Improving the risk management of New Zealand's historic heritage and the role of the heritage engineering community

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Abstract
This paper provides of an overview of the risks to New Zealand's built historic heritage, including natural hazards. It analyses reasons for the demolition of heritage buildings and structures, including engineering heritage, that were formerly entered on the New Zealand Heritage List/Rārangi Kōrero. The paper examines the current framework for managing risks to historic heritage, and investigates issues and gaps. It suggests emerging opportunities for collaboration and input needed from the heritage engineering community.

1. Introduction

Historic heritage is a finite, non-renewable resource, and it is recognised as being a matter of national importance under Section 6 of the Resource Management Act 1991. Heritage contributes to our sense of place, national identity, and community. Heritage places and areas are popular tourist destinations.

The Canterbury earthquakes in 2010 and 2011 resulted in a devastating loss of historic heritage. The destructive force of the quakes focussed attention on the fragility of our built environment and the risks posed to and by heritage buildings, particularly unreinforced masonry buildings. Insurance became difficult to get for buildings seen as being at risk. Councils focussed more effort on assessing the earthquake-prone status of their building stock and heritage building owners became aware that they may need to upgrade their buildings to meet the current building code. Legislative amendments to the Building Act 2004 have been proposed to make this mandatory within set timeframes for all non-residential buildings.

Severe earthquakes are an infrequent, unpredictable, and potentially catastrophic threat to heritage buildings. However other natural hazards occur much more frequently, with effects that may be less severe and more localised but are potentially cumulative.

This paper looks at the threats to the long term survival of New Zealand's historic heritage. It examines records of demolition of identified historic heritage and the reasons for demolition. It evaluates the ability of current legislation to protect historic heritage from hazards, including gaps in the legislation, and proposes opportunities for agencies and professionals to work together to address these gaps.

2. New Zealand is a dynamic landscape

New Zealand's location in the southern ocean and linear topography with high mountain ranges means that our climate is subject to extreme weather events such as cyclones, flooding, storm surges, high winds and even tornadoes. Some of these natural hazards have been exacerbated by human development. Many of our coastal areas are at risk from erosion and rising sea levels. Climate extremes mean that forest fires are a risk in some areas in summer, whereas heavy rain and snowfalls affect other areas in winter. Earthquakes are common, and tsunami, although rare, can occur.

3. Natural hazards that pose a risk to historic heritage

Risk is the "effect of uncertainty on objectives" and is often expressed as a combination of the consequences of an event and the associated likelihood of that event occurring.[1] Figure 1 shows New Zealand's risk profile, expressed as estimated frequency of occurrence of an event type and associated consequences. The events in the lower right quadrant of the diagram are catastrophic events which may occur very infrequently, whereas the events at the top left of the quadrant are events that may occur frequently but where the effects are minor. The events most likely to affect historic heritage are floods and severe weather (bright blue) and earthquakes and volcanic activity (mustard).

Since 1967 there have been 167 declarations of states of emergency involving natural hazards earthquakes, landslides, tsunami, floods, severe weather, and wildfire, as shown in Table 1.

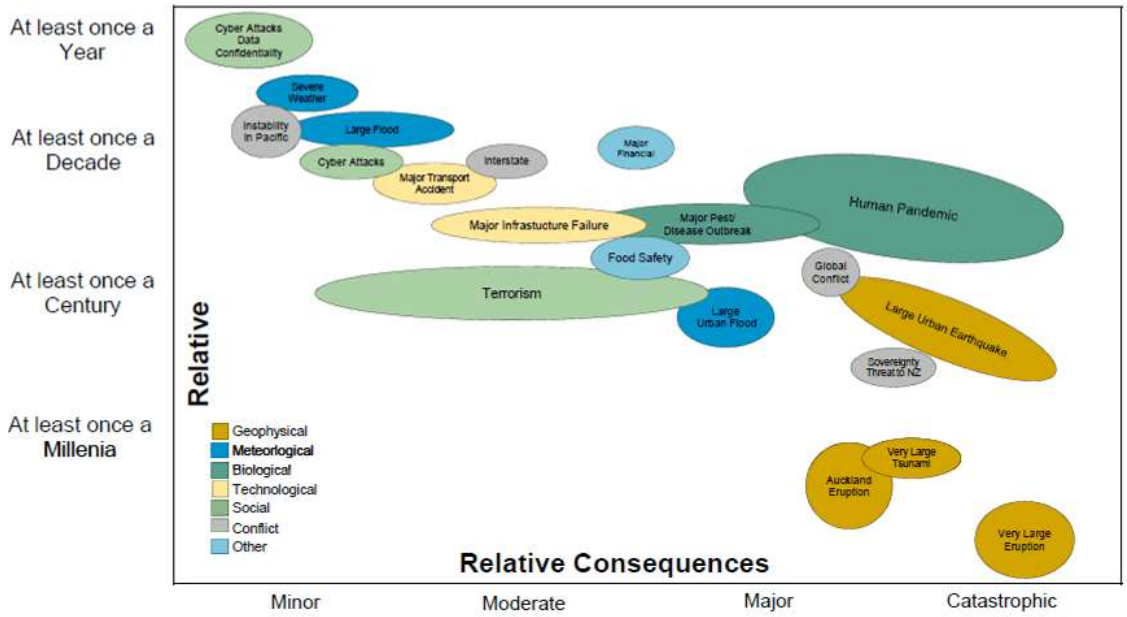

Figure 1: Relative frequency of occurrence of hazardous events and the relative consequences. Source New Zealand Treasury; *2014 Investment Statement: Managing the Crown's Balance Sheet.* [2]

Table 1: Breakdown of types of civil defence emergency: Ministry of Civil Defence "Historical Emergencies" http://www.civildefence.govt.nz/resources/historical-emergencies/) [3]

Type of emergency	Number since 1967
Floods	122
Severe weather	17
Earthquake	9
Wildfire	7
Landslides	6
Tsunami	4
Volcanic unrest	1
Other	1
Total	167

The states of emergency were declared primarily because the extreme events could affect people, economic activity, settlements or key infrastructure. Localised events, such as severe weather, could pose a threat to historic heritage but not meet the criteria for declaring a state of emergency. For example, BRANZ estimates that natural hazards result in the following damage to residential properties each year:

- 1086 homes are damaged by flooding
- 280 homes in New Zealand suffer wind or storm damage
- 76 homes are damaged by coastal erosion.[4]

Climate change research suggests that the frequency of severe weather events could increase, with more storms, flooding and high winds and in some areas increased risk of drought and forest fires. Heavier rainfall can also lead to unstable building foundations and landslides undermining or damaging buildings.[5] Warmer climates may allow pests that attack building fabric, such as termites, to spread and thrive.[6]

4. Human activities that pose a risk to historic heritage

Development is a major threat to historic heritage. Modernisation of cities (the construction of new buildings, roads, and infrastructure) has resulted in the loss or compromise of heritage urban fabric. Often, heritage is simply "in the way", and heritage buildings may need to be upgraded or retrofitted to be commercially viable.

Fire, usually starting within a building or deliberately lit by vandals, poses a particular localised risk to heritage structures. Vacant heritage buildings are also at risk from deterioration through lack of maintenance, and vandalism.

Whereas the frequency and severity of calamitous natural events cannot be controlled, the threat to heritage posed by human activities is more amenable to risk reduction through controlling the activity.

5. New Zealand's heritage is vulnerable

Since the Canterbury earthquakes in 2010–2011, New Zealanders have become acutely aware of the risk to heritage buildings posed by natural hazards. The media often report on the loss of heritage buildings and structures, demolition precipitated by earthquake damage, fire, extreme weather, vandalism, delayed maintenance or economic imperatives. Is this a fair representation of the actual loss of heritage?

To answer this question, we interrogated the records of demolitions of heritage structures recorded on the New Zealand Heritage List Rārangi Kōrero (the List) for the last 15 years. This analysis only includes heritage items entered on the List, which may not include all of New Zealand's significant heritage. Other important heritage of local and regional significance is identified on district and regional plans and on other schedules, such as the IPENZ Engineering Heritage Register and Rail Heritage Trust Register.[7]

5.1 What types of heritage we are losing and why?

Significant historic places are entered on the List and classified as Category 1 or Category 2 depending on the level of significance. The List also identifies historic areas (which contain several historic places), wāhi tapu and wāhi tapu areas and, in the future, will include wāhi tūpuna and National Historic Landmarks/Ngā Manawhenua o Aotearoa me ōna Kōrero Tūturu. The List identifies 5709 heritage places and areas, and a breakdown of these into categories is shown in Table 2.

Table 2: Heritage entered on the New Zealand Heritage List/Rārangi Kōrero as at 20 October 2014 (Source: Heritage New Zealand internal database Pātaka)

List Entry Category	Number of Entries
Historic Area	121
Historic Place Category 1	997
Historic Place Category 2	4431
Wahi Tapu	101
Wahi Tapu Area	59
Total	**5709**

The first question to be examined is what type of heritage are we losing? Category 1 historic places are identified as "places of special or outstanding historical or cultural heritage significance or value".[8] Approximately 18 per cent of the historic places (i.e. of Category 1 and Category 2 places) on the List are Category 1. We are losing around six times as many Category 2 buildings to demolition as Category 1 buildings, which reflects the greater number of Category 2 buildings on the List. The number of demolitions by type of List entry is shown in Figure 2. The focus of the analysis is on buildings and structures entered on the List. No wāhi tapu or wāhi tapu areas are identified as having been demolished within the study period. The study does not look at the potential destruction of archaeological sites which are recorded thorough the granting of an archaeological authority.

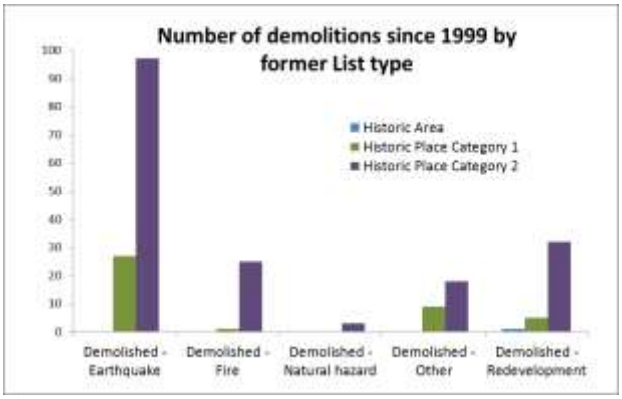

Figure 2: Demolitions of historic heritage by type of event and heritage significance (Source: Heritage New Zealand internal information database Pātaka)

Table 3 shows the proportion of Category 1 historic places demolished as a percentage of total places demolished.

Table 3: Proportion of Category 1 historic places demolished. (Source: Heritage New Zealand internal database Pātaka)

Demolition type	Total Cat 1 & 2	Cat 1	Cat 1 as % of total Cat 1 & 2
Demolished - Earthquake	124	27	22%
Demolished - Fire	26	1	4%
Demolished - Natural hazard other than earthquake	3	0	0%
Demolished - Other	27	9	33%
Demolished - Redevelopment	37	5	14%
Total Demolished	217	42	16%
Total on NZ Heritage List	5428	997	18%

Overall, the percentage of Category 1 places demolished, and in particular those demolished as a result of development or earthquake damage, roughly reflects the proportion of Category 1 places on the List. The proportion of Category 1 places destroyed by fire is very low, but the proportion demolished for other reasons (often neglect) is nearly twice the proportion on the List. Further investigation would be needed to determine the reason for this. Overall, it does not appear that we are losing a disproportionate number of nationally significant Category 1 places.

5.1.1 Examples of historic heritage lost to fire

The Canterbury Roller Flour Mill building in Ashburton was demolished in 2011 after being damaged by fire. This type of building is unlikely to have had any form of fire protection.

Figure 3: Canterbury Roller Flour Mill Original Building, and Concrete Store, Ashburton, (HNZPT).
Originally entered in the List as Category 2 historic places the Flour Mill was lost to fire in 2011.

5.1.2 What type of heritage structures are we losing?

The next question we examined is what types of buildings and structures are lost to demolition. A breakdown by use of the building or structure is shown in Figure 4.

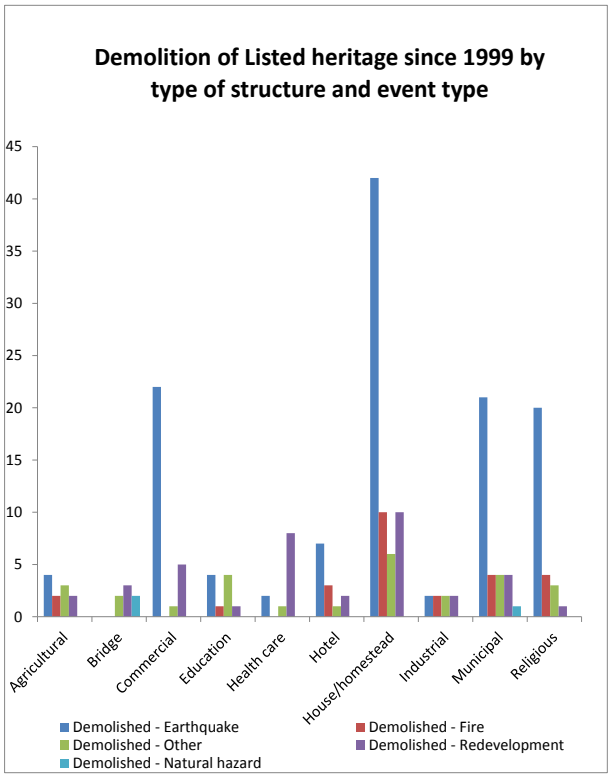

Figure 4: Demolitions of heritage structures by type of building and event type (Source: Heritage New Zealand internal information database Pātaka)

Loss of historic heritage structures is dominated by demolitions after the 2010–11 Canterbury earthquakes. Around one third of the buildings demolished were residential and two thirds non-residential, mainly religious, commercial and industrial buildings. The next most frequent cause of loss of heritage buildings is fire, and again a little over a third of buildings demolished were residential buildings. As seen above, all but one of the buildings lost to fire were Category 2 buildings.

5.1.3 Examples of bridges lost to flood or redevelopment

Several heritage bridges have been lost recently as a result of flood damage, but the number is surprisingly small given that flooding is the most frequent reason for civil defence emergencies and results in significant damage to residential properties. Redundant bridges, replaced by modern structures or no longer required because of rail closures, are also at risk of demolition. An example of a demolished bridge is shown below. No heritage buildings are listed as being demolished due to flood damage, but it is likely that some will have suffered repairable damage.

Figure 5: Mangaotuku Truss Bridge, Stratford (Chris Cochran). Originally entered in the List as a Category 2 historic place. This bridge was built around 1905 and was destroyed in a flood on 15 February 2011.

5.2 Canterbury Earthquakes

As Figures 2 and 4 show, a single catastrophic event can have disastrous consequences for heritage at a regional level. As of October 2014 at least 125 heritage buildings previously entered on the List either as Category 1 or Category 2 have been lost as a direct consequence of the Canterbury earthquakes. These losses were concentrated in Christchurch City, as shown in Figure 6.

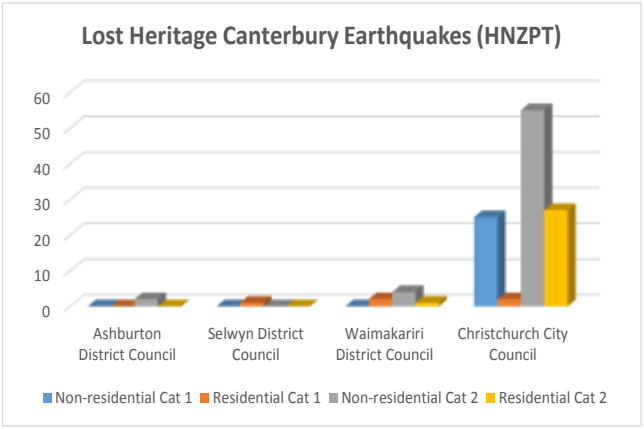

Figure 6: Loss of residential and non-residential historic heritage as a result of damage in the Canterbury earthquakes, by local authority. Source Heritage New Zealand "Lost Heritage" http://www.heritage.org.nz/the-list/lost-heritage/canterbury-earthquakes.[9]

5.3 Has the loss of heritage buildings changed over time?

As shown above, more than half the demolitions within the 15-year study period were due to the Canterbury earthquakes and occurred in the 2011 and 2012 years. To examine demolitions caused by less extreme events, earthquake-related demolitions were excluded from the analysis of changes over this period.

Figure 7 shows demolitions for reasons other than earthquake damage. Redevelopment is the second most common reason for demolition, although decisions to demolish and redevelop a site are usually based on complex factors including the condition of the building, the value of the land, and the costs to strengthen or adapt the building for economic use. Overall, there appears to be a slight downward trend in demolitions per year. Further work would be needed to determine if this is due to a greater value being placed on heritage buildings or whether it is related to economic factors.

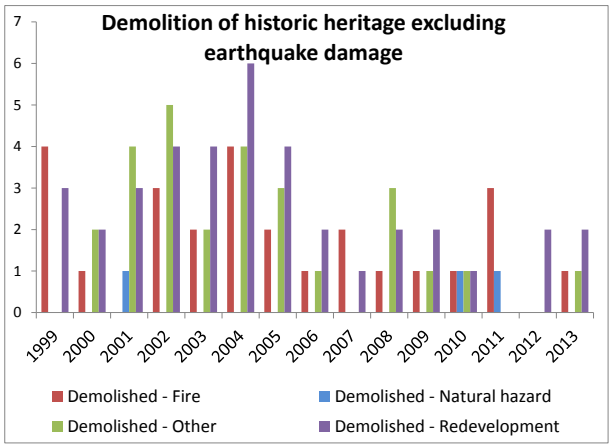

Figure 7: Demolition of heritage by year, excluding earthquakes (Source: Heritage New Zealand internal information database Pātaka)

5.4 Assessment of heritage lost

Based on the analysis of demolitions of historic heritage structures over the last 15 years of historic places previously entered on the List:

- A single catastrophic event can have devastating results for historic heritage – earthquake damage accounted for more than half the demolitions of buildings on the List in the last 15 year
- Development pressure is the next biggest threat to historic heritage buildings and around six times as many Category 2 buildings are lost to development as Category 1 buildings, roughly reflecting the proportions of these buildings on the List.
- Fire is the next biggest threat, and in the last 15 years has mainly affected Category 2 buildings.
- A surprisingly small number of demolitions have occurred as a result of other natural hazards, and these are mainly due to floods damaging bridges. However, this analysis does not take account of the destruction of historic heritage that is not entered on the List, for example heritage that is scheduled in district plans only, or repairable damage.
- The focus of the analysis is on buildings and structures entered on the List. The absence of archaeological sites from this analysis does not mean they are not at risk.

6. Are we doing enough to reduce the risk to historic heritage?

6.1 Assessing risks to heritage

Risk is a function of the likelihood of an event occurring and the consequences of that event, as discussed above and portrayed in Figure 1. The risks posed to historic heritage from natural hazards can be viewed as the intersection of the hazard (likelihood, severity), the exposure of the structure to the hazard (likelihood) and the vulnerability of the structure (consequence), to determine the risk from a particular type of event. This is shown in Figure 8.

Figure 8: Assessment of risk (Source: Reese and Schmidt 2008 [10])

Cost is a significant factor in decisions on the extent of managing heritage risks. However preventative measures can reduce the long-term financial risk. One international guide on managing disaster risks for heritage states that “Disasters can have great financial consequences: it is much more cost-effective to invest in preventive risk management planning before disaster has struck than to spend large amounts in post-disaster recovery and rehabilitation”.[11]

International best practice for managing cultural heritage is based on a number of key principles:

- When planning for disasters it is necessary to consider all risk to all heritage (tangible and intangible) and the potential for multiple disasters (e.g. earthquakes followed by fires, cyclones followed by flooding and landslides).
- Consider where a risk may come from (i.e. both from within the site and external,) and prepare for not only reducing risk, but also response and long term recovery.

- It is important to also consider the role of traditional knowledge in preparing for and responding to disaster (for example oral traditions and histories of previous events).
- In all situations life-safety is of paramount importance.
- Disaster risk management for cultural heritage should recognise the need to reconcile conflicts and engage multiple stakeholders.
- Disaster risk management should be integral to the management of the site and linked to local/ regional and national disaster management plans. Cultural heritage should be mainstreamed into disaster management plans. [12]

Managing risk to heritage structures requires the preparation of a risk management plan, as shown in Figure 9. The process includes setting objectives, identifying and assessing risks, examining measures for prevention and mitigation, planning for emergencies and recovery. The process includes ongoing monitoring and review.

Figure 9: Steps in the risk management process (From Managing Disaster Risks for World Heritage, UNESCO, 2010.[13])

6.2 How do we currently manage these risks?

As discussed above, the hazards posed by environmental factors such as extreme weather and seismic or geothermal events cannot be controlled. Managing exposure to hazards is also difficult, because historic heritage items are at fixed locations and relocation can significantly reduce heritage values.

Other natural hazards such as storms and floods occur more frequently and the probability of an event of a particular magnitude occurring within a specified timeframe at a location can be estimated based on long term records of similar events. Some engineering solutions such as catchment management can reduce exposure of structures to the effects of extreme weather for example, but schemes are not usually designed with heritage protection as a prime objective. One notable exception is the work at Kerikeri where a significant amount of investment by central and local government has gone into reducing the flooding risk to some of our most important historic places.[14]

One of the most important (but often neglected) ways of improving the resilience of heritage structures is regular maintenance. Without good maintenance structures can gradually weaken, thus increasing their vulnerability to catastrophic events. Some heritage structures were not built with the intention that they would stand permanently. Often a poorly maintained structure can degrade to the point that the cost to remediate any damage is greater than the commercial value of the building. In such situations it is more than likely the structure will be demolished and replaced.

Fire protection is critical for wooden structures. As shown in Figure 4, few Category 1 heritage buildings have been demolished as a result of fire in the last 15 years. This may be a result of Heritage New Zealand, in partnership with the New Zealand Fire Service, working with building owners, providing advice and targeted incentive funding. As a result one reason Category 1 buildings seem to be less vulnerable to fire could be improvements to wiring and installation of alarms and sprinklers. Category 1 buildings may also be more likely to be economic to repair after a fire than Category 2 buildings.

Overall, the most effective way of protecting heritage buildings from natural hazards is likely to be to improve the resilience by reducing the vulnerability.

7. Mechanisms for protecting historic heritage

7.1 How well does current legislation protect heritage buildings and structures?

Regulation is one of a suite of complementary tools for improving the resilience of our stock of heritage buildings. This section looks at the regulatory means available to ensure that heritage buildings are maintained and enhanced.

There are three key pieces of legislation that serve to identify, manage and protect historic structures:

- Heritage New Zealand Pouhere Taonga Act 2014 (HNZPTA)
- Resource Management Act 1991 (RMA)
- Building Act 2004 (the Building Act)

In addition, the Conservation Act 1987 assigns the Department of Conservation (DoC) a stewardship role for the conservation of natural and historic resources on land it manages for the Crown. The

main way that DoC gives effect to this is by managing and conserving a range of historic heritage sites and providing interpretive information on these sites.

A further piece of legislation, the Civil Defence and Emergency Management Act 2002 (CDEM), manages our response to natural disasters. However, it does not specifically provide for the protection of heritage buildings. We will explore the potential of this legislation and associated planning documents to reduce risks to heritage structures later in the paper.

Both the HNZPTA and the RMA focus on the identification of historic heritage and protection from human activities, as shown in Table 4. The Building Act focuses on setting and enforcing performance standards for new and existing buildings.

Table 4: Legislation related to the identification and protection of historic heritage

	Identify heritage	Protect from inappropriate development	Increase resilience of structure
HNZPTA	Yes	Yes (archaeology) Limited (structures)	Yes (Landmarks) Limited (other heritage)
RMA	Yes	Yes	Limited
Building Act	No	Limited	Yes

The HNZPTA has four mechanisms for identification and protection:

- historic heritage is identified and recognised through entry onto the List
- places with outstanding national heritage value are identified and recognised through entry on the National Historic Landmarks List. A risk management plan must be produced for every Landmark
- covenants, which are an agreement between Heritage New Zealand and the property owner for the purpose of protecting and conserving a heritage item
- Archaeological sites are protected and an authority is required for their modification or destruction. A simplified and streamlined process has been set up to quickly consider work that affects archaeological sites under the Canterbury Earthquake Response and Recovery Act 2011.

The RMA provides for:

- recognition of historic heritage as a matter of national importance, to be protected from inappropriate subdivision, use and development
- recognition of entries on the List when preparing regional policy statements and regional and district plans
- scheduling of historic heritage in district and regional plans, and protection through a structure of rules governing activities that can be carried out
- heritage orders, which are requirements set out in district plans providing for the protection of specific heritage items.

The provisions of the Building Act include:

- requirements for building safety and fitness for purpose, including structural stability and fire protection
- the need to facilitate the preservation of buildings of significant cultural, historical or heritage value.
- a requirement that every territorial authority adopt a policy on dangerous, earthquake-prone, and insanitary buildings including how the policy will apply to heritage buildings
- provisions to manage dangerous, earthquake-prone and insanitary buildings, and dangerous dams
- requirement for territorial authorities to notify an application for a building consent or project memorandum that affects any place (historic place, historic area, wahi tapu, wahi tapu area, or wahi tupuna) that has been entered on the List.

7.2 How do the three key pieces of legislation work together?

Places with heritage values are recognised by entry onto the List and protected through scheduling in district and regional plans and protection from inappropriate activities through rules. However, the ability of the HNZPTA and the RMA to directly require building owners to take steps to reduce the vulnerability of their buildings to natural hazards is limited, apart from requirement to prepare a risk management plan for National Historic Landmarks. No Landmarks have been proposed yet, as the legislation establishing the Landmarks is relatively recent and the policy is currently under development.

The Building Act is the key mechanism for ensuring that buildings are maintained and upgraded to meet current performance standards. Tension can arise between Building Act requirements for buildings to meet these performance standards and RMA requirements for resource consent to undertake major work or demolish heritage buildings. If standards cannot be met, demolition is the likely outcome. Councils can order demolition of buildings on the grounds of risk to public safety, even for a localised issue where a civil defence emergency has not been declared. The demolition of the Category 1 Aurora Hotel in Auckland is an example of council ordering an

emergency demolition of a heritage building on the grounds of danger to public safety.[15]

In 2013 the Ministry for Culture and Heritage commissioned a report to understand the role the RMA plays on influencing seismic strengthening of heritage buildings. Seventeen operative/proposed district plans were assessed representing a range of territorial authorities. Only one of the plans in the sample provided an explicit linkage between the RMA and the Building Act, and few gave clear guidance on how earthquake strengthening proposals would be assessed. None of the plans contained provisions addressing the reduction in the vulnerability of heritage structures to other natural hazards.[16]

7.3 Do the protection mechanisms match the risks to heritage?

As discussed above, earthquakes and other natural hazards cannot generally be mitigated, but the vulnerability of structures to these hazards can be enhanced. Until recently the only way to ensure that owners enhance the resilience of heritage buildings was through the Building Act. Where a building consent is required for building work or a change of use, conditions will require that the building meet current performance standards for fire protection and earthquake strengthening.

The earthquake-prone buildings provisions of the Building Act are currently being reviewed to require councils to assess buildings and for earthquake-prone buildings to be rectified within set timeframes. The review identified “too much variability” in council policies as an issue, with some councils not actively addressing the problem and others giving building owners long timeframes to address problems.[17]

8. Dealing with the effects of natural disasters on heritage

8.1 Civil defence legislation and interface with heritage risk management

The Civil Defence and Emergency Management Act 2002 (CDEMA) addresses the sustainable management of hazards, identifying and managing risk, and preparing for emergencies, including response and recovery. Sustainable management in this context takes into account the social, economic, cultural, and environmental well-being and safety of the public and also to the protection of property. Communities are encouraged to achieve acceptable levels of risk by evaluating, communicating and managing risks, cost effective risk reduction, and monitoring and evaluation.

To achieve the purposes of the CDEMA, territorial authorities have a role in planning and implementing programmes. There are 16 CDEM Groups across the country. Each Group is required to prepare, consult on, and approve a civil defence emergency management group plan and review it every five years. Although there is scope for Group plans to include how heritage will be managed before, during and after a disaster, only a few actually mention the need to consider heritage.

9. Opportunities for heritage and engineering professionals to work together

The HNZPTA establishes a specific function of Heritage New Zealand: “in the event of a national or local emergency, to provide advice on heritage matters”. The review of the Civil Defence National Plan consulted on earlier this year has recognised this new role for Heritage New Zealand and also for the Ministry for Culture and Heritage. A civil defence emergency management group plan must not be inconsistent with the national civil defence emergency management strategy and must take account of Director's guidelines, codes, or technical standards. Four CDEM Group plans will be reviewed in 2014/15, nine in 2016/17 and three plans have recently been reviewed. This presents an opportunity for councils and civil defence and heritage experts to work together to ensure that heritage is taken account of in civil defence emergencies.

The requirement that a risk management plan is prepared for every proposed entry to the National Landmark List introduces the notion of risk management of heritage into legislation. Preparation of these risk management plans will require an interdisciplinary approach. An understanding of the heritage values of the proposed Landmark will be critical in setting objectives. Assessing risk and identifying risk management strategies will need input from heritage and engineering professions. Risk management plans will need to incorporate mechanisms for dealing with disasters, and will need to integrate with existing disaster response mechanisms.

Risk management plans for heritage will need to address reducing the vulnerability of heritage places to natural hazards. This presents the opportunity for dialogue between engineers and heritage specialists to find engineering solutions that take account of heritage values.

While risk management plans are only required for proposed Landmarks, in the longer term risk management should be addressed in conservation plans for all significant heritage places. This will be particularly important if the proposed amendments to the Building Act requiring strengthening of earthquake-prone heritage buildings within specified timeframes are enacted. Councils identify heritage in district plans and there is an opportunity to assess ways of reducing risk to heritage places through other council programmes such as flood protection work.

10. Conclusion

Natural hazards pose a threat to historic heritage as shown by both data on events and on loss of heritage. While a single major event can have a catastrophic effect on heritage, every year several significant heritage items are demolished and this adds up over time to a significant loss of heritage.

- We cannot influence the frequency or severity of natural hazards and our ability to reduce exposure is limited, but there are opportunities to reduce the vulnerability of buildings.
- While the current legislative framework protects historic heritage from human activities, it does not universally require that heritage items are maintained or upgraded to reduce their vulnerability to hazards.
- Proposed amendments to the Building Act would require councils to identify earthquake-prone buildings and owners to strengthen or demolish them within specified timeframes, with special provisions for heritage buildings.
- Changes to the Heritage New Zealand Act 2014 formalise the role of heritage professionals in the civil defence response
- Owners of properties proposed for inclusion on the National Landmarks list will need to prepare risk management plans.

In order to address the risks to heritage from natural hazards, engineers and heritage specialists will need to work together to find ways to reduce the vulnerability of heritage buildings that are cost-effective and provide an adequate level of protection while respecting the heritage values and heritage fabric of the place. Recent and proposed changes to legislation will challenge both the heritage and engineering communities, but also offers opportunities to collaborate and improve the risk management of New Zealand's historic heritage.

11. Acknowledgements

Michael Kelly and Nicola Jackson, for providing comments on a draft of the paper.

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