

The relationship between building lifecycle of commercial properties and seismic strengthening in Wellington CBD

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Abstract

Earthquake fatality is a function of building vulnerability. Several studies that have investigated seismic disruptions have revealed that the severity of earthquakes is influenced by vulnerable buildings, especially unreinforced masonry (URM) structures. Also referred to as earthquake-prone buildings (EPB), most vulnerable buildings have been identified to be multi-storey and were constructed before World War II. In New Zealand, like other earthquake-prone countries, attempts are being made to reduce the susceptibility of the existing building stock to seismic disruptions. As a result, Pre-1976 buildings that are proven to be less than 34% of the current new building standard (NBS) are required by law to be strengthened to at least 34% NBS or risk being demolished. However, the financial burden of adhering to the stipulated standard is ominous, particularly for commercial building owners who seem to justify seismic strengthening by their ability to recoup commensurate return on investment through increased rents or lease contracts. Consequently, the rate of compliance of commercial property owners to seismic strengthening is market-driven and below the expectation of policymakers. Recognising that seismic strengthening can be combined with other forms of building adaptation (e.g., renovation, refurbishment, remodelling, rehabilitation and recycling of the original building structure or components) to minimise the associated cost of maintaining a building throughout its lifecycle, this study investigates the relationship between building lifecycle and seismic adaptation. Adopting multivariate, descriptive statistical analysis of multi-storey commercial buildings, this study explores the cityscope database and Wellington building consent information from 1995 to 2019 to evaluate documented adaptations on commercial buildings in Wellington CBD. Insights from this study will serve as a basis for policy recommendations that could enhance the commitment of commercial building owners to seismic adaptation.

Introduction

- The vulnerability classification of buildings in seismic regions is influenced by series of factors including the building design, imposed load, height, construction material and age.
- With an estimated 80% of the buildings that will exist by 2050 already in operation (Remoy and Wilkinson, 2017), seismic strengthening of vulnerable of commercial buildings is essential in ensuring safety and business continuity.
- Over 3000 vulnerable buildings in New Zealand have so far been identified as EPB and expected to be strengthened or risk being demolished by 2055 (MBIE, 2020).
- These vulnerable buildings are required by law to be strengthened to at least 34% of the New Building Standard (NBS) but owing mainly to financial reasons, the compliance rate of building owners to the existing regulations deviate from the expectations of policymakers (Filippova et al., 2018).



According to Thornton (2010, pg 3), "it is clear that those retrofit projects that are regarded as successful (at least financially) are those that have, for the most part, combined seismic retrofit with more general refurbishment/change of use and lifting of perceived quality, and thus improved commercial return"

Aim

This study explores the relationship between building life cycle and seismic adaptation as a basis for policy recommendations that could enhance the adaptive reuse of vulnerable buildings and consequently improve the resilience of seismic cities to earthquake hazard.



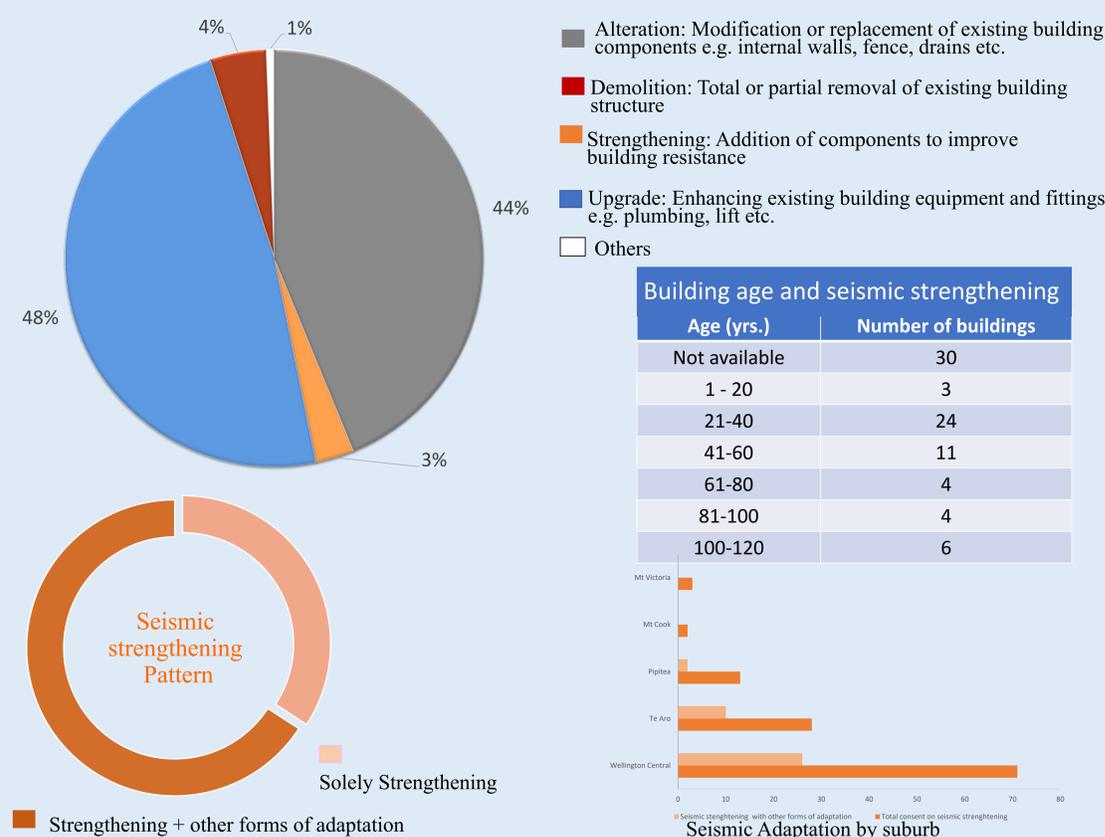
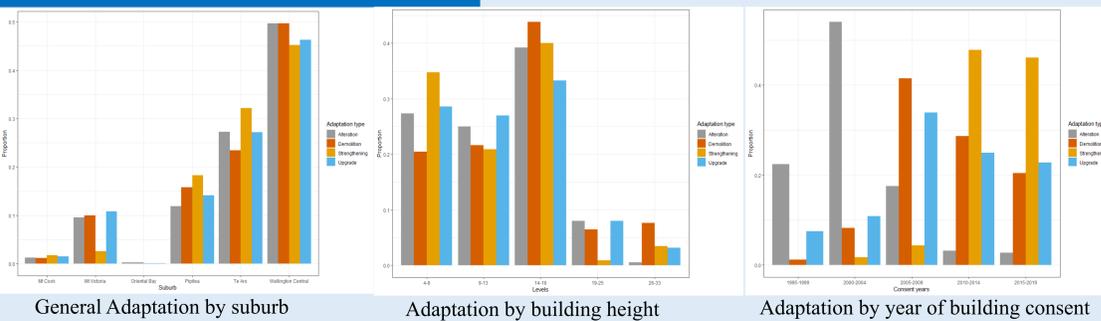
Methodology

Focusing on 4 storey buildings and above, this study evaluates the building consent data of commercial properties in Wellington CBD between 1995 and 2019

- 3927 building consents issued across 247 buildings
- 117 (approx. 3%) of the total consents were issued on seismic strengthening across 82 buildings



Data Analysis



Preliminary Findings

- Formal regulations alone may not be enough to save lives and ensure business continuity in seismic locations.
- The adaptive response of commercial building owners to seismic disruption is low, especially for buildings that were built before 2010.
- Seismic strengthening has been executed alongside other forms of adaptation. However, the consequential cost implication of this practise is not clear.
- The frequent change in tenancy and the associated refurbishment in Te Aro and Wellington central may be responsible for the relatively high number of seismic strengthening in the locations.
- There is a need to purposively engage commercial building owners that have combined seismic strengthening with other forms of adaptation in order to understand the economic significance of such practise.

References

Thornton, A. W. (2010, March). Twenty-five years of strengthening Wellington. In *New Zealand Society for Earthquake Engineering Conference* (pp. 26-28).

Filippova, O., Xiao, Y., Rehm, M., and Ingham, J. (2018). Economic effects of regulating the seismic strengthening of older buildings. *Building Research and Information*, 46(7), 711-724

Remøy, H., & Wilkinson, S. (2017). Sustainable transformation in real estate developments through conversions. *Routledge Companion to Real Estate Development*.

MBIE, 2020, available through: <https://epbr.building.govt.nz/>