Overlaying Social and Engineering Aspects of Earthquake Preparedness

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JOINT CENTRE FOR DISASTER RESEARCH

Te Hiranga Rū | QuakeCoRE
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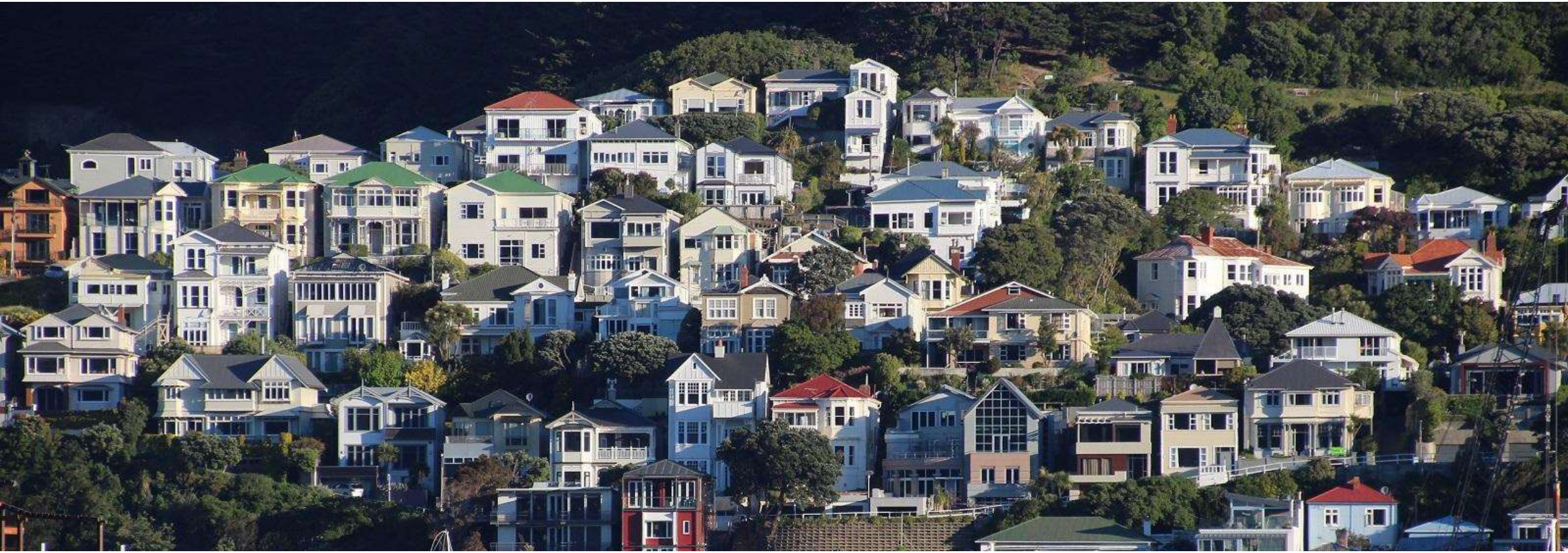
Toka Tū Ake EQC

Wellington



https://www.viator.com/Wellington/d399

Wellington Scenario – Public expectations of damage – Builders

What are the homeowners' expectations of damage to wooden-framed houses?

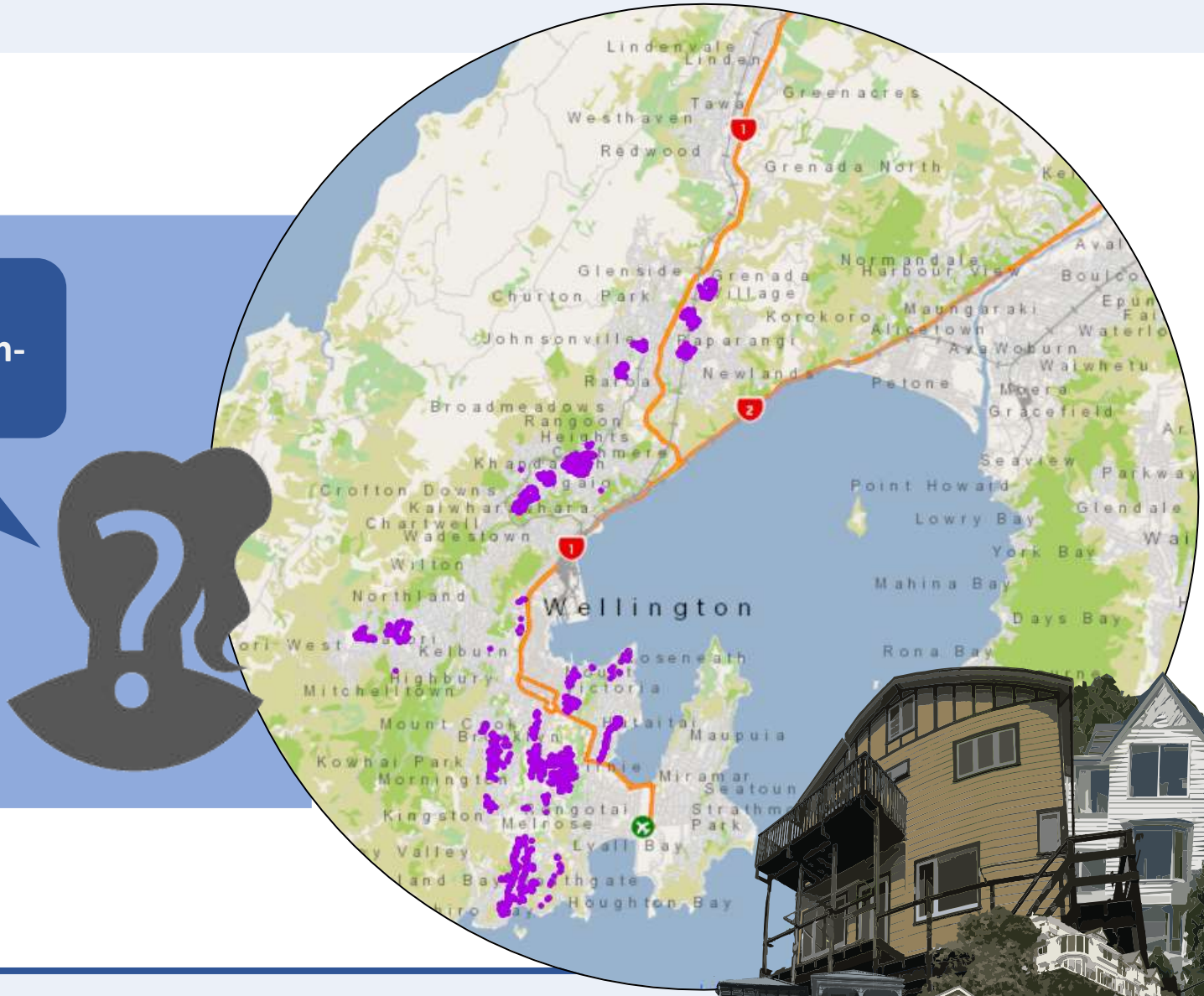
Phase 1
Social Aspects

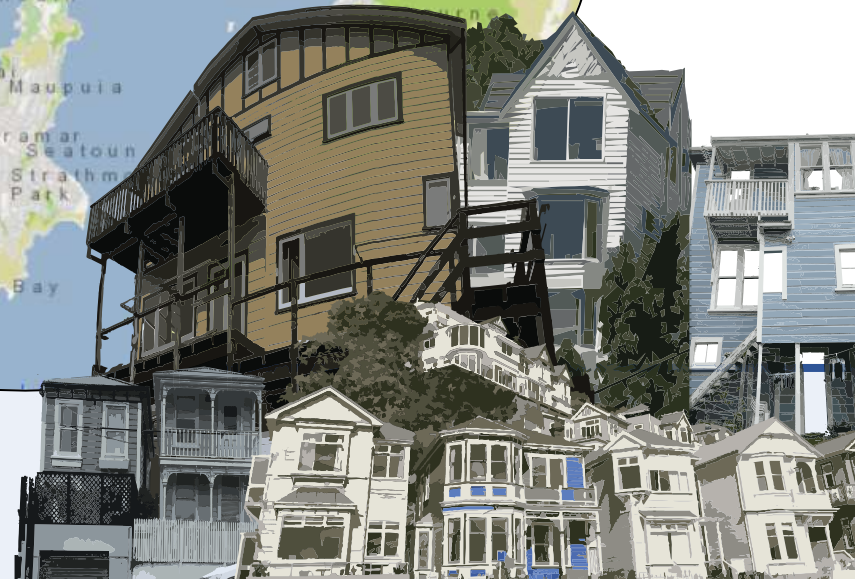
What is the predicted seismic performance of wooden-framed houses?

Phase 2
Engineering Aspects

What are the homeowners' expectations of damage to wooden-framed houses?

Phase 1
Social Aspects





Awareness of structurally strengthening

Awareness of strengthening

Aware Participants

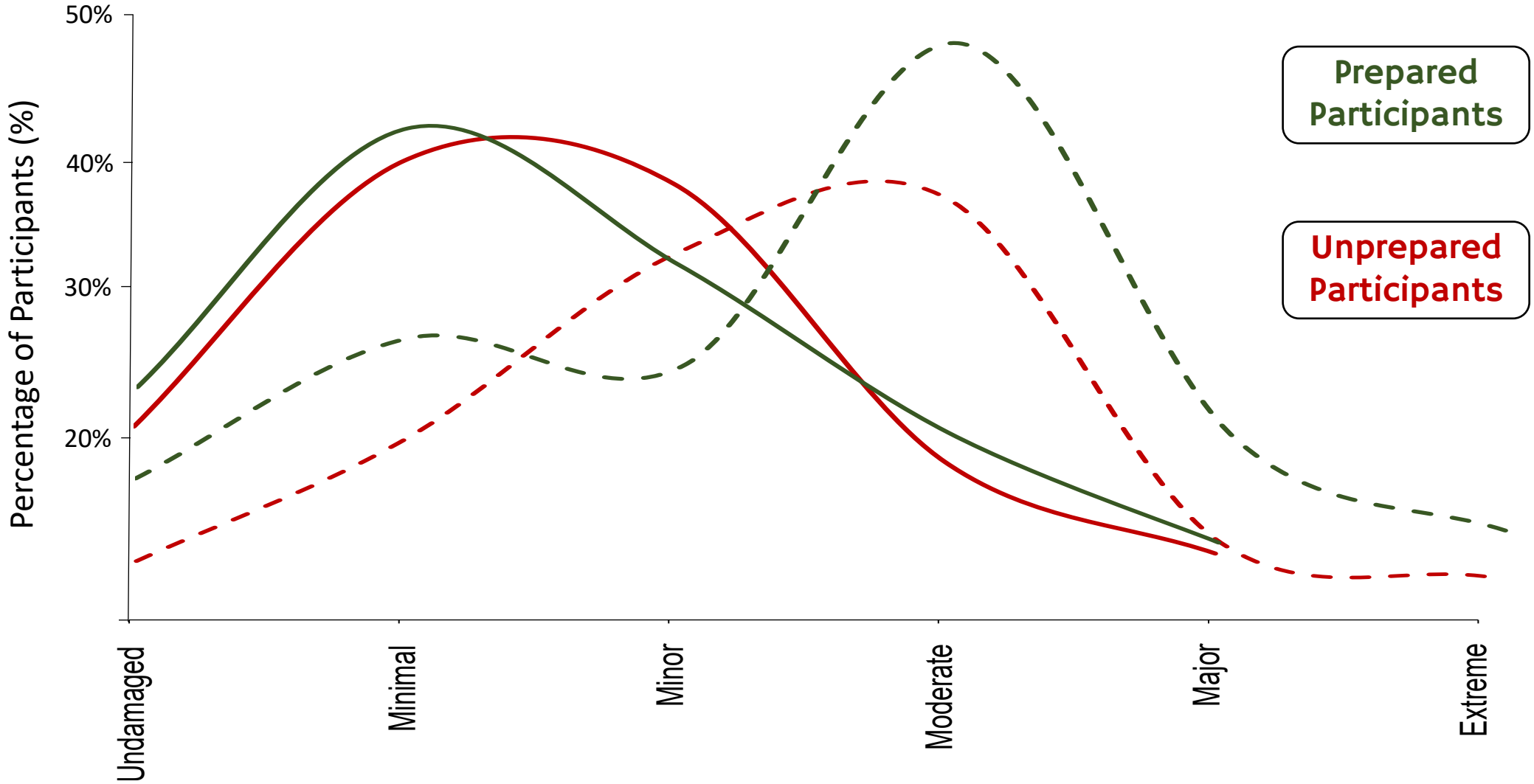
Not Aware Participants

Have you applied any to your house?

Prepared Participants

Unprepared Participants

People's expectation of damage – 500-year EQ



Wellington Scenario – Public expectations of damage – Builders

Engineering predictions

What are the societal expectations of damage to wooden-framed houses?

Phase 1

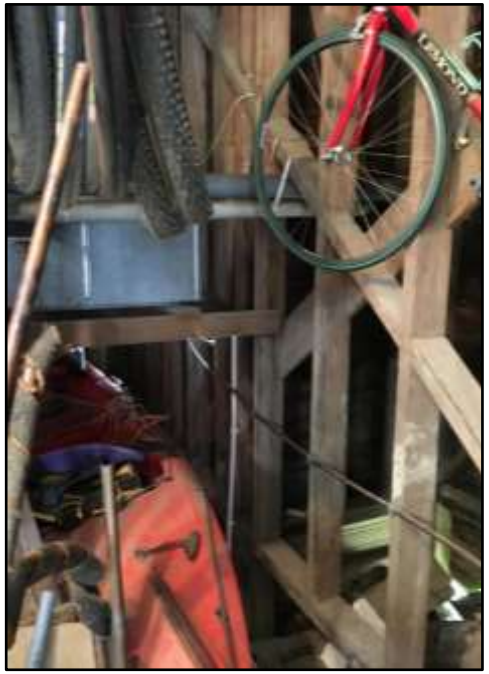
What is the predicted seismic performance of wooden-framed houses?

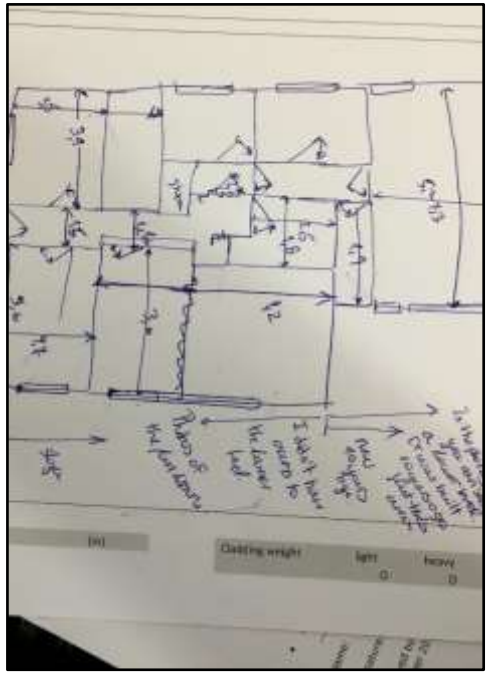
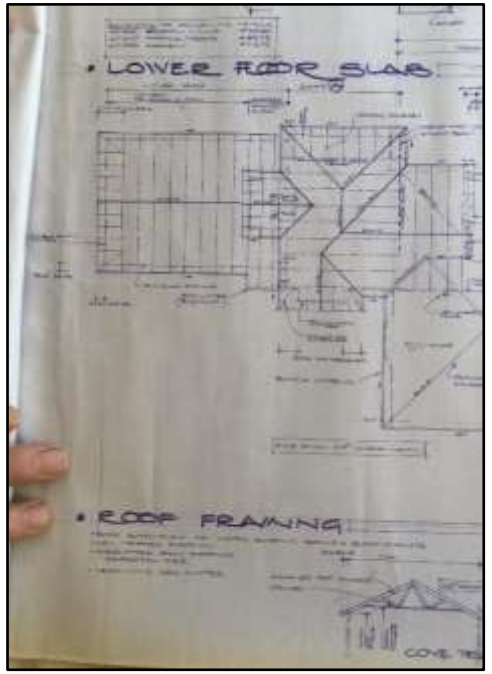
Phase 2

Wellington Scenario – Public expectations of damage – Builders

Surveying Houses



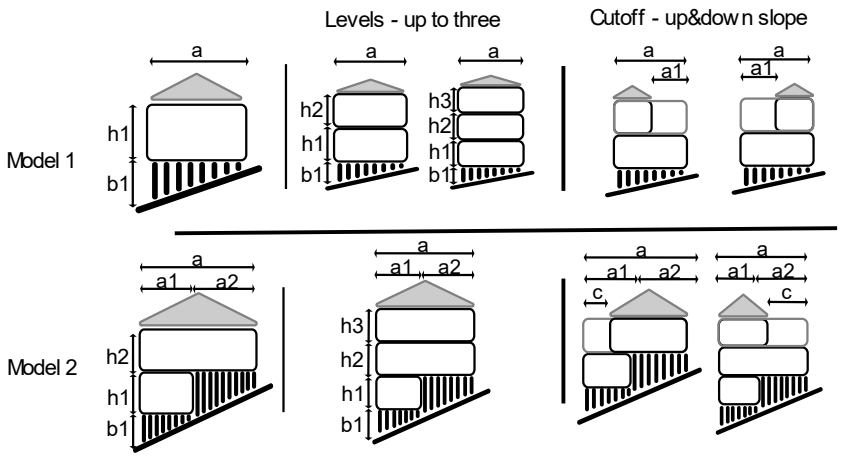




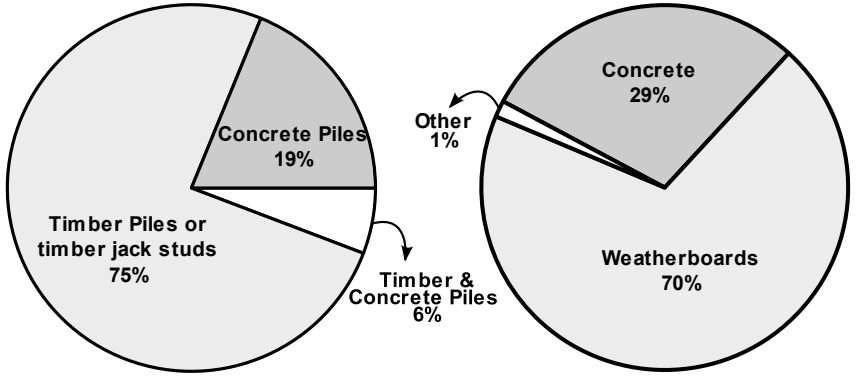
Wellington Scenario – Public expectations of damage – Builders

Surveying Houses

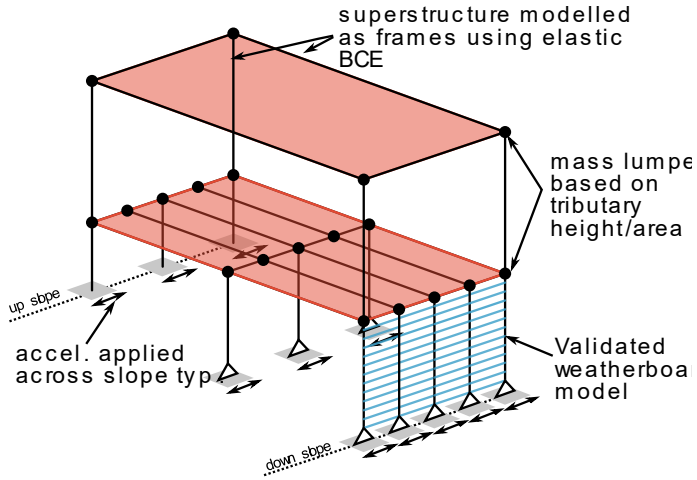
Wellington Scenario – Public expectations of damage – Builders

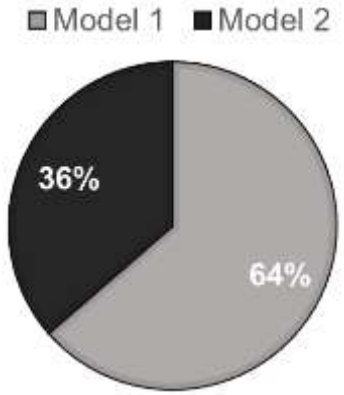
Typology



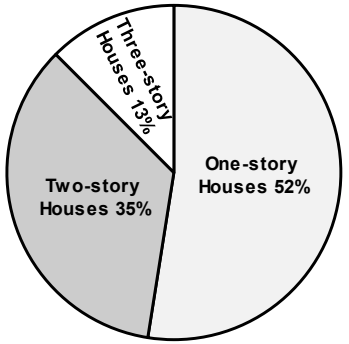


Sub-floor's types **Sub-floor's main wall**





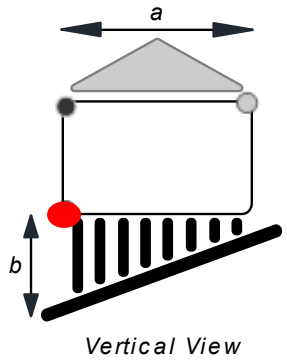
Percentage of houses

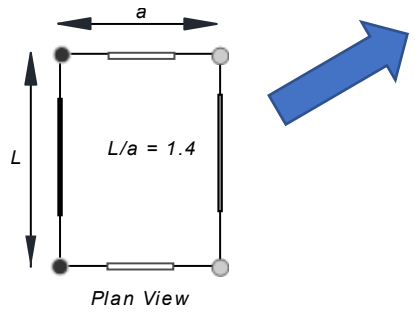


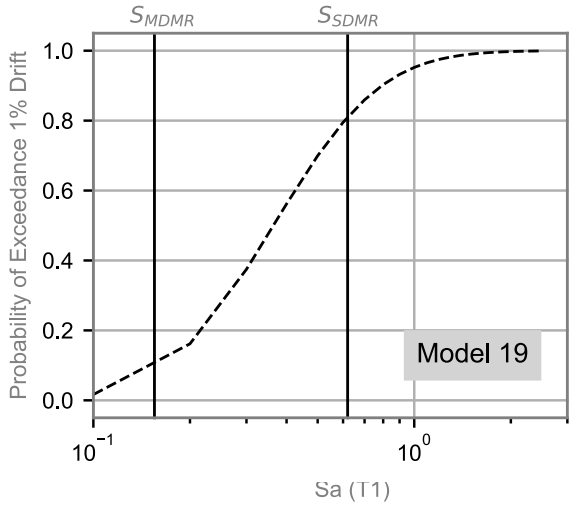
Number of Stories

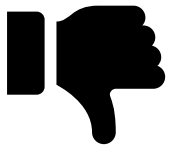
Wellington Scenario – Public expectations of damage – Builders

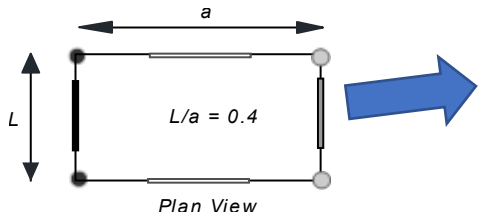
Analysis – 1% drift

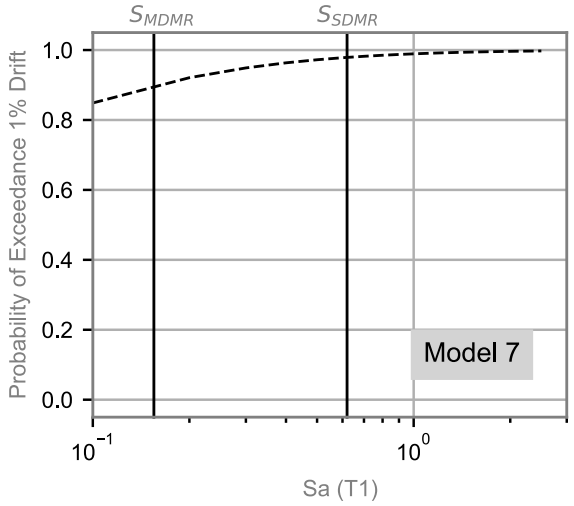






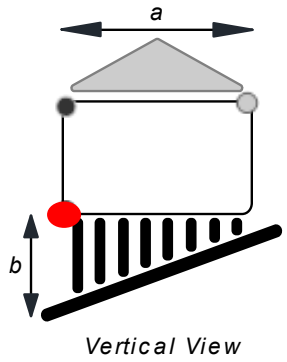


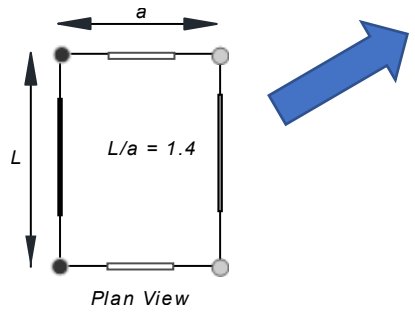


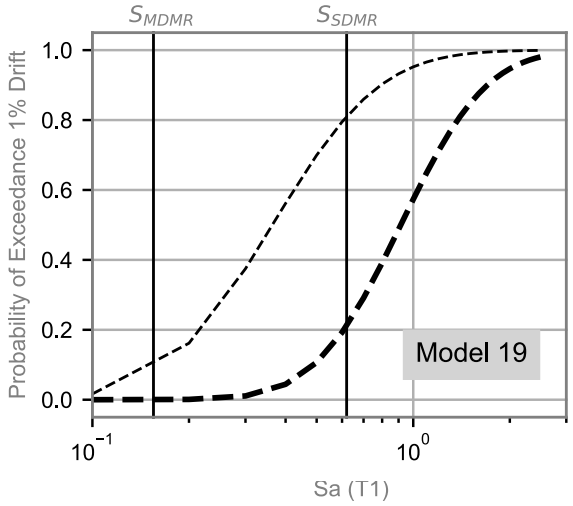


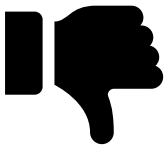
Wellington Scenario – Public expectations of damage – Builders

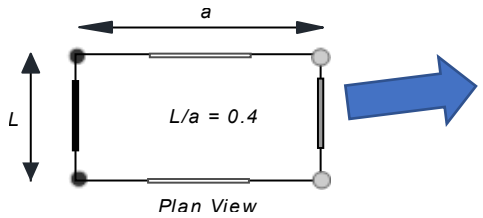
Analysis – 1% drift

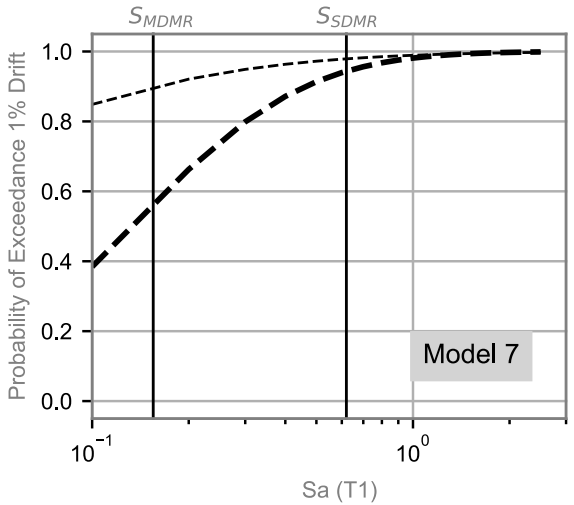






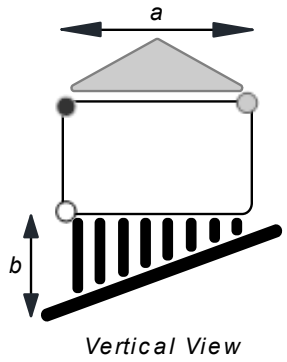


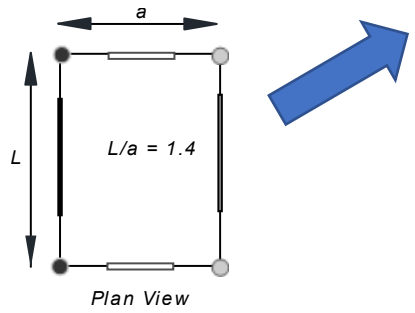


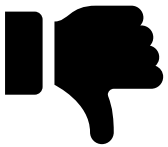


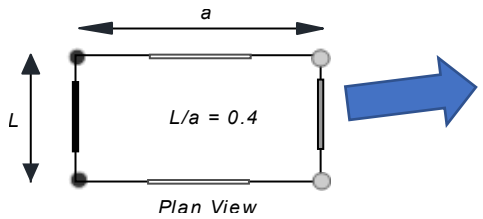
Wellington Scenario – Public expectations of damage – Builders

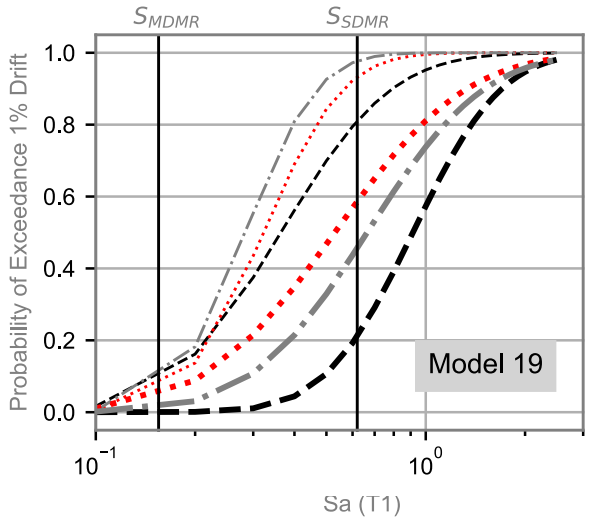
Analysis – 1% drift

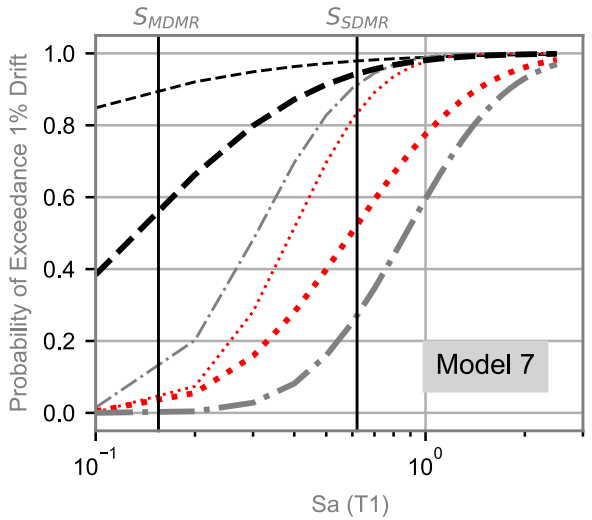


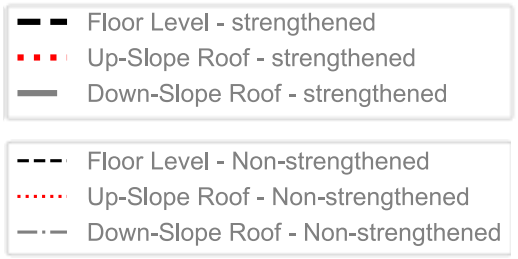








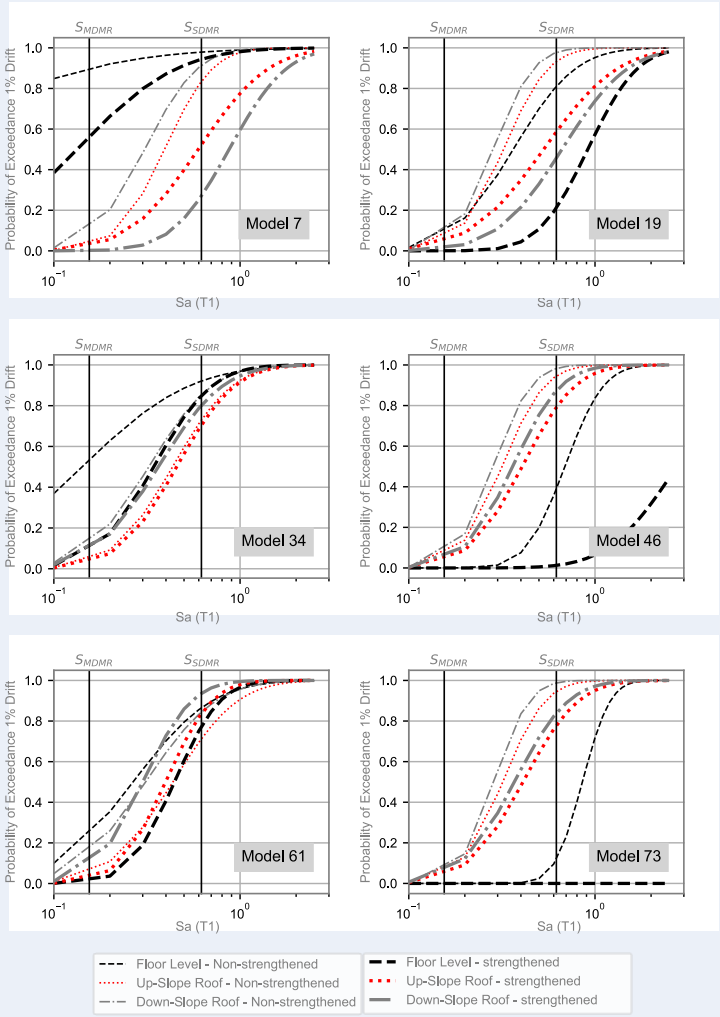




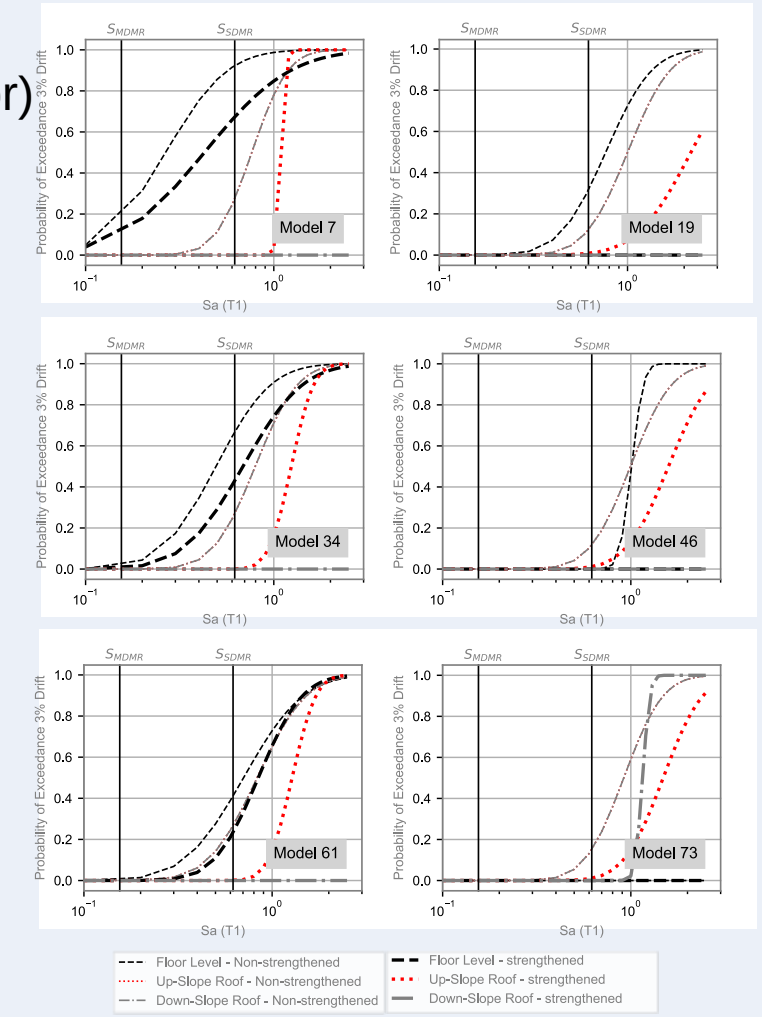
Wellington Scenario – Public expectations of damage – Builders

Analysis – 1% and 3% drift

1% (minor)



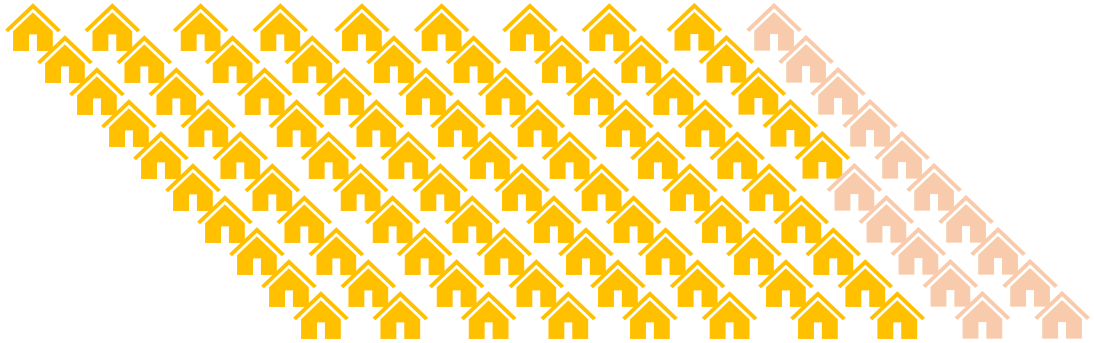
3% (major)



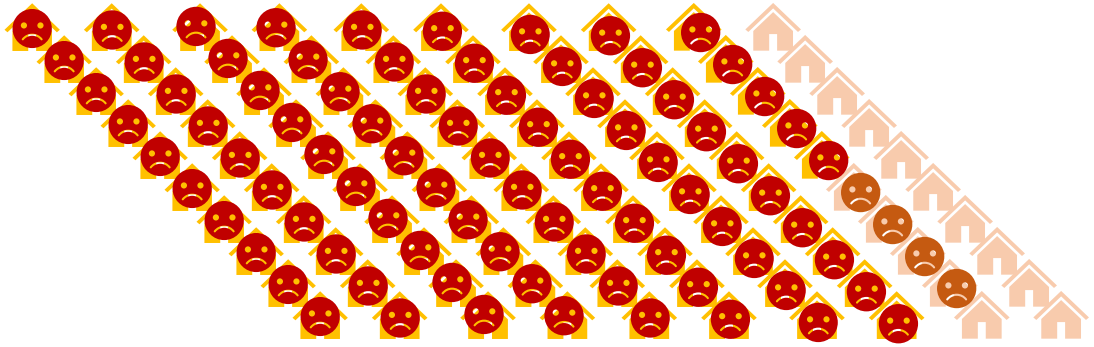
Wellington Scenario – Public expectations of damage – Builders

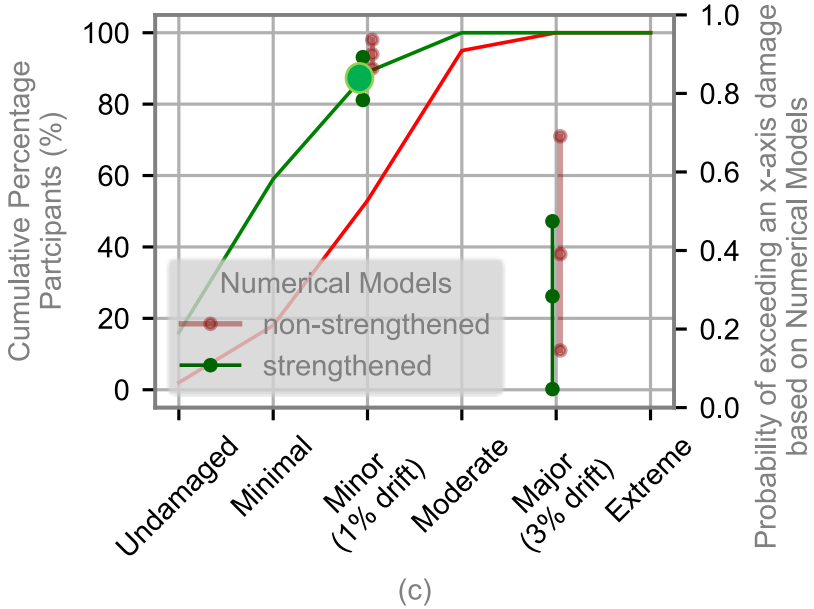
Overlaying social and Engineering results

86 out of 100 strengthened houses might <u>exceed</u> minor damage



89 out of 100 prepared homeowners expect <u>minor or less damage</u>

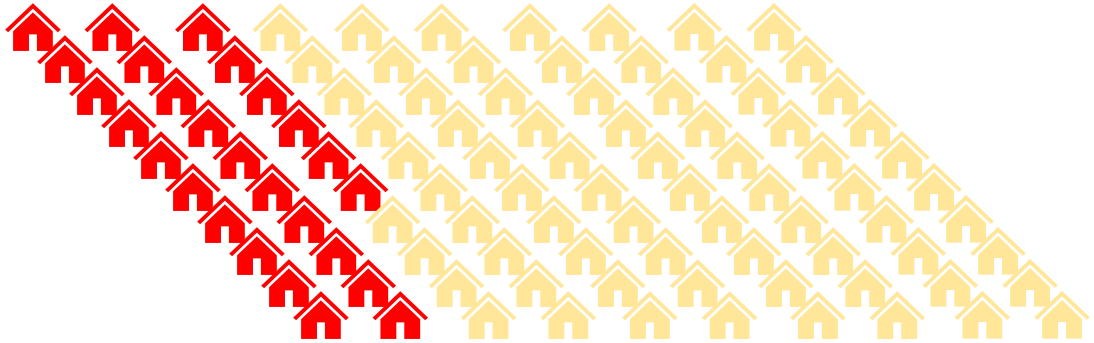




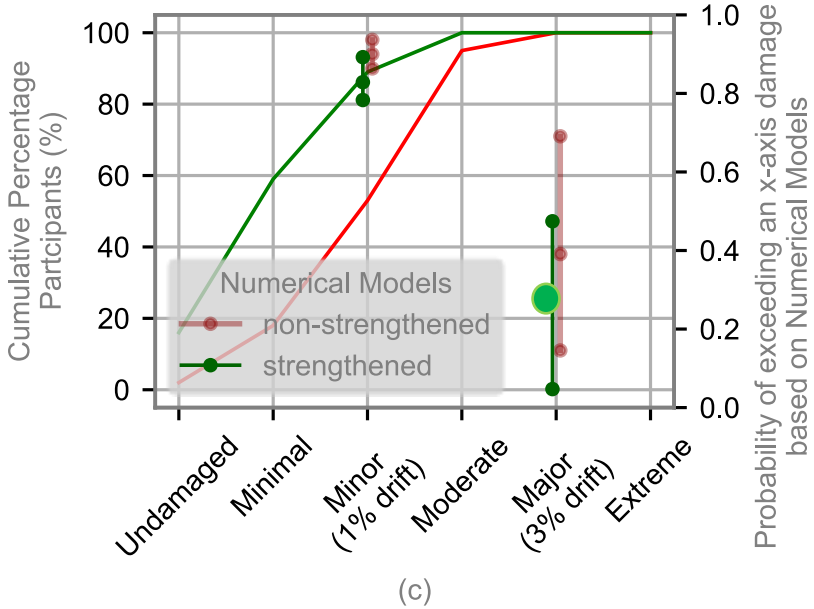
(c)

Overlaying social and Engineering results

26 out of 100 strengthened houses might exceed major damage



none of the prepared participants out of 100 expects to exceed major damage



Wellington Scenario – Public expectations of damage – Builders

Public expectations of damage


ABELING, S. MIRANDA, C. BECKER, J. Public expectations of damage and disruption to existing multi-storey buildings in earthquakes. NZSEE conference 2023 Auckland New Zealand.


PORTER, K. 2021. Should we build better? The case for resilient earthquake design in the United States. *Earthquake Spectra,* 37**,** 523-544.


TANNER, A., CHANG, S. & ELWOOD, K. 2020. Incorporating societal expectations into seismic performance objectives in building codes. *Earthquake Spectra*.


NZSEE Resilient building project (2021-2023)

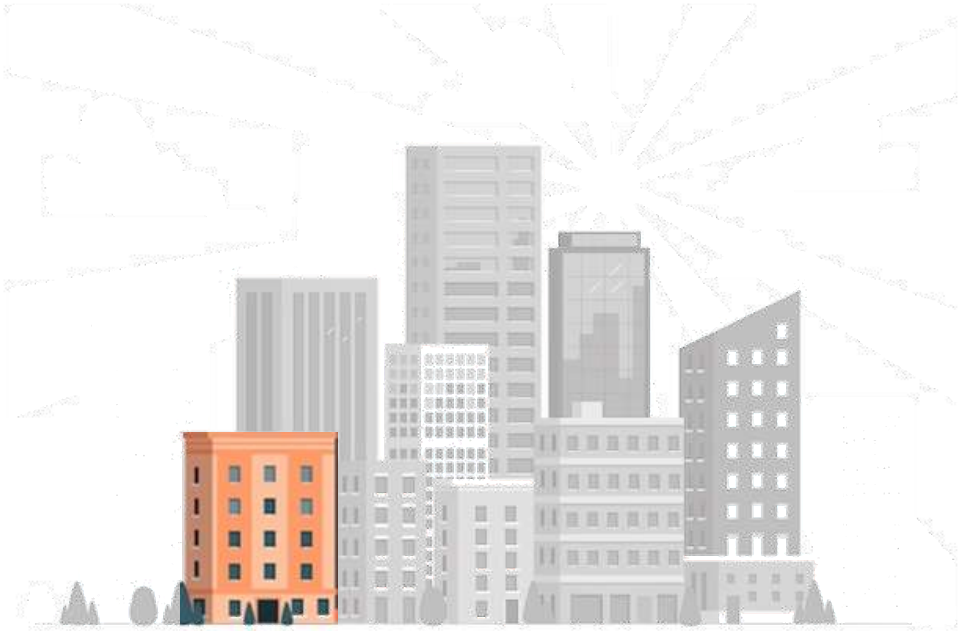

MIRANDA, C., BECKER, J. S., TOMA, C. L. & VINNELL, L. J. 2022. Homeowners' Perceptions of Seismic Building Performance and Implications for Preparedness in New Zealand. NATURAL HAZARDS REVIEW © ASCE, 24.


MIRANDA, C., BECKER, J. S., VINNELL, L. J., TOMA, C. L. & JOHNSTON, D. M. 2021. Seismic experience and structural preparedness of residential houses in Aotearoa New Zealand. International Journal of Disaster Risk Reduction, 66.

Public expectations of damage

ABELING, S. MIRANDA, C. BECKER, J. **Public expectations of damage and disruption to existing multi-storey buildings in earthquakes**. NZSEE conference 2023 Auckland New Zealand.

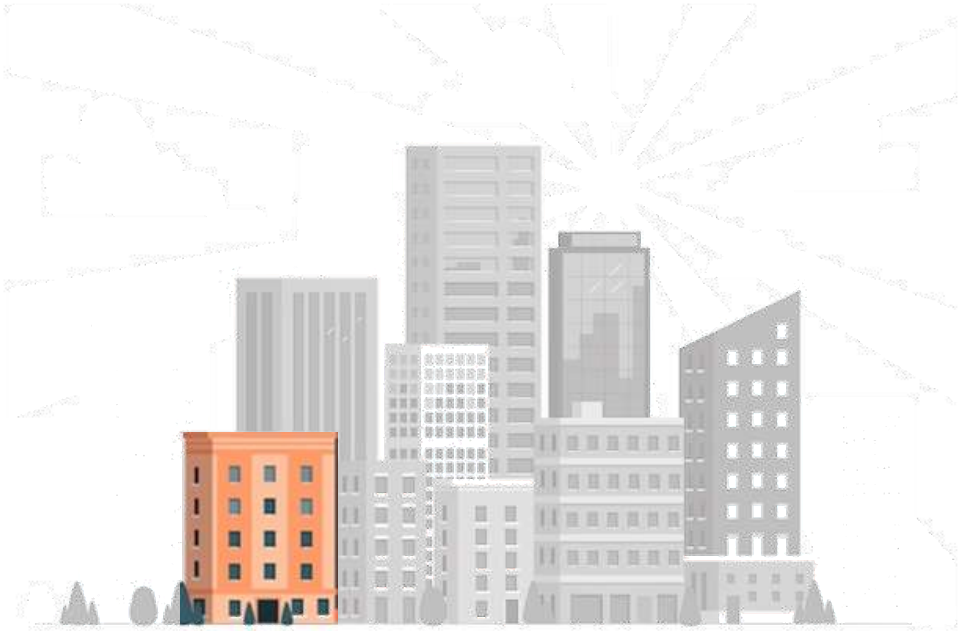
- Expected their building would perform in weak, moderate, or severe earthquakes
- Considering 4 aspects of the built environment (Internal services, external utilities, essential infrastructure and other buildings)
- Actual performance in previous earthquakes



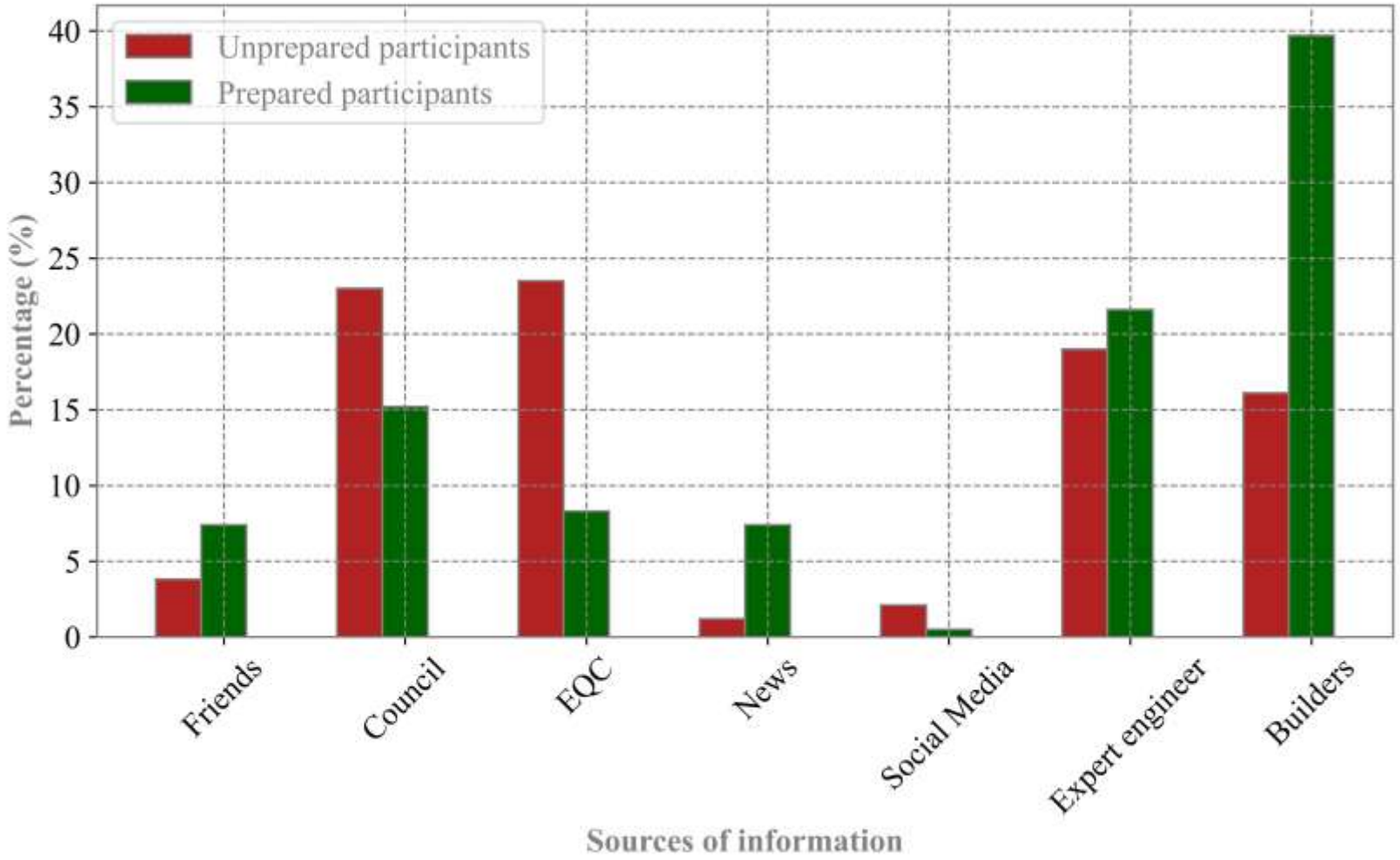
Public expectations of damage

ABELING, S. MIRANDA, C. BECKER, J. **Public expectations of damage and disruption to existing multi-storey buildings in earthquakes.** NZSEE conference 2023 Auckland New Zealand.

- On average, participants had high expectations for functional performance.
- Participants seem to understand that different levels of shaking would cause different damage.
- Depending on the level of shaking, participants expect different levels of functionality of different aspects of the built environment.
  - Almost **no** participants expected aspects of the built environment or other buildings to fully recover after years.



Builders and Seismic Risk Communication



Wellington Scenario – Public expectations of damage – **Builders**

Thank you!

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