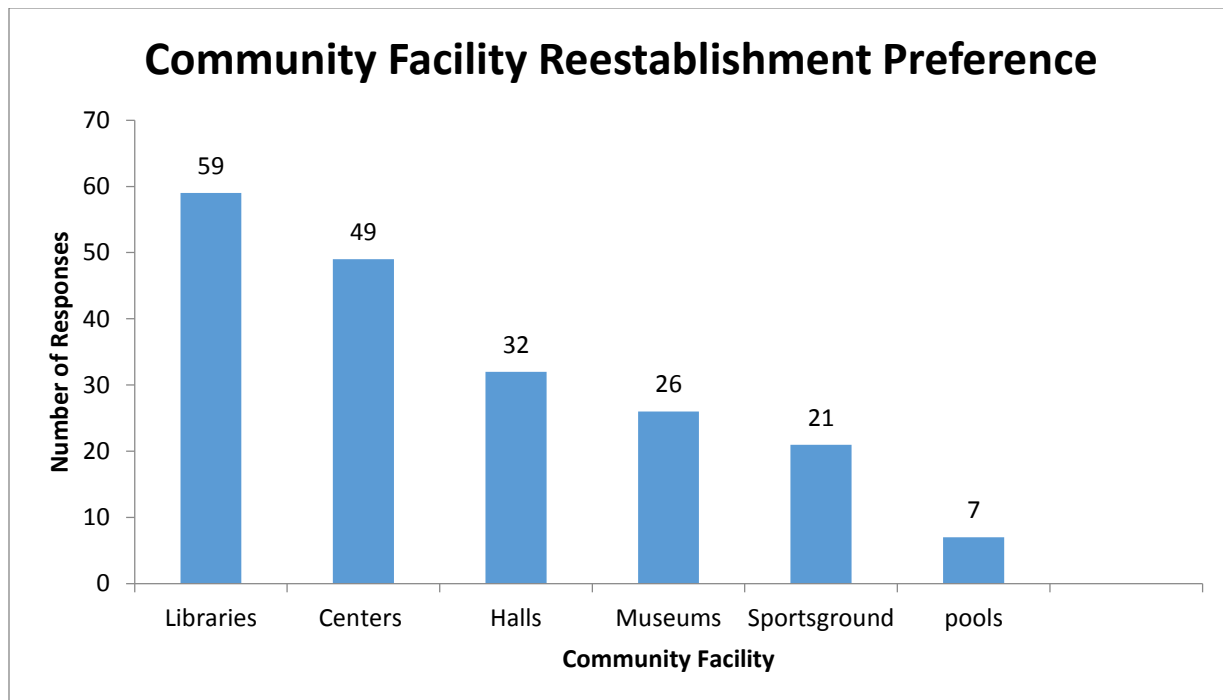
Lastly we asked the people surveyed, “If a community building is tagged as earthquake prone, would you prefer to upgrade, replace or demolish it?” 70% of the people surveyed chose to have the building upgraded over replacing and demolishing it (see appendix 6). However, it is important to note that many people believed this decision varies on a case-by-case basis depending on the cost of the project.

WREMO Appendices

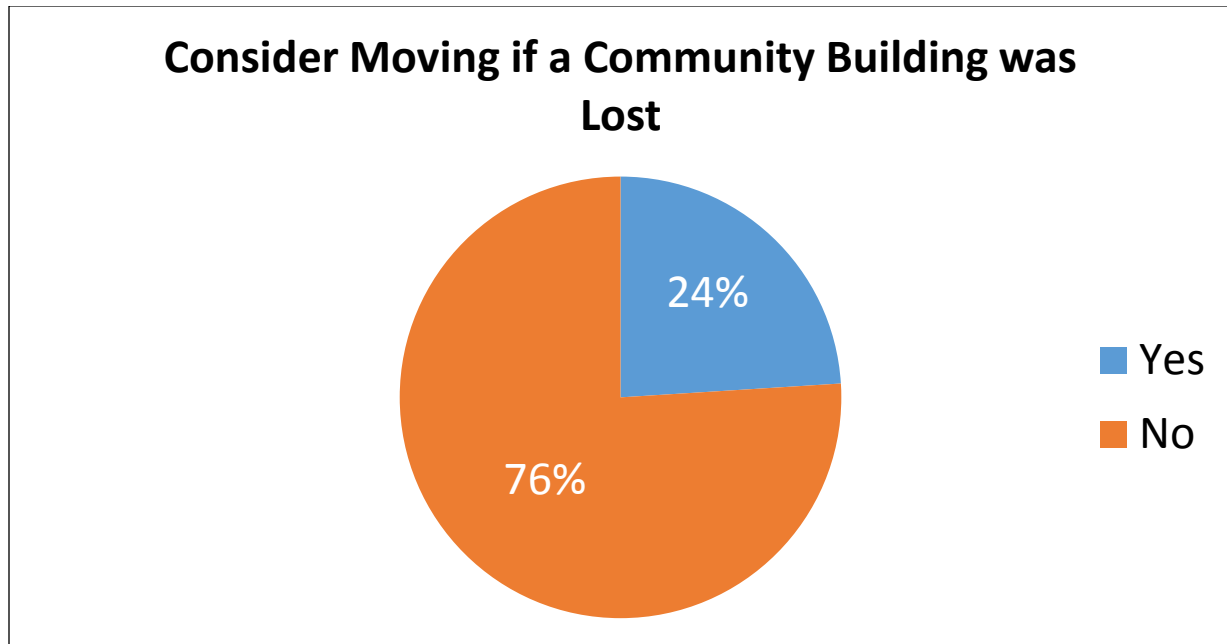
Appendix 1



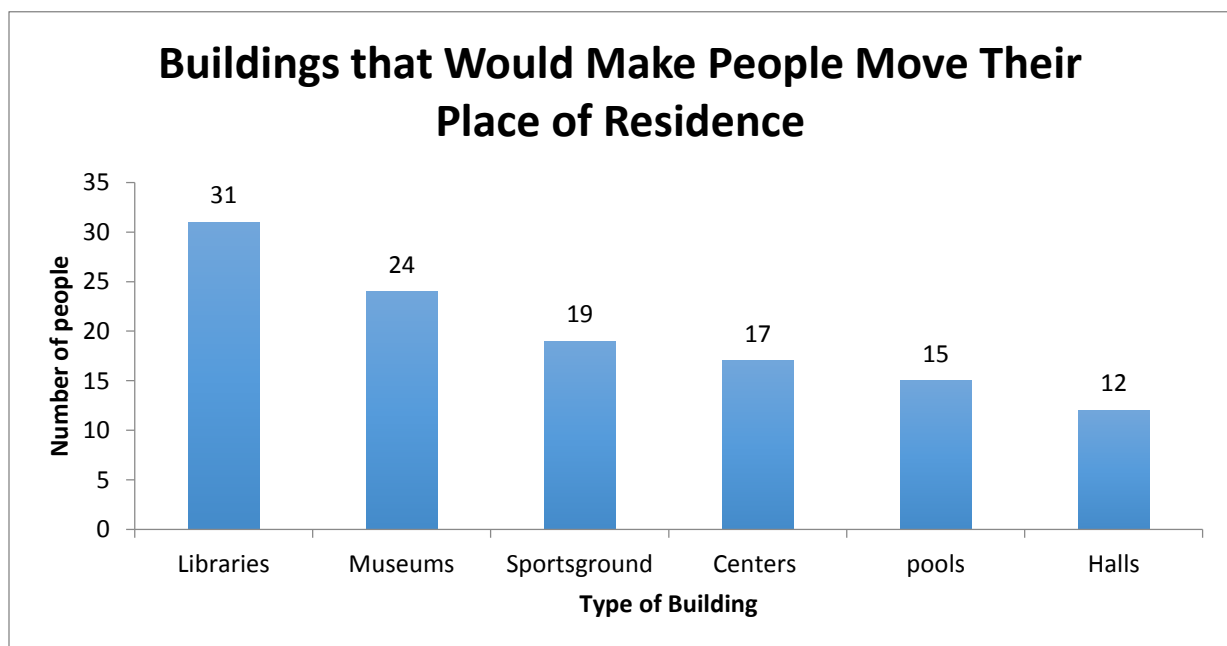
Appendix 2



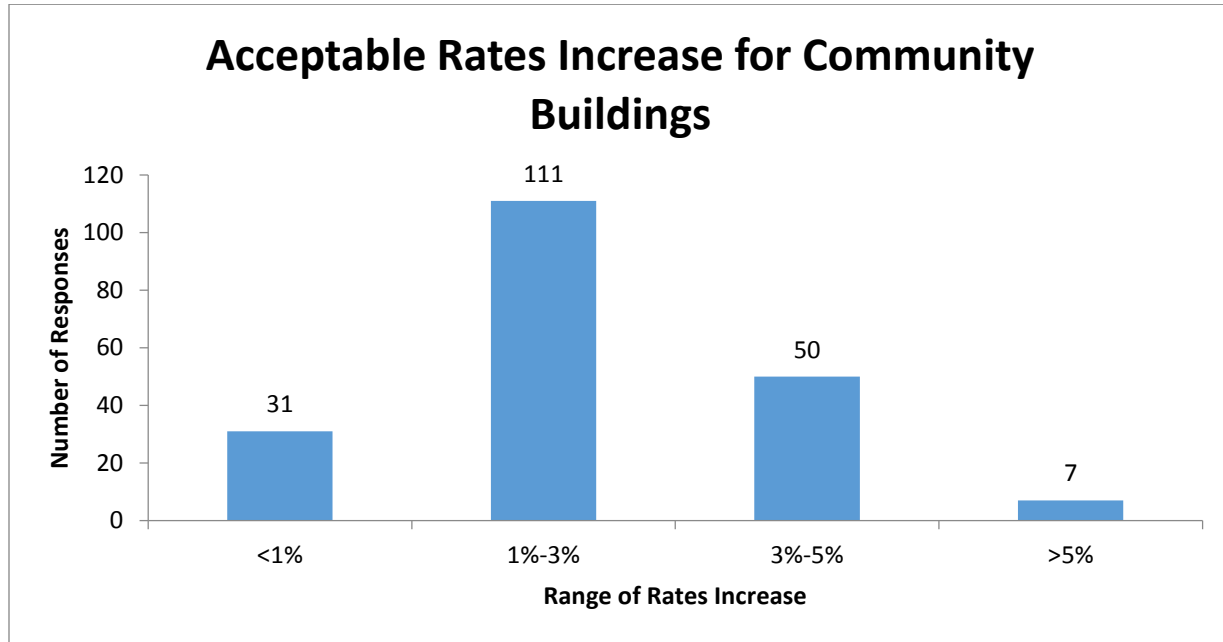
Appendix 3



Appendix 4



Appendix 5



Appendix 6

