QuakeCoRE 2023 Review

Julia Becker

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QuakeCoRE
NZ Centre for Earthquake Resilience
Te Hiranga Rū

Transforming the earthquake resilience of communities and societies through innovative world-class research, education of the next generation and deep national and international collaborations.
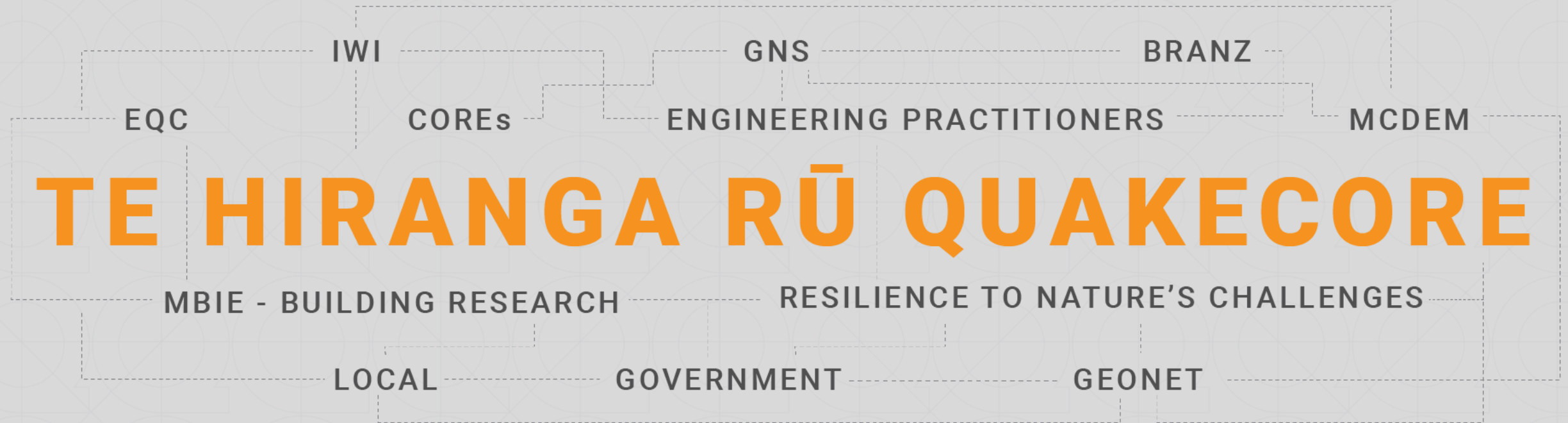
Centres of Research Excellence (CoRE)

*"To encourage the development of **excellent tertiary education-based research** that is **collaborative**, **strategically focused** and creates significant **knowledge transfer** activities."*
– Tertiary Education Commission

Excellence in Aotearoa NZ Earthquake Resilience

Providing a focal point for research excellence in Aotearoa NZ earthquake resilience and connections with an ecosystem of stakeholders

IWI   GNS   BRANZ

EQC   COREs   ENGINEERING PRACTITIONERS   MCDEM

TE HIRANGA RŪ QUAKECORE

MBIE - BUILDING RESEARCH   RESILIENCE TO NATURE'S CHALLENGES

LOCAL   GOVERNMENT   GEONET

Community

20 **Programme Area Leaders**

80 **Associate Investigators**

30 Industry Affiliates

12 Partners

18 Affiliate Organisations

Research Programme

How will the Wellington basin amplify ground motions for strong earthquakes?

de la Torre et al.

Observations
(6 sites)

Observations + Analyses
(1 site)
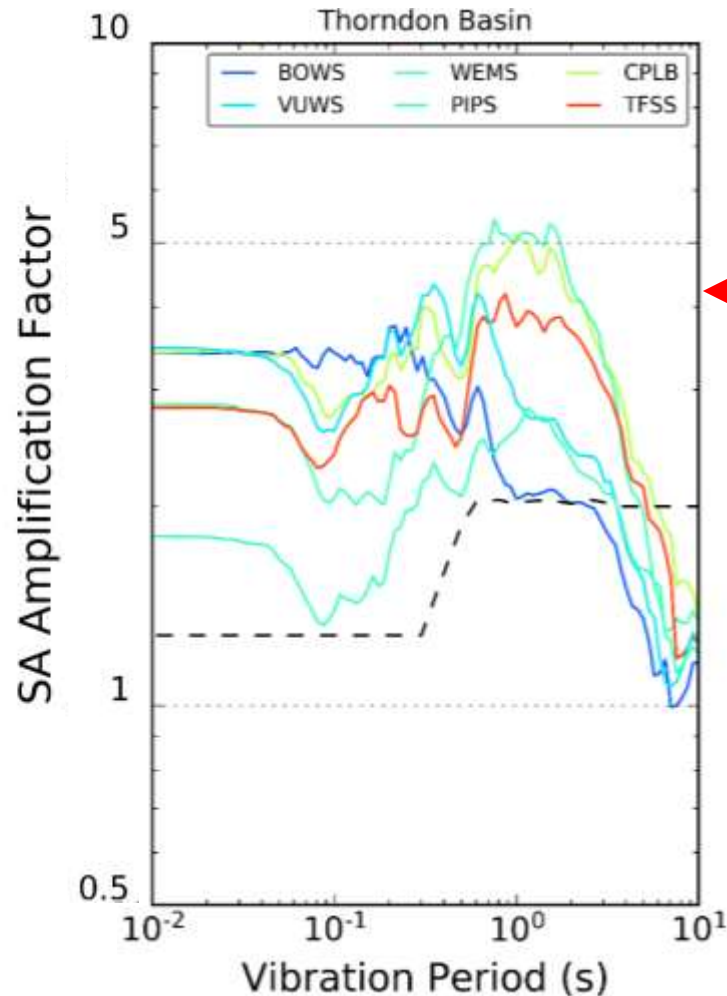
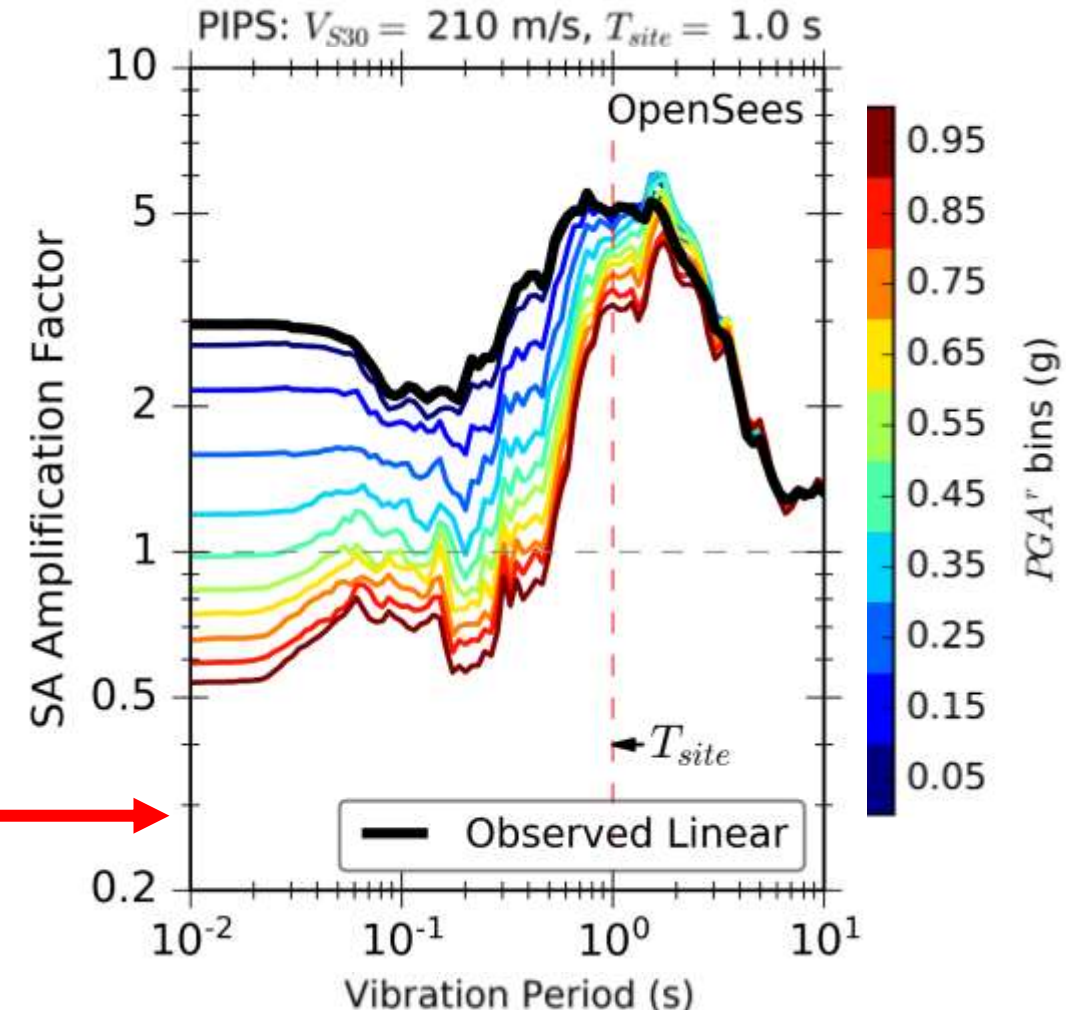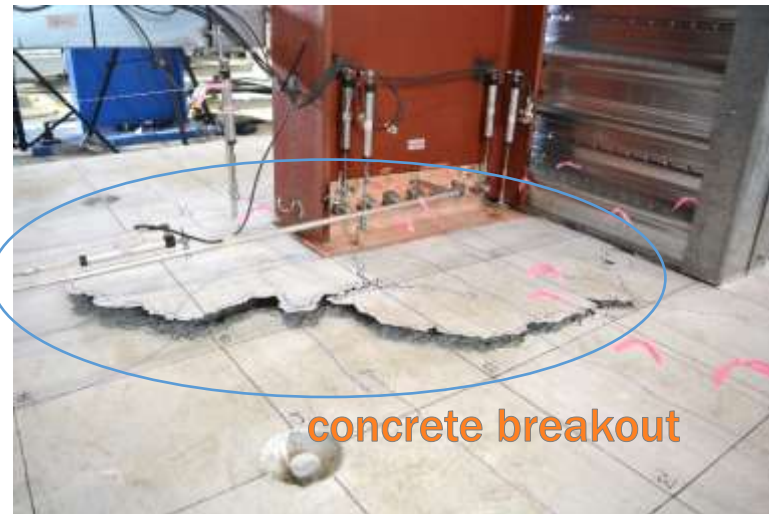- Strong basin amplification recorded in Wellington (e.g., Thorndon Basin).

- Only for weak to moderate ground motions.

- Combine with analyses to predict effects of soil nonlinearity under strong shaking.

Seismic performance of concrete wall-steel frame buildings

concrete breakout

Tests of beam-to-wall connections:

➢ Assess rotational capacity and failure mode

➢ Four tests with different connection detailing

Although the connection was designed for ductile failure, it failed in a brittle manner by CONCRETE BREAKOUT.

Next steps:
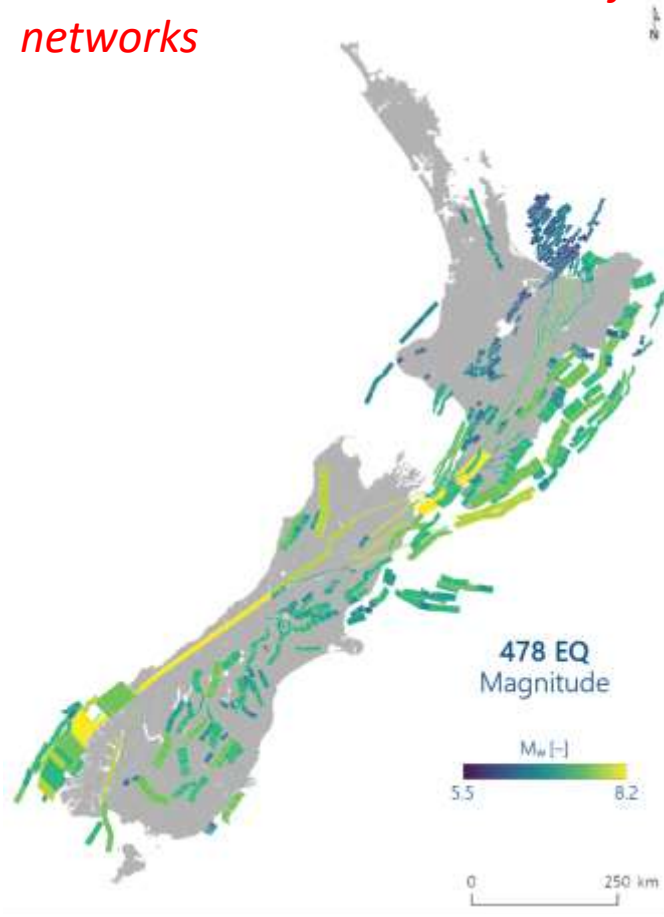
❑ Data analysis (ongoing)

❑ Numerical modelling (ongoing)
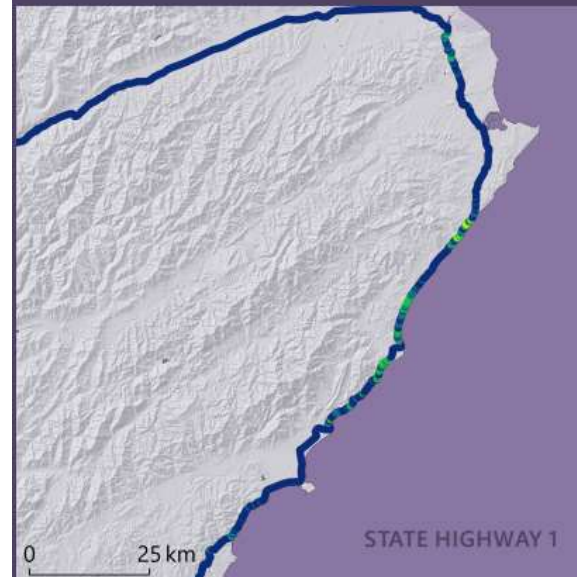
❑ Developing design procedure

Geospatial Hazard Exposure

Lin et al. Poster #96
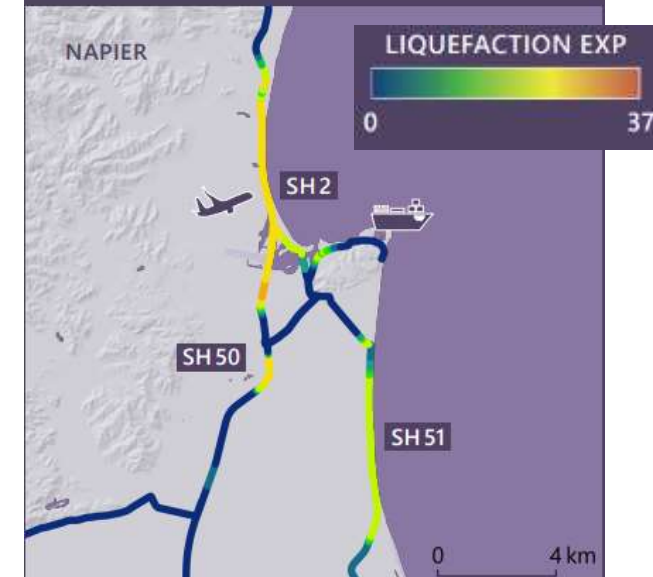
Development of approaches to link geospatial co-seismic hazard models to infrastructure networks

Combine exposure across all scenarios

Result: *Highlight exposed routes for scenarios and cumulative exposure across multiple scenarios*

Post-Disaster Dispute Resolution: A New Zealand Case Study

Collins and Hopkins

Project

- A base line assessment of the lessons to be learned from dispute resolution in the wake of the Canterbury Earthquake Sequence (CES)
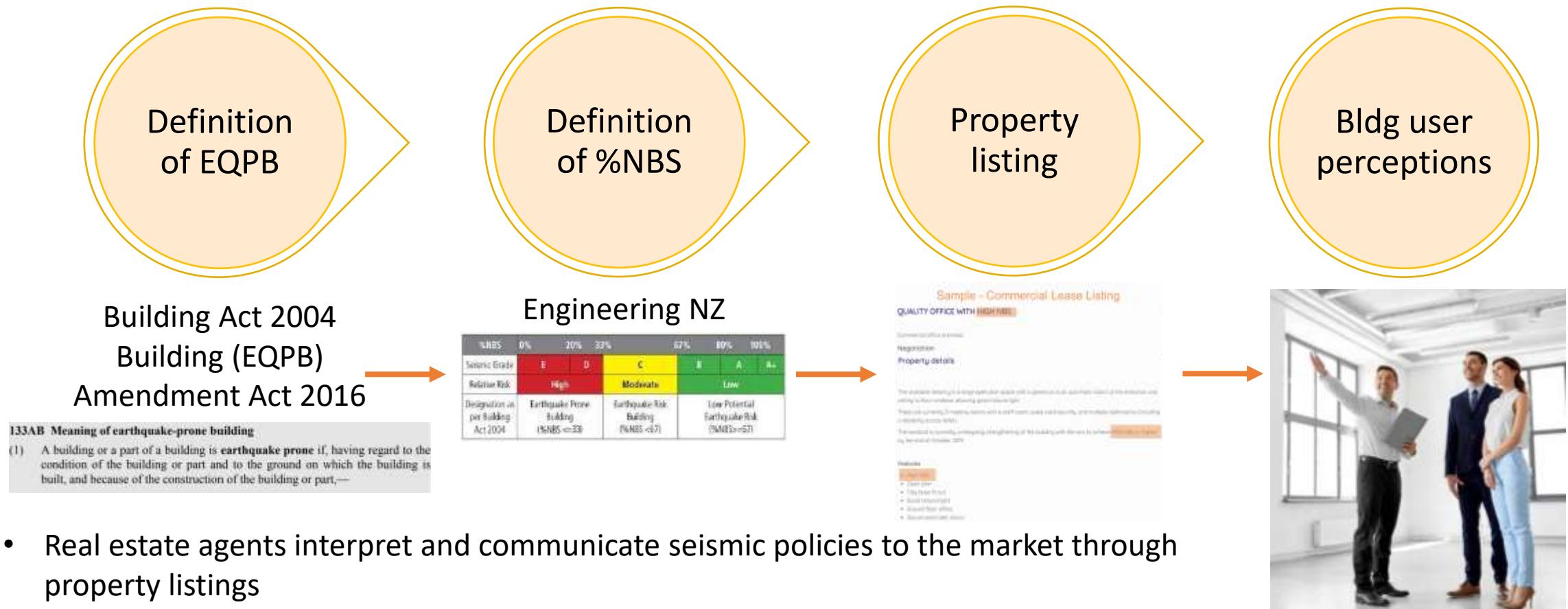
Findings

- In line with existing disaster law theory, the CES exposed existing fault lines within the dispute resolution system of Aotearoa New Zealand, including complexity, cost, delay and formality

- This provided significant advantages to "repeat players"

- It proved difficult to adapt existing mechanisms to cope with the pressures of the post-CES environment

- The consequences for recovery in Canterbury were significant with a number of cases remaining unresolved over a decade after the event

Conclusions

- The current reform process assumes that a pre-planned post-disaster response system will be able to address the issues seen post-CES

- This research suggests that such a model may be insufficient and a more holistic approach to post-disaster dispute resolution may be required

- Fundamental changes to the dispute resolution system may be required to deliver a resilient model, capable of managing future seismic (and other disaster) events

Collins, T and Hopkins, WJ *International Handbook of Disaster Research* (Springer-Nature, 2022)

Investigating the interplay between seismic policy language and commercial property listings

Tong et al. Poster #45

Definition of EQPB → **Definition of %NBS** → **Property listing** → **Bldg user perceptions**

Building Act 2004
Building (EQPB)
Amendment Act 2016

Engineering NZ

- Real estate agents interpret and communicate seismic policies to the market through property listings
- %NBS is often [mis]perceived as a building's ability to function after an earthquake
- We study the content of 55k office lease listings in Auckland, Wellington and Christchurch b/w 2009-21 with special focus on how agents communicate structural performance
- Measuring the differences b/w the intention and interpretation of seismic policies is important for better policy design

"Saving Precious Seconds" - A Novel Approach to Implementing a Low-Cost Earthquake Early Warning System with Node-Level Detection and Alert Generation

Prasanna et al. Poster #100

Sensors

Raspberry Shake sensors are chosen as the ground motion sensors for the proposed experimental Earthquake Early Warning (EEW) system due to its openness to access and relatively superior processing capability.
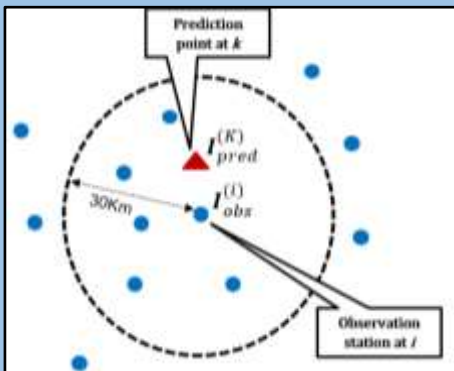

EEW Network Architecture

Driven by SD-WAN-based hole-punching, this architecture supports entire data processing occurs at the sensor node, and **the communication takes place directly between the sensors without the support from any centralised cloud-based servers.**
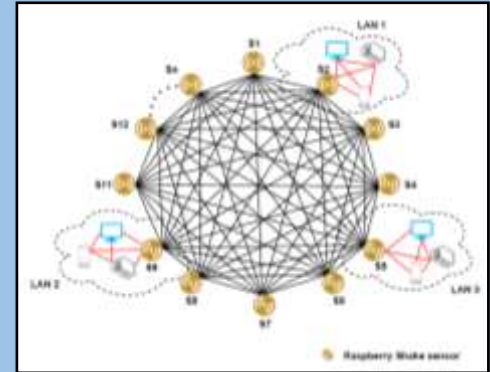
Detection Algorithm

The PLUM (Propagation of Local Undamped Motion) algorithm has been selected for the earthquake detection algorithm. **This is an algorithm which recently become popular for EEW domain due to its robustness, lightweight design and easy to implement nature.**

Results

Results show that the proposed decentralised EEW architecture can outperform traditional centralised EEW architectures and can save valuable seconds when generating EEW, leading to a longer warning time for the end-user.

How to get involved

Collaborate with us

If you have a significant research activity which aligns with that of QuakeCoRE please get in touch.

Apply for our Scholarships

Prospective PhD students are encouraged to contact QuakeCoRE Investigators.

Apply to our RfP

Our annual request for proposals is released in the third quarter of each year

Join our Monthly Videoconferences

Our Research Programmes have monthly video-conferences to discuss research activities which are open to all.

Attend our Annual Meeting

The QuakeCoRE Annual Meeting is the primary avenue that the QuakeCoRE Community comes together.

Thank you