

RCET-NEW

Earthquake Early Warning

In collaboration with:

JCDR Massey University, ETH Zürich, ShakeAlert, AESAP EEW group and others

Presented by

Jen Andrews

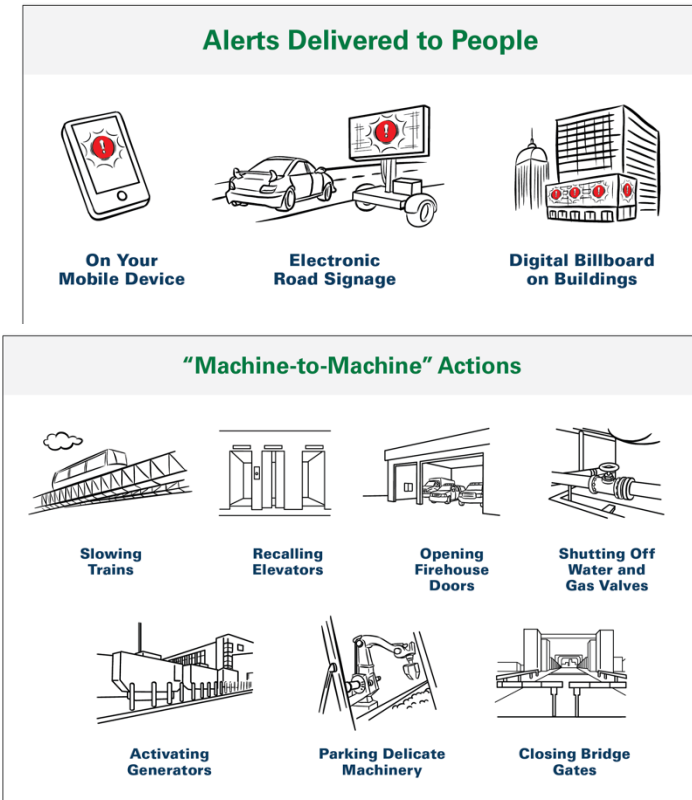
Seismologist

What is EEW?

- Rapid earthquake detection and forecast of shaking
- Warning to vulnerable populations before strong shaking arrives
- Seconds to tens of seconds of warning

EEW could protect ...

- People
- Property
- \$\$\$



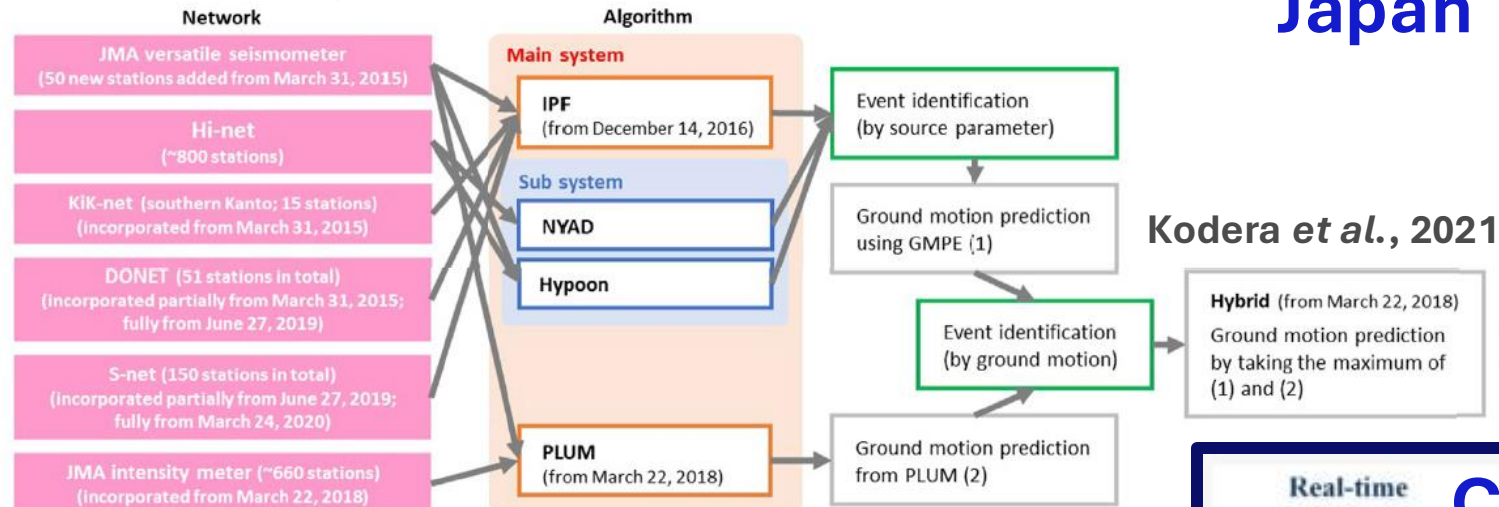
EEW globally

EEW in New Zealand

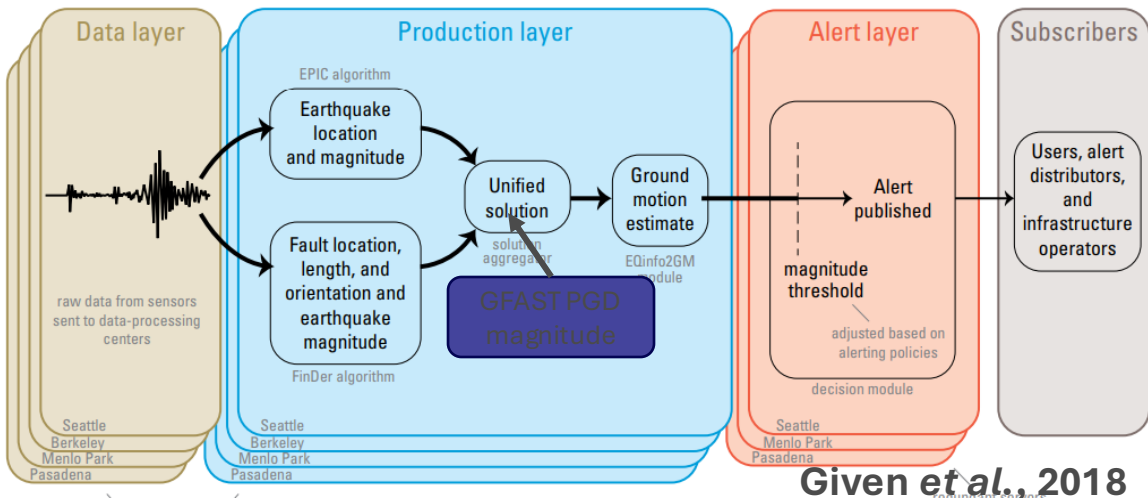
- Now
- Future
- What types of EEW can best help NZ?
- How to optimise the impact of early warnings?

International: Operational EEW Systems

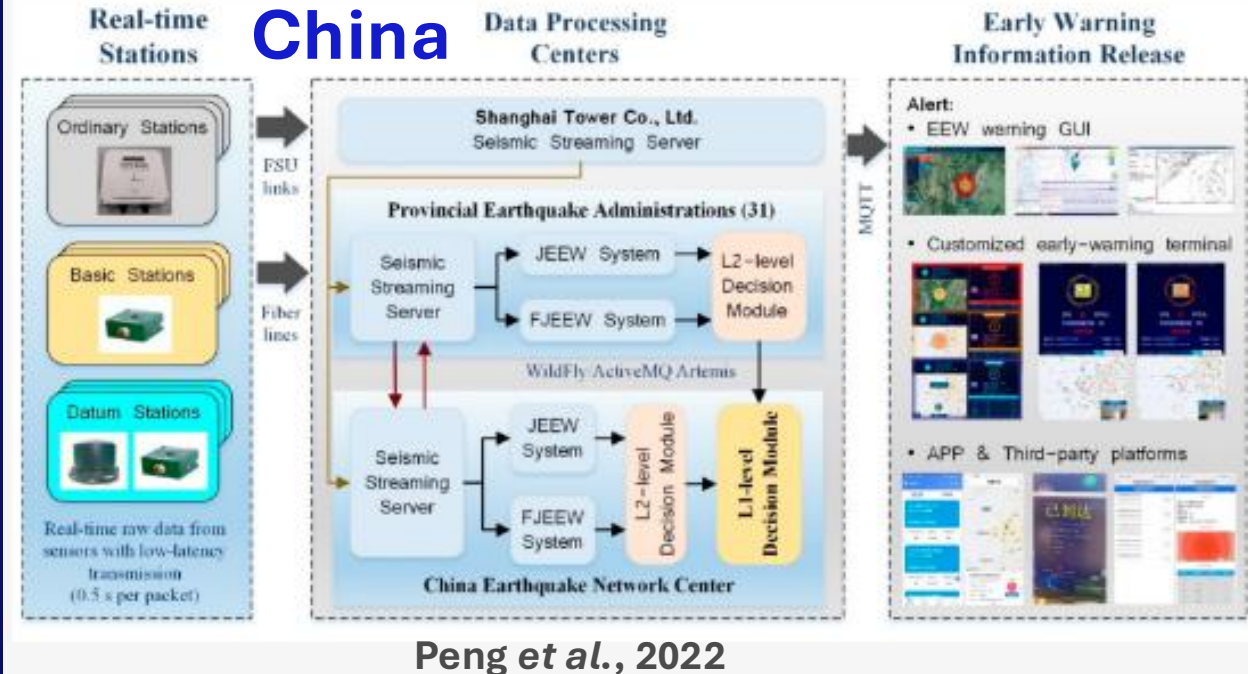
After the Tohoku-Oki earthquake



USA



China



Physical environment

- Tectonic setting

Technological environment

- Sensor, communication and alert networks

Social environment

- Expectations and education

Economic / Political environment

- National alert capability
- Costs and benefits

NZ: Social Science and Google AEAs

Earthquake early warning in Aotearoa New Zealand: a survey of public perspectives to guide warning system development

Julia S. Becker¹, Sally H. Potter², Lauren J. Vinnell¹, Kazuya Nakayachi³, Sara K. McBride⁴ & David M. Johnston¹

Scoping the potential for earthquake early warning in Aotearoa New Zealand: A sectoral analysis of perceived benefits and challenges

Julia S. Becker^{a,*}, Sally H. Potter^b, Raj Prasanna^a, Marion L. Tan^a, Benjamin A. Payne^a, Caroline Holden^b, Nick Horspool^b, Ryan Smith^c, David M. Johnston^a

The Effects of Earthquake Experience on Intentions to Respond to Earthquake Early Warnings

Julia S. Becker^{*,}, Lauren J. Vinnell¹, Sara K. McBride², Kazuya Nakayachi³, Emma E. H. Doyle¹, Sally H. Potter⁴ and Ann Bostrom⁵

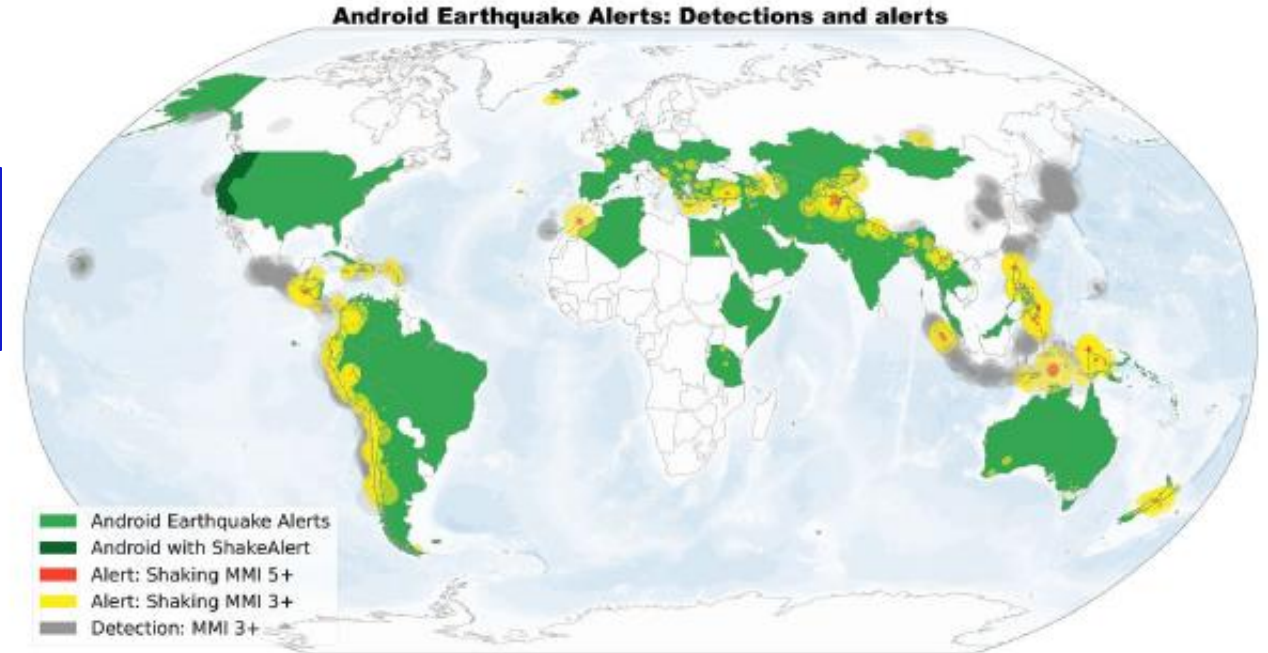
Knowledge, perceptions, and behavioral responses to earthquake early warning in Aotearoa New Zealand

Lauren Jennifer Vinnell^{*}, Marion Lara Tan, Raj Prasanna and Julia Susan Becker

The public's perception of an earthquake early warning system: A study on factors influencing continuance intention

Marion Lara Tan^{a,*}, Lauren J. Vinnell^a, Alvin Patrick M. Valentin^b, Raj Prasanna^a, Julia S. Becker^a

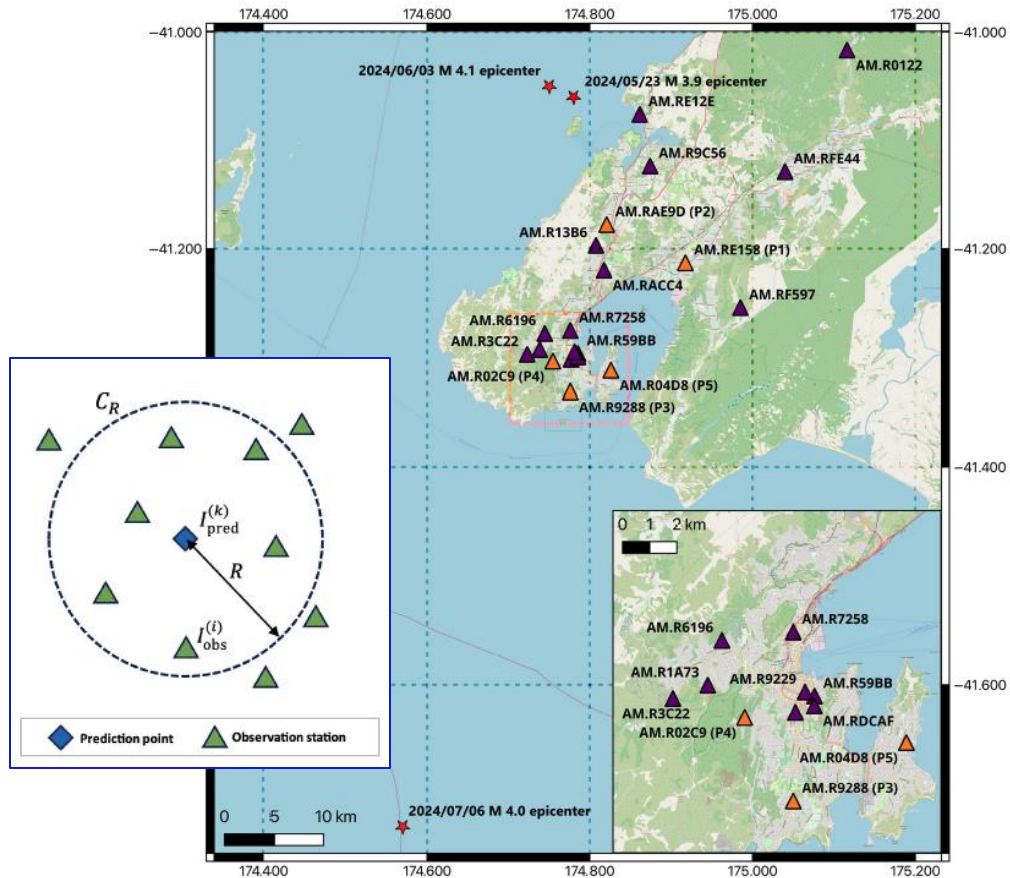
- Public generally positive about EEW
- Knowledge of EEW (capability / limitations) is low
- No clear sectoral benefits / pathways to use



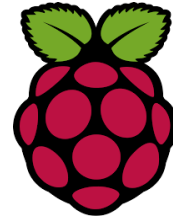
Allen *et al.*, 2025

- Public confusion about the origin of Google's AEAs
- Experience of earthquakes and EEW modifies intentions and behaviour

NZ: Low-Cost Sensor Networks, Commercial



Chandrakumar *et al.*, 2025



CANTERBURY
Seismic

HOME



3/09/25 5:31 PM | Earthquake
Preparation

**September 4 -
our first early
warning**

NZ: National Network (GeoNet)

Kaikōura M7.8 2016 Replay – No Latency

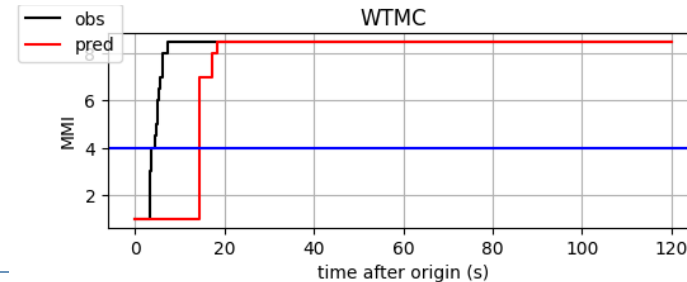
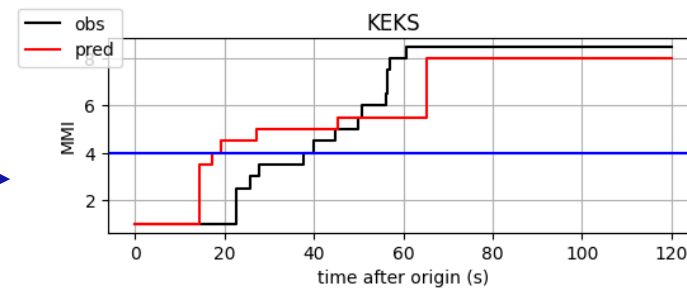
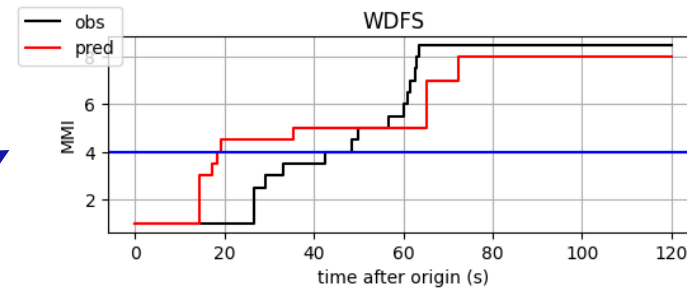
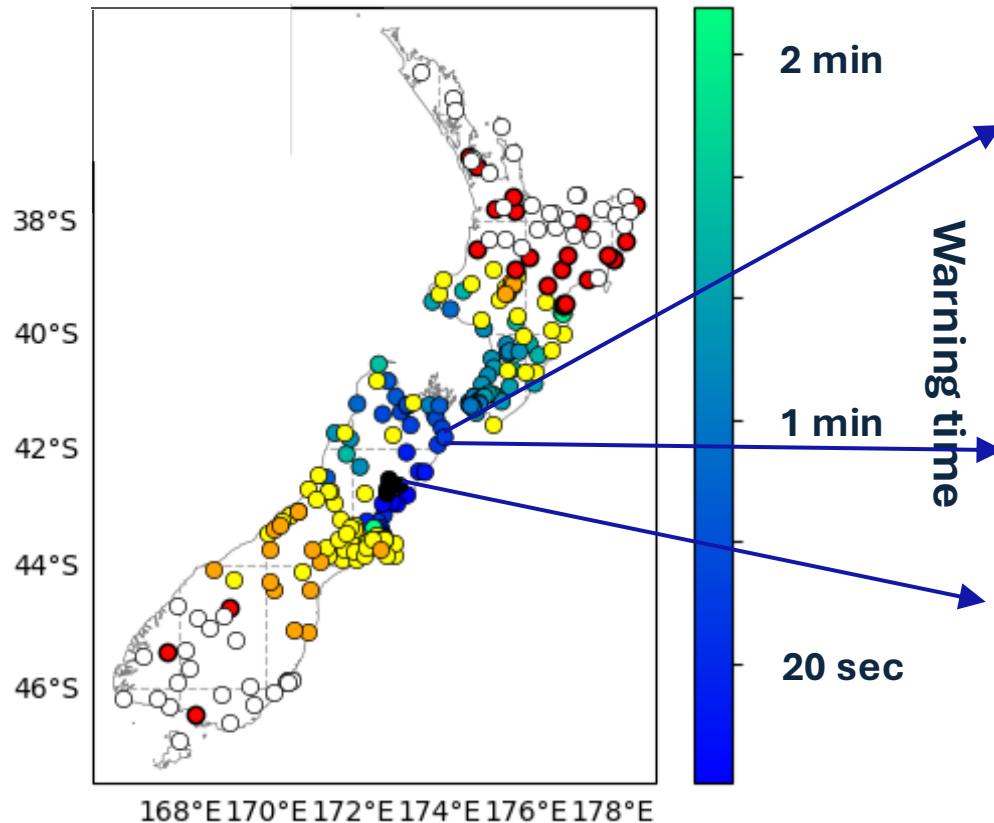
Potential Damage
No Warning (Late)

Potential Damage
Warning Received

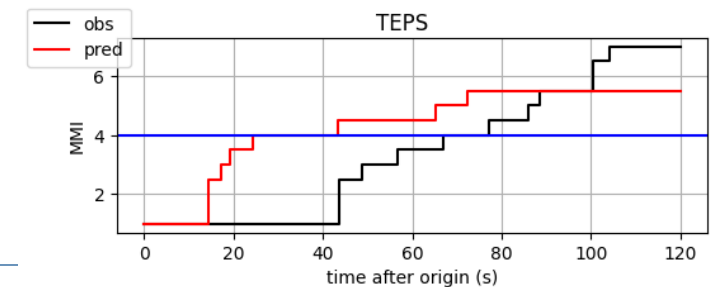
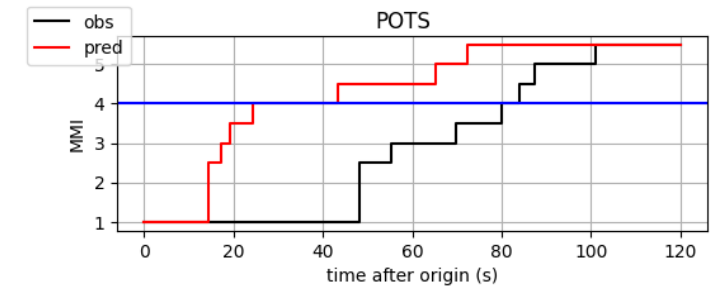
Potentially Felt
Warning Received

Potentially Felt
No Warning

Likely Not Felt
Warning Received



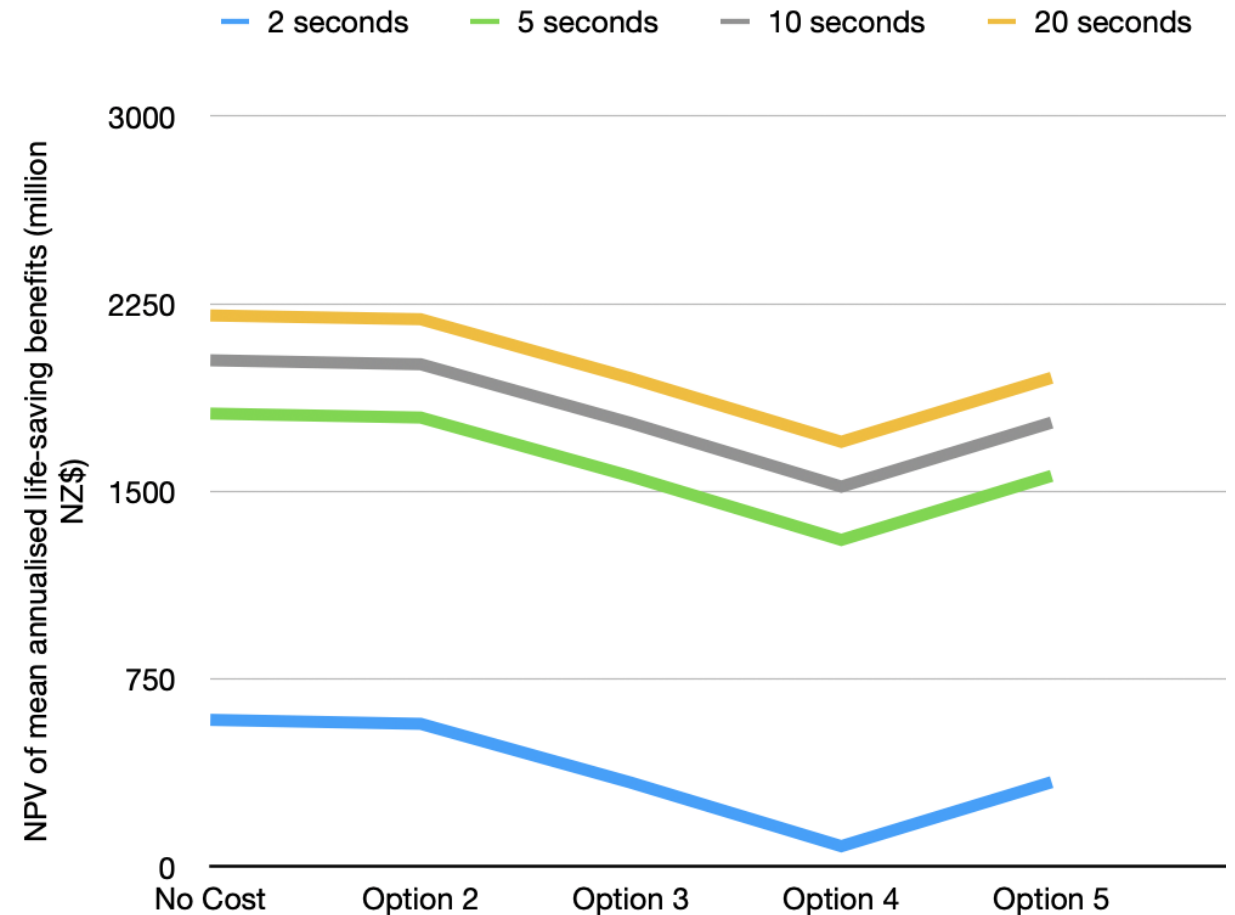
Wellington Sites



NZ: Economics Cost-Benefit Analysis

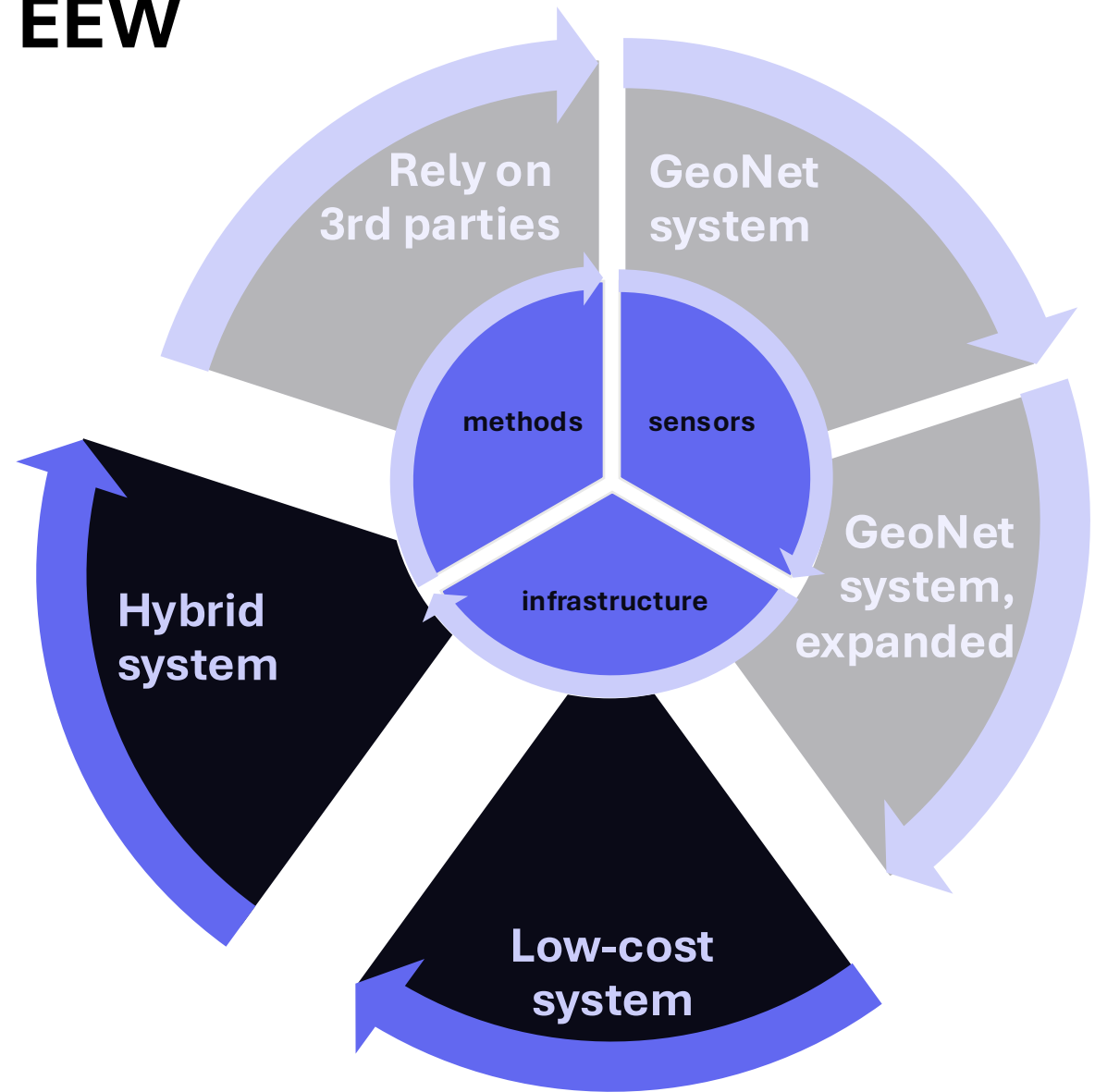
Annualised over 50 years, default social discount rate (2% in Y1-30, 1.5% in Y31-50), mean benefit.

NPV of EEWS cost (million NZ\$)		NPV of mean annualised life-saving benefits (million NZ\$)			
		2 s	5 s	10 s	20 s
		587	1,811	2,024	2,203
Option 2	-16	571	1,795	2,008	2,188
Option 3	-251	336	1,560	1,773	1,952
Option 4	-505	82	1,306	1,519	1,698
Option 5	-249	338	1,562	1,775	1,954

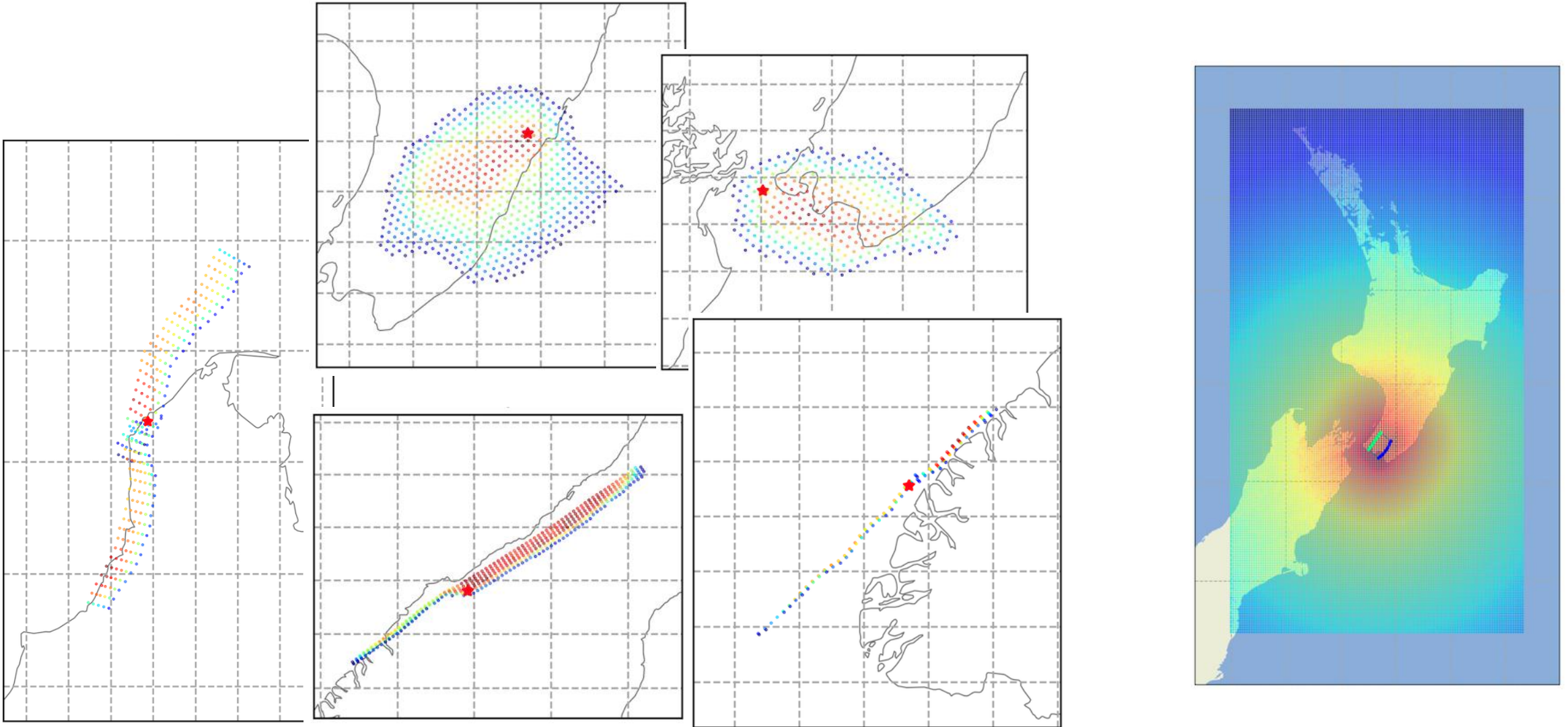


RCET-NEW: Explore and Test EEW

- PhD hosted at JCDR, Massey University (2026 – 2029):
- EEW performance using **hybrid sensor networks**
- Explore **multi-data** approaches
- Different EEW **algorithm performance** using historic and synthetic data catalogues
- Incorporate detailed **regional data sets** to improve performance

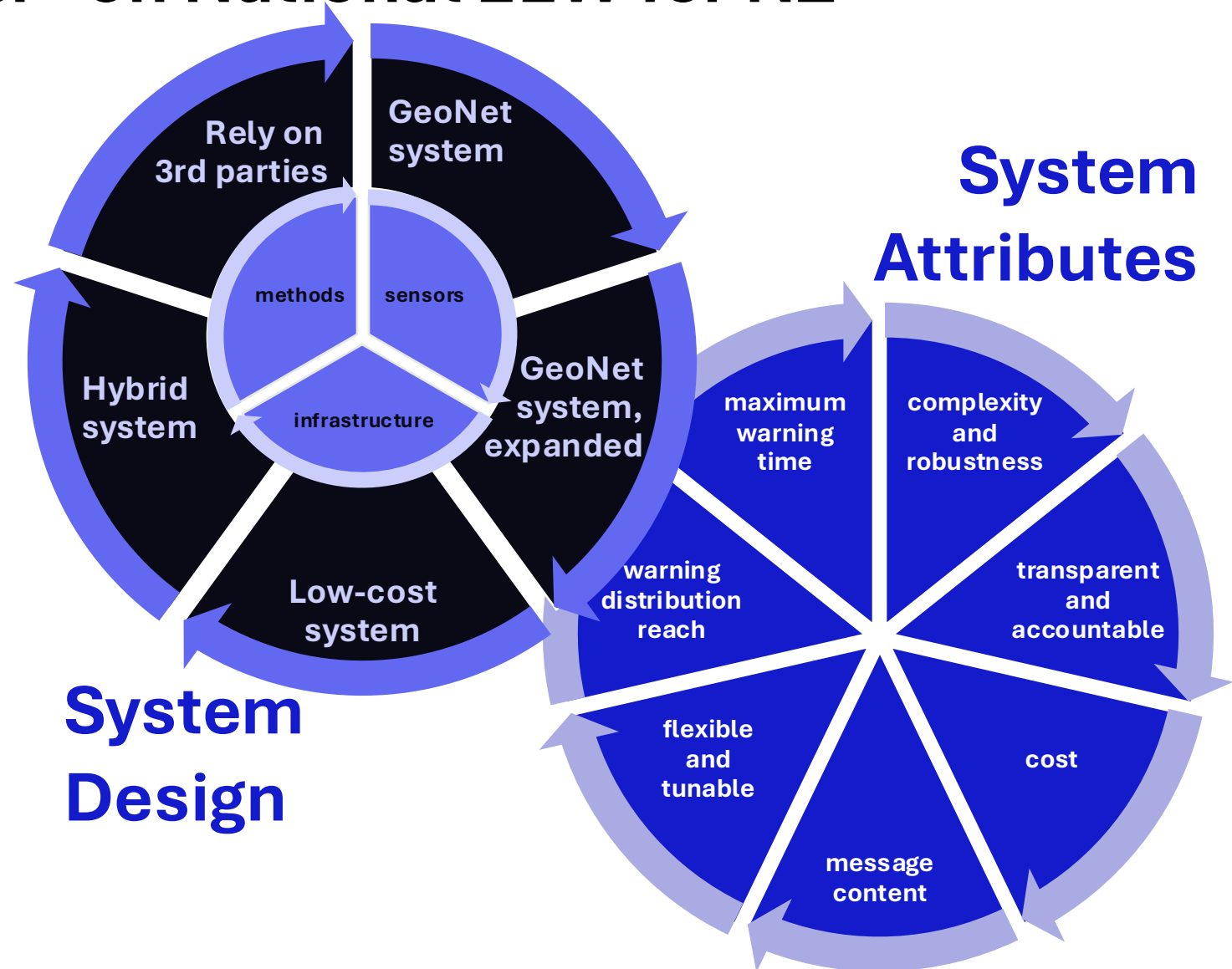


E.g. Using RSQSim Catalogues to Test EEW Methods



RCET-NEW: “White Paper” on National EEW for NZ

- Prepare a white (or green) paper outlining **science pathways for national EEW in NZ** (2027 – 2030):
- Input from **researchers** and **stakeholders**
- Review **international** practice and **national** research
- Consider NZ-context for **evolution of early warning messaging** and **multi-hazard**





Earth Sciences
New Zealand