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Storm resilience of New Zealand housing and the implications for older people – Preliminary study

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Abstract

New Zealand is susceptible to a wide range of natural hazard events. The response of dwellings to these adverse events is critical to both the resilience of whole communities and the individuals within them, with older people being particularly vulnerable when homes are damaged or destroyed. Older people are defined as those 65 years and older. In New Zealand, most older people are owner-occupiers and they must therefore confront the tasks of making good their dwellings and dealing with insurance companies after an adverse event. This research investigates just how vulnerable older people are in adverse natural events, through the examination of both physical and functional aspects of their dwelling, compared to those dwellings owned by the general population.

The data from the 2010 House Condition Survey (HCS) by BRANZ (an independent research, testing and consulting company providing resources for the New Zealand building industry) provided an opportunity for a preliminary examination of this, in particular the resilience of the New Zealand dwelling stock in the context of storms and weather-related adverse events. An assessment was then made of the vulnerable features of housing inhabited by the general population compared with those 65+. It was found that older people do not appear to be substantially or systematically more exposed to dwellings with less resilient designs, materials or amenities. This paper identifies some additional questions to the existing HCS that will lead to a more comprehensive understanding of households' storm-related resilience in New Zealand.

Keywords: Dwelling resilience; Natural hazards; Vulnerability; Elderly

1. Introduction

In this study, resilience is defined as "the ability of people and communities to return to prior levels of functioning following an event. Therefore, to begin the recovery process after a disaster or extreme hazard event, individuals and communities must have the resources to look after themselves before help can arrive. Preparedness is the key to resiliency." (Finnis, 2004).

In this context, a resilient home is one that:

- Helps to protect occupants during an event.
- Minimises damage.
- Minimises the costs and time involved in recovering and repairing damage.

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This requires an understanding of the likely performance of dwellings during an extreme event and that residents have the knowledge to enable them to increase that performance, if appropriate.

Building resilience has recently emerged as a key interest for government advisers, research funders and practitioners internationally (Wilson, 2011). New Zealand's interest stems from its national vulnerability to a wide range of adverse natural events. Of these, storms and other high wind events resulted in the highest insurance losses from natural hazards in New Zealand from 1968 to 2012 (with the exception of the Canterbury earthquakes) (Jones et al., 2014).

Relatively complete storm vulnerability information for buildings is available from international literature, and some consumer tools exist to inform decisions to improve building resilience (Jones et al., 2014). However, the tools and the ratings given in these international tools do not completely reflect the materials available in New Zealand or the way that New Zealand houses are built. BRANZ has carried out an HCS every 5 years since 1994, providing a snapshot of New Zealand's housing stock at different points in time. This has been done by investigating a group of houses that broadly represent the range of designs, ages and conditions of New Zealand houses, and also interviewing their occupants.

The 2010 HCS was the first nationwide survey allowing the examination of resilience on a national scale. It also included a representative selection of properties occupied by people 65+, providing an opportunity to examine the vulnerability of older people relative to the general population. A detailed description of the HCS is given elsewhere (Buckett et al., 2011).

The 65+ cohort in New Zealand, like many developed nations, is of particular interest in this research due to their increasing share of the demographic. By 2031, it is expected that between 20 and 22 percent of New Zealanders will be aged 65+, compared with 14 percent in 2012. By 2061, it is expected that between 22 and 30 percent of the population will be aged 65+ (Statistics New Zealand, 2014).

2. Methodology

In 2010, four hundred and ninety-one houses were randomly selected from New Zealand's nation-wide housing stock, as part of the BRANZ 2010 HCS (Buckett et al., 2011). They were then individually inspected and occupant interviews were completed concerning their family circumstances and maintenance practices. Both the inspections and the interviews were carried out by trained independent personnel. All the properties in the HCS were standalone houses, including terrace housing and units, and excluding apartments and flats. It was required that each property had no units above or below it, and that there was fire separation from other units if adjoined, thereby constituting an independent dwelling. A simplification of the research method can be seen in Fig. 1.

The HCS has not deliberately collected resilience-specific data in the past, but it has collected data relevant to our understanding of resilience in the New Zealand housing stock. It also allowed the research team to assess, on that available set of data, whether older participants in the survey were more likely to be living in dwellings that have less resilient design, materials and amenities. Although no special effort was made to target occupants 65+ for inclusion in the HCS, sample analysis showed that 145 (or 30%) of the dwellings assessed were occupied solely by those aged 65+. This provided an opportunity to compare this group with the rest of the general population in the sample.

As one constituent of research into dwelling resilience, a review was undertaken of the international literature on the resilience of dwellings to storms. The important learnings from that review can be summarised as follows:

- The overall condition of a component will exert a considerable influence over its performance under normal and extreme conditions. A component that has not been maintained will fail ahead of what would be expected for a new or similar item subject to an active maintenance programme. For example, if a window has glazing seals that are loose or opening elements that are poorly supported, there is a high likelihood that its performance during a storm will be poorer than if its components had been in good condition. Building age can have different implications. Older buildings may be less resilient. This may be because of poor maintenance and repair. It may also be because the performance requirements on buildings may change. New Zealand compliance documents have evolved over time to integrate areas – such as revised wind zoning and risk ratings. As a result, older buildings and older additions may not have been engineered or assessed to ensure they are optimal. This may make them more vulnerable during a storm event. However, new buildings may have less amenity resilience than older buildings. The trend towards increased reliance on reticulated electricity for water heating, space heating and cooking can reduce the protective and functional capacity of buildings in adverse natural events, where electricity supply is lost.
- Canopies, verandas, lean-tos and carports are a weak link within the building envelope during storms and other high-wind events (Unanwa et al., 2000).
- A more complex building envelope means more wall junctions and greater risk of leaks. Generally, the more complicated the building shape, the higher its resilience risk (Unanwa et al., 2000).
- Different materials react differently to temperature changes: rates of thermal expansion and contraction vary depending on the material, and there may also be differences in response to moisture exposure, moisture absorption and subsequent drying.