
Considerations for communicating changes to and details of the earthquake-prone building system

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ABSTRACT

While there are some legislative levers within the current earthquake-prone building system which will presumably continue into the new system, the work that is required of New Zealand building owners necessitates potential complex behavioural decisions. As such, research from the field of psychology can help identify particular communication challenges and solutions. Some of these challenges are inherent in the system itself, while the nature of the changes to aspects such as which buildings and regions are included also present additional difficulties from a communication perspective.

This paper will give an overview of some important considerations for practice and policy in terms of how to communicate the changes to and details of the earthquake-prone building system to both help achieve the intended benefits and avoid unintended damage. We will present lessons from the communication strategy for the 2023 update to the National Seismic Hazard Model which are relevant to the EPB system changes and give an overview of how decisions to strengthen earthquake-prone buildings can be influenced by a range of factors such as risk perception, understanding, and tolerance, spatial, temporal, and salience risk comparisons, and perceptions of benefits from strengthening.

1 INTRODUCTION

The current Earthquake-Prone Building System (EPBS) was first introduced in 2013 and then revised and formalised in the 2016 amendment to the Building Act (MBIE, 2025). The recent review is timely and proposes a range of options for changes to the EPBS in response to progress which has, or has not, been made during the first decade of the system. Several of the key challenges inherent to the previous version of the system are planned to be addressed, including behavioural barriers related to the scale of the work required and confusion around the percentage of New Building Standard (%NBS) metric. There are some existing challenges which are likely to continue. Many of these challenges have been addressed through guidance and policy documents (e.g., BRANZ, 2021) as well as from a behavioural sciences perspective

(Ball et al., 2022). Therefore, this paper will focus on additional potential challenges that may arise in the process of changing this legislation. This paper will cover some of those challenges and suggest several recommendations for future efforts to communicate both the legislative framework for requiring earthquake mitigation and any changes to it. The content below is not comprehensive, but rather indicative of the fact that while strengthening earthquake-prone buildings is foremost an engineering issue, it is also an issue of human behaviour. Relatedly, there are several key audiences for any communication relating to the EPBS, including policy makers, engineers, building owners, tenants, and the public. Several pieces of research have recently been completed or are underway focused on specific audiences (for example commercial tenants; Miranda et al., 2025; Resilient Organisations, 2024), so this review will largely speak generally.

The current version of the EPBS has led to some success, with an encouraging number of buildings demolished or retrofitted to improve their earthquake resilience (MBIE, 2025). However, there is a significant proportion of buildings covered by the system which have not been addressed, including some high-profile examples which reached the end of their time frame (before the time frame was extended; for example, the Toomath building in Wellington; Hickman, 2023). There have also been several instances of buildings being hastily, and under the system unnecessarily, vacated due to misunderstandings of the system and in particular %NBS (Brown et al., 2021).

For the rest of this paper, we use the term “earthquake-prone building” to refer to buildings which require addressing under the legislation, and the EPBS to refer to the underpinning legislative system. We acknowledge that these terms may change; some potential benefits of change, especially relating to the term “earthquake-prone” are discussed later. Regardless of the terms used in the future, it is important that they continue to be defined clearly and any possible misinterpretations are considered and addressed.

2 EXISTING CHALLENGES

2.1 Risk tolerance

Whether to tolerate a risk is an active decision made by an individual on a case-by-case basis, although often with little to no awareness of the cognitive process and influenced by a large range of factors including risk appetite (Vinnell, 2024). Decisions of whether, when, and how to address an earthquake-prone building (i.e., those under 34%NBS) can therefore vary widely between different audiences as well as between members of the same audience. Of particular relevance for this context, the decision by an individual to tolerate a risk (such as that posed by earthquake-prone buildings) is affected by how they would be impacted; therefore, there are likely to be meaningful differences in attitudes towards remediation between a building owner, who may face economic, legal, or reputational costs if their building were to be damaged, and a building occupier, who may face damage to belongings, injury, or death. Recent research has shown that communication of seismic risk information to commercial building tenants can be improved (Miranda et al., 2025), and that the EPBS has had impacts on commercial prices (Filippova et al., 2017).

2.2 Risk comparisons

When designing, constructing, remediating, or choosing to occupy a building, earthquakes are not the only risk which needs to be considered. Some groups who receive information about earthquake-prone buildings may downplay the risk of earthquakes because they prioritise other, more frequent and salient, risks including those that are building-specific such as fire (Tversky & Kahneman, 1974) as well as those which are not relevant to buildings but require investment such as traffic accidents (Vinnell et al., 2017; for a review, see Das et al., 2025).

2.3 Risk understanding

Productive conversations around the EPBS require an awareness of different understandings of risk, as the meaning of this and related terms can vary between audiences (Boholm et al., 2015). In particular, communication to non-experts regarding earthquake-prone buildings needs to be informed by an awareness of different understandings of risk (Vinnell, 2024). One challenge of communicating the EPBS is the issue of compounding probabilities. Understanding of probability is generally low and can vary widely depending on how it is framed (e.g., numbers versus words; Vinnell et al., 2017). In the case of earthquake-prone buildings, decisions are made on the basis of the probability of building damage sufficient to cause loss of life, *in the event of* an already-low probability event (i.e., a moderate earthquake). This calculation likely factors into decisions around, for example, different requirements in different regions of NZ. However, it is also possible that rather than recognising the compounding probabilities (i.e., a low likelihood of building damage in a low-likelihood earthquake means that fatalities are a very low likelihood), non-experts focus on one of the two to make their risk decisions (Park, 2025). That is, people may focus on the likelihood of building damage in an earthquake without considering that that earthquake has a low probability of occurring. This can lead to a considerable overestimation of the risk, and as seen with public reaction to decisions to not close earthquake-prone school buildings, when the consequence of a collapse is extreme enough then the probability can be discounted entirely and the risk deemed unacceptable (Slovic & Peters, 2006). Inversely, non-experts tend to treat a very low probability equivalent to a zero probability (Corotis, 2006), so efforts to better communicate the likelihood of building damage should reinforce that the risk is still real.

2.4 Perceived benefits

There are several challenges to communicating the perceived benefits of strengthening earthquake-prone buildings. One is the infrequency of earthquakes posing a life safety issue through which to demonstrate the real-world benefit. Another is the challenge of invisible success, whereby the benefit of strengthening or demolition is demonstrated through reduced damage or injury. The public in particular expect a higher performance from their buildings than required by the code, although understanding of the code itself is low (Miranda et al., 2022; Vinnell et al., 2019) and are sensitive to evidence that large-scale investment is not providing tangible or short-term benefits. For example, while we would expect support for earthquake resilience to increase after a large event, research showed a decrease in support for the EPBS after the 2016 Kaikōura earthquake (Vinnell et al., 2019). Some participants noted that they did not see the value in bringing older buildings closer to new building standards, when most high-profile cases of damage in this earthquake were to very recent builds. This point supports the option proposed in the review and potential change to the %NBS metric in particular.

3 NEW CHALLENGES

3.1 Changing hazard context

Related to the above point on risk comparisons, most potential audiences of information relating to the EPBS are likely to consider earthquakes in the wider natural hazard context. The system was first introduced in 2013, while the Canterbury Earthquake Sequence was ongoing and there was a series of significant earthquakes around the Cook Strait. The legislation was formalised half a year after the Kaikōura earthquake. However, New Zealand has (fortunately) enjoyed a period of relative seismic quiescence. Instead, severe weather events have been highly salient. People tend to prioritise risks which they have experienced more recently (Solberg et al., 2010) and so support for (from the public) or interest in (from building owners) strengthening earthquake-prone buildings has likely reduced. For example, recent research has shown that non-experts are less concerned about earthquakes if they have been impacted by flooding (Vinnell et al.,

2025). Approaches which could be considered in response to this challenge include taking a multi- or all-hazards perspective, requiring buildings to be resilient to all impacts to which they are exposed. Such an approach could leverage public appetite for investment in resilience to severe weather, for example.

3.2 Location context

Parts of New Zealand experience fewer and weaker earthquakes than other parts of the country, which can (although not always) lead to the belief that earthquakes are not a risk in lower seismic hazard areas (Vinnell et al., 2025). Care needs to be taken to ensure that removing any regions from the EPBS does not reinforce any beliefs that earthquakes are a negligible risk in some parts of the country. It may be useful to consider public opinion in decisions to reduce or remove requirements for earthquake strengthening in certain regions. As discussed above, while calculations of risk which appropriately consider compounding probabilities may support less focus on Auckland, a 2023 survey of Aucklanders found that earthquakes ranked highest of all natural hazards for perceived likelihood and severity of impacts (Vinnell et al., 2025).

One additional challenge here relates to use of a “moderate earthquake” within the legislative framework. It may be valuable to consider whether this term within the legislation could be revisited to align better with other information about earthquake size provided to non-experts. For example, GeoNet lists 31 moderate or larger earthquakes in the year-to-date 4th of February, yet as far as we are aware none of these events led to significant building damage despite at least some being located near population centres.

4 FUTURE CHALLENGES

4.1 Dichotomisation and confirmation

People have some capacity to deal with uncertainty, especially when it is communicated thoughtfully (Doyle et al., 2024). However, there is a tendency to prefer dichotomies over continua, although this can be managed depending how key terms such as “risk” and “safe” are defined and used (Boholm et al., 2015). While the proposed revised system does provide more nuance than “safe” and “unsafe”, it is possible that some audiences will take such perspectives. This black-or-white thinking is often a response to uncertainty, ambiguity, and anxiety (Bonfá-Araujo et al., 2021; Grenier et al., 2005). An existing challenge with the system is that it may lead to the notion that buildings which are not “earthquake prone” are “earthquake proof”. This challenge may be exacerbated with changes to the system that lead to buildings which were previously classed as earthquake prone no longer legally requiring remediation under the revised system (Miranda et al., 2025), as non-experts often see risk as either present or not (Weber, 2017). This may especially be the case among those who were/are less supportive of investment in earthquake mitigation who may exhibit a confirmation bias (that is, attending only to information which supports their opinion), relating to both information provided officially as well as within social debate on the topic (Del Vicario et al., 2017).

Effort will be needed to avoid dichotomisation and the perception that these residual risk buildings are “safe” (i.e., “earthquake proof”). As noted above, any changes to terminology may provide an opportunity to address this dichotomy. Doing so will require a careful consideration of whether the meanings of key terms are shared or not between different groups (Boholm et al., 2015).

4.2 Potential strengths

As mentioned above, the %NBS metric has led to some occupation-related decisions which were not necessarily supported by engineering evidence as well as scepticism about the benefits of retrofitting. This metric is currently being reviewed (e.g., Das et al., 2025), so will not be discussed in detail here.

One key strength of the proposed changes to the system is the focus on the highest risk. This aligns with foundational principles of behaviour change, including:

- prioritising actions with the most benefit,
- breaking down a large task into smaller actions, and
- removing or limiting barriers to action (Mckenzie-Mohr, 2011).

Targeting the highest risk buildings and components means a stronger, clearer case for return on investment.

4.3 Uncertainty and Trust

There is already a degree of uncertainty around the current system as well as when and how to make the best decisions for earthquake-prone buildings. This uncertainty is only likely to increase with any changes. Research has explored the best ways to communicate uncertainties in the natural hazard space, including co-development with stakeholders and decision makers (Doyle et al., 2019) and cross-disciplinary approaches (Doyle et al., 2024).

The New Zealand public is relatively trusting of government as well as science and research and accepting that knowledge and perspectives change over time (Cologna et al., 2025). However, in some situations care may need to be taken to explain why changes are being made to the system. For example, an owner of a building which was deemed earthquake prone (or equivalent) under the old but not new system may question the credibility of the expertise behind the original assessment if they do not fully understand what has changed. Particularly from a public perspective, communicating how and *why* the changes are happening will help to protect trust in the engineering and construction communities. To help explain this point, we briefly refer to the example of the 2022 update to the National Seismic Hazard Model (NSHM).

5 NATIONAL SEISMIC HAZARD MODEL

The NSHM was updated in 2022, for the first time since 2010. While some areas of New Zealand saw no change in their modelled hazard, other areas more than doubled. The team behind this update were aware that this may cause concern, particularly among the general public. To address this, they planned a comprehensive communication strategy which included explaining clearly why these changes had happened and what they meant. This included key messages such as the difference between hazard and impact and guidance on how to understand probability (GNS, n.d). The team created “Frequently Asked Questions” documents, Factsheets, definition documents, and key point documents. These resources focused on the main anticipated concerns including why the revisions occurred, how trustworthy the new model is, and what the model means. While there were still some misunderstandings, including a common conflation of “hazard” and “risk” in the media, this front-footing largely meant that the update was received with curiosity rather than fear.

It is unlikely that changes to the EPBS pose as high a likelihood of causing fear, and as noted above may lead to less interest given the current focus on weather events. However, it may be advisable to apply some of the lessons from the NSHM update to any communication around changes to the EPBS.

6 RECOMMENDATIONS

The challenge of increasing the resilience of our buildings to earthquakes is foremost one of engineering. However, as we have seen over the decade of the previous system, success requires owners to act. Therefore, knowledge from the social sciences will have a key role to play in ensuring that success. Recommendations include:

- Where possible, convey probability in multiple formats (Das et al., 2025)

- Draw lessons from other dynamic earthquake contexts such as aftershock sequences (Becker et al., 2019; Wein et al., 2015)
- Ensure clear communication around what it means for any buildings to no longer require remediation, to avoid implying that these buildings are completely safe and have a consistent narrative across parties involved (e.g., government and engineers; Weber, 2017)
- Consider the broader hazard context, including other building-related hazards such as fire, differing priorities based on salient natural hazards, and differing perceptions in lower seismic hazard zones
- Provide clear, upfront information not just about what has changed but *why* to reduce uncertainty and limit impacts on trust and to make clear that residual risk remains.

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