

Helicopter View of Infrastructure Research

Sampling of Progress and Outcomes from a
range of research programmes and
collaborations

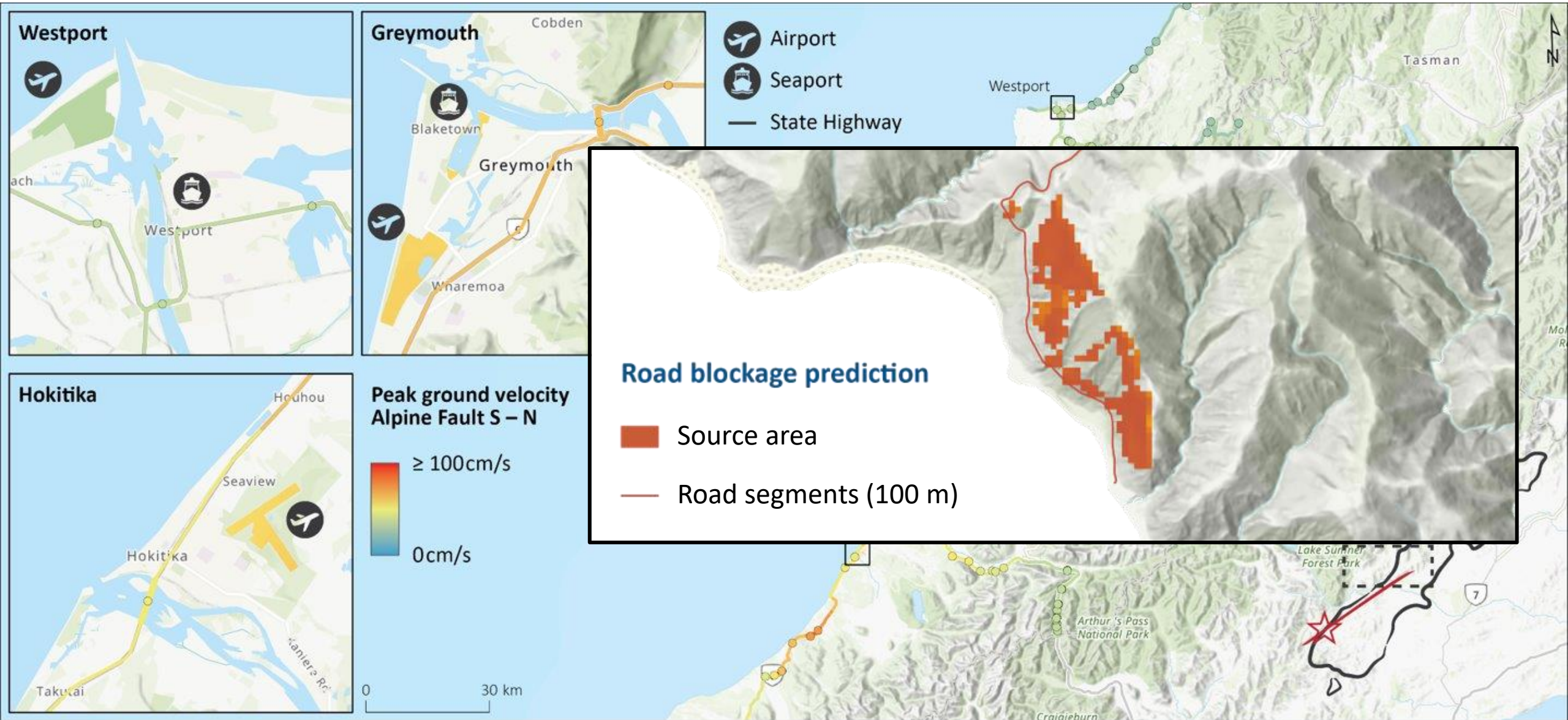
Research programmes

- Outputs across several programmes and from wide range of researchers

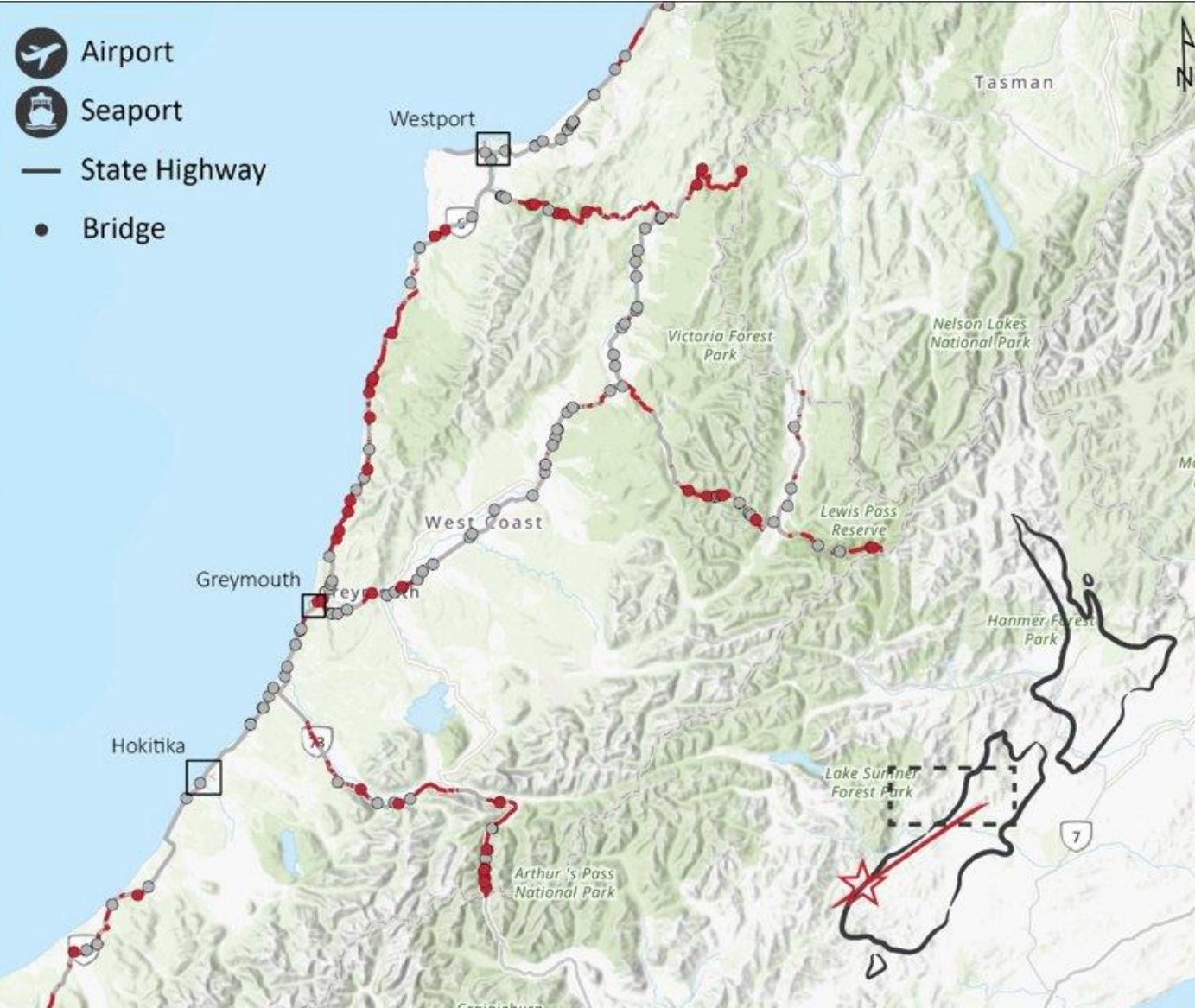
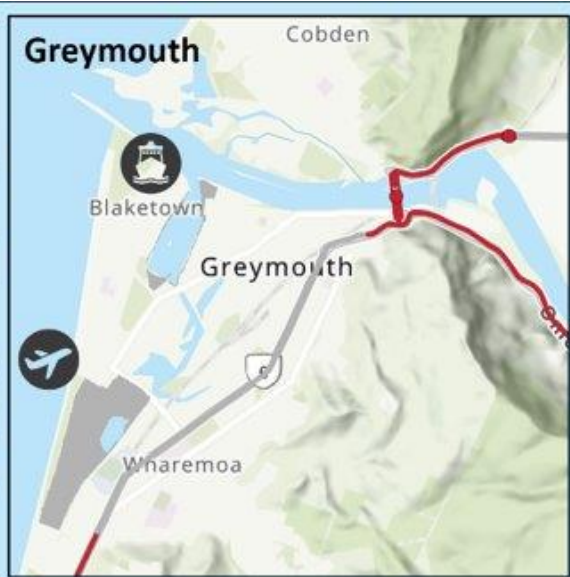
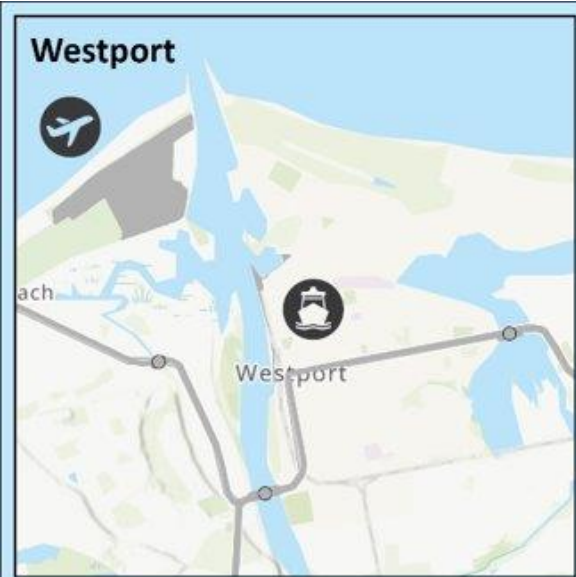


Mā te haumaru ō nga puna wai ō Rākaihautū ka ora mo ake tonu:
Increasing flood resilience across Aotearoa

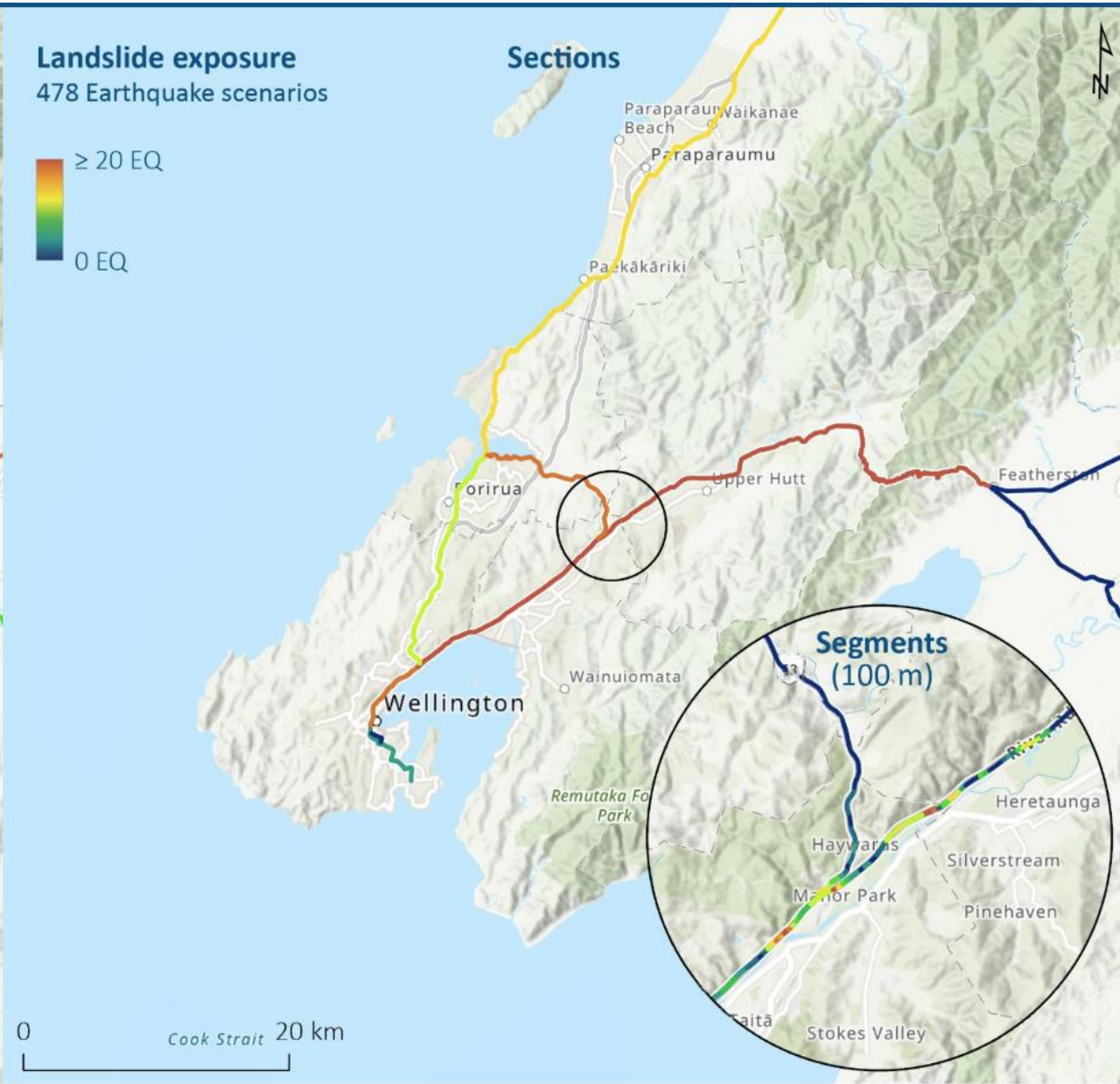
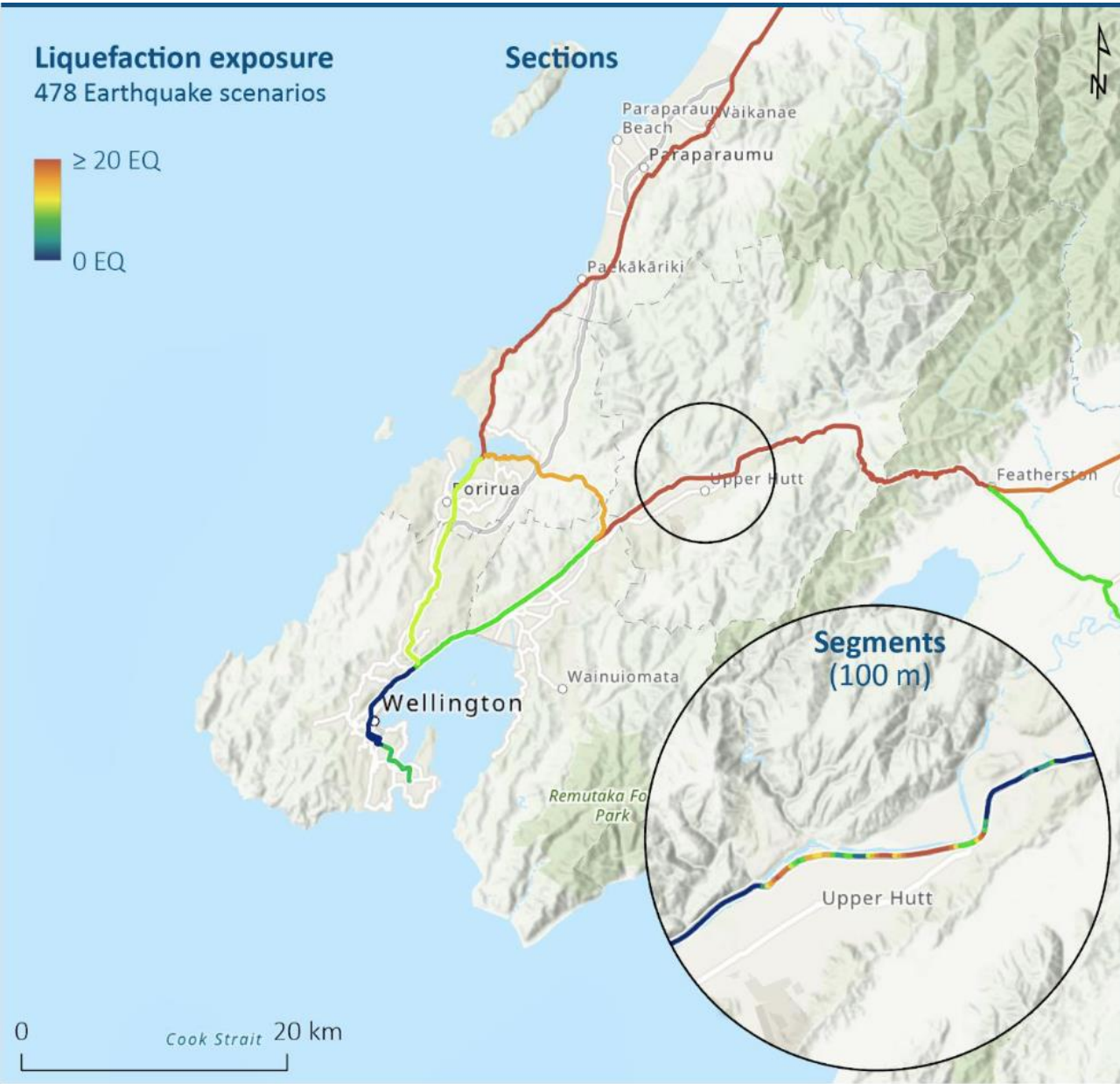
Seismic & Co-seismic Hazards

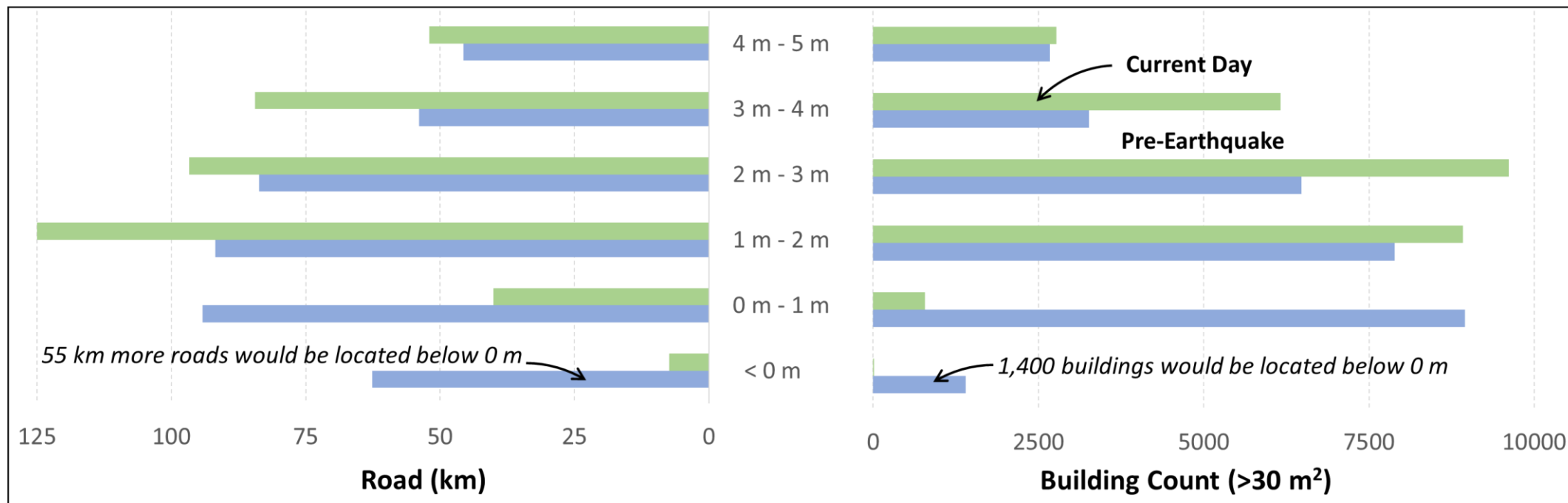
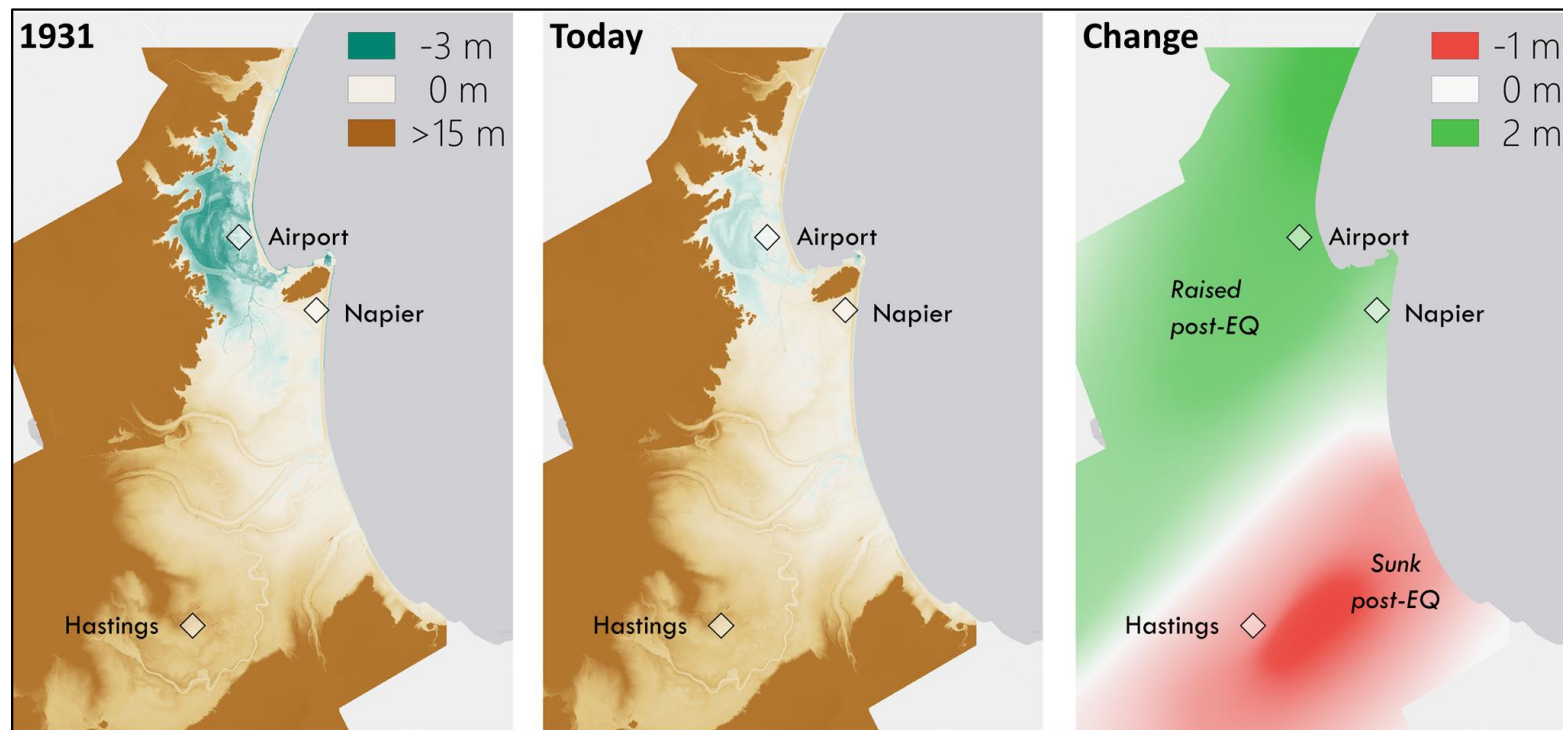


Seismic & Co-seismic Hazards



Combined Exposure

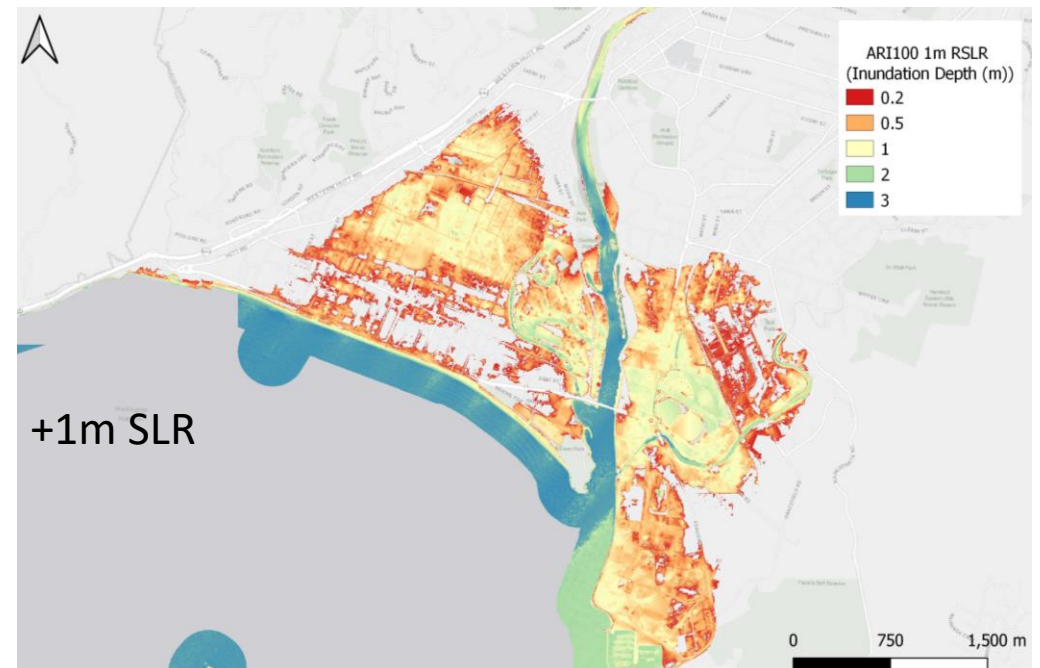
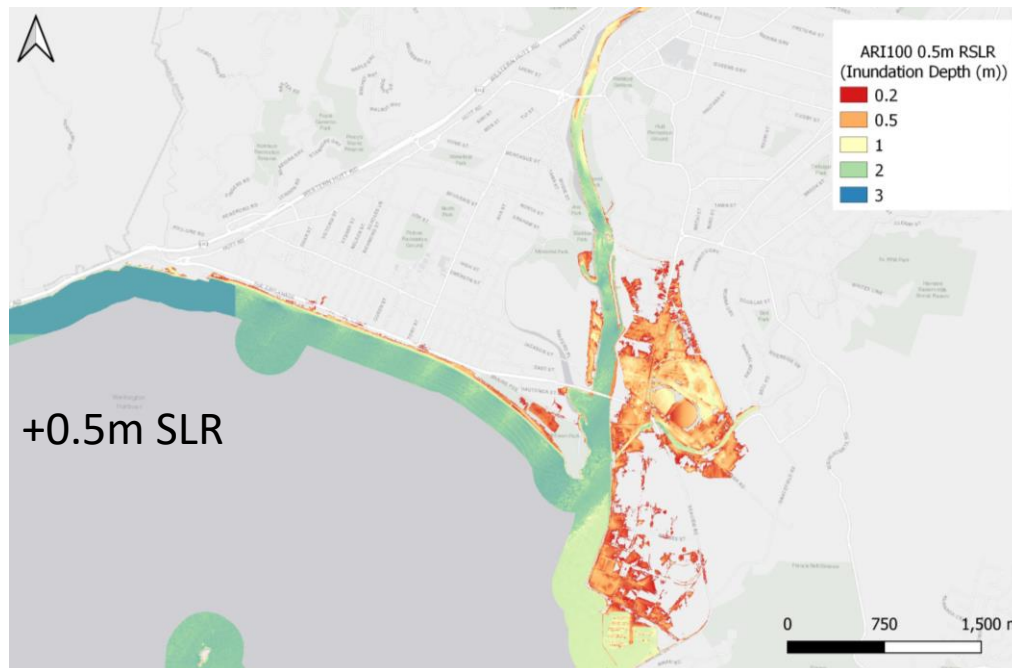
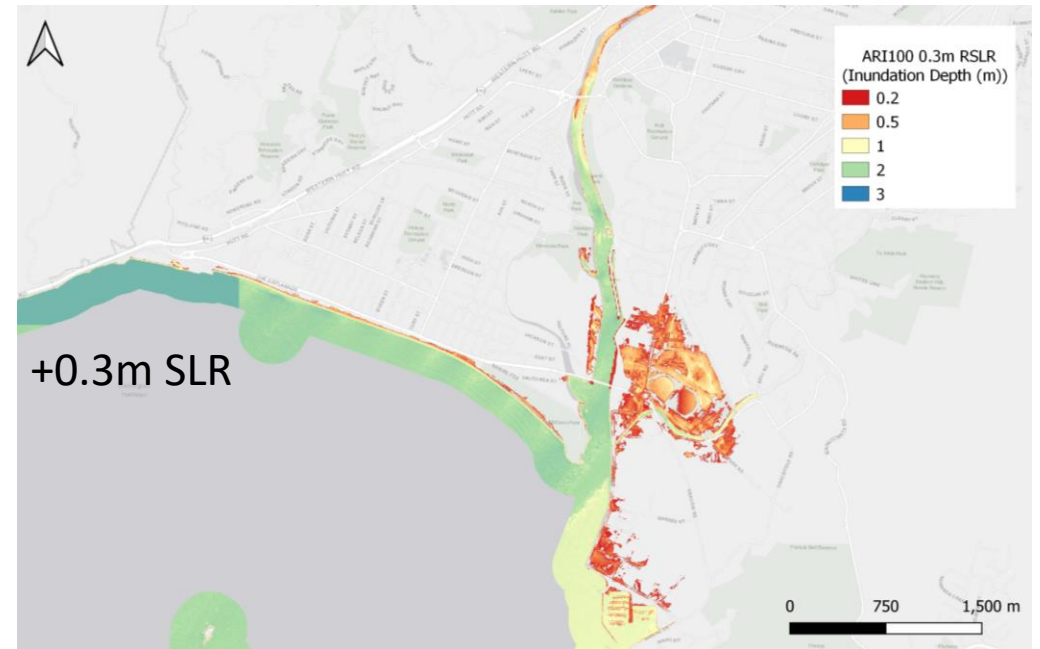




Infrastructure Disruption from Coastal Flooding

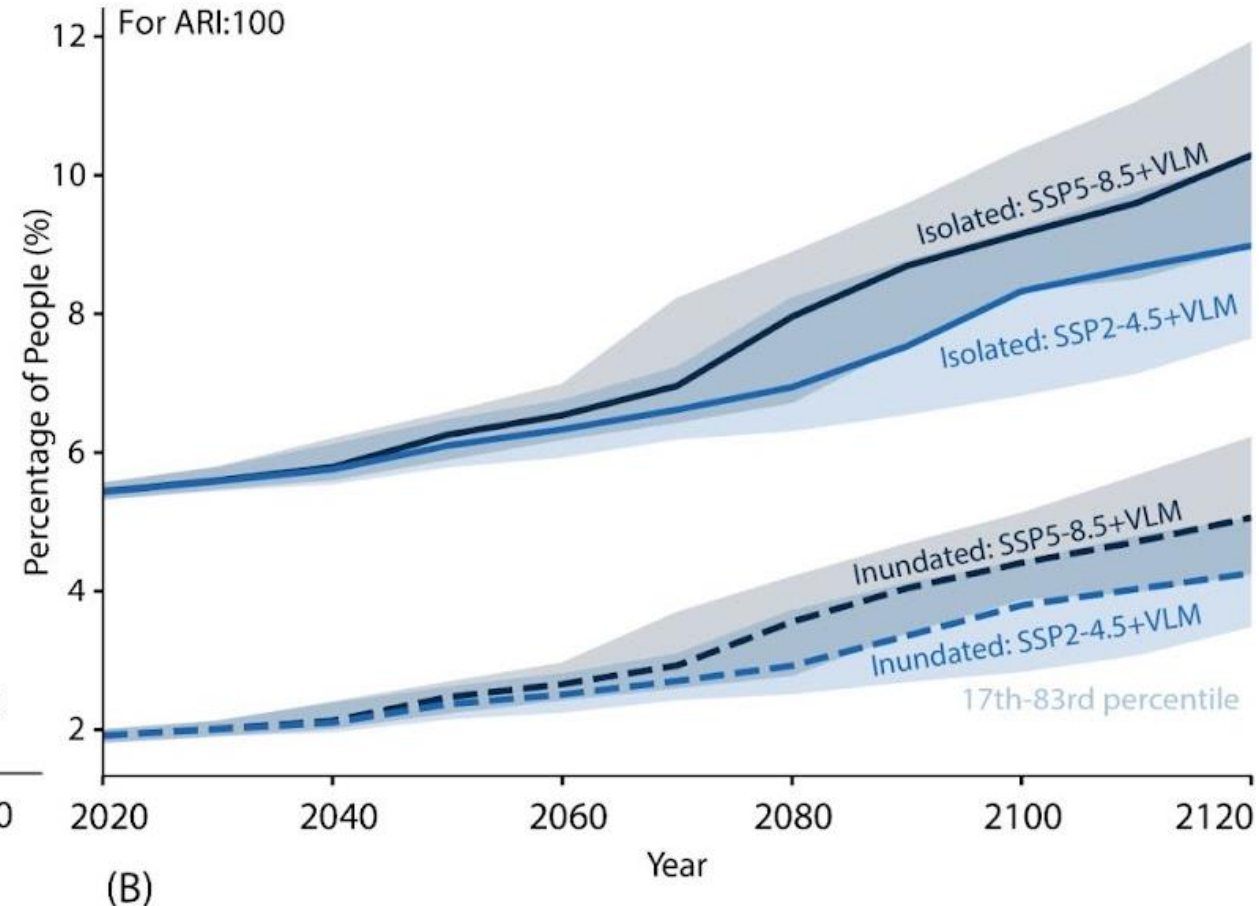
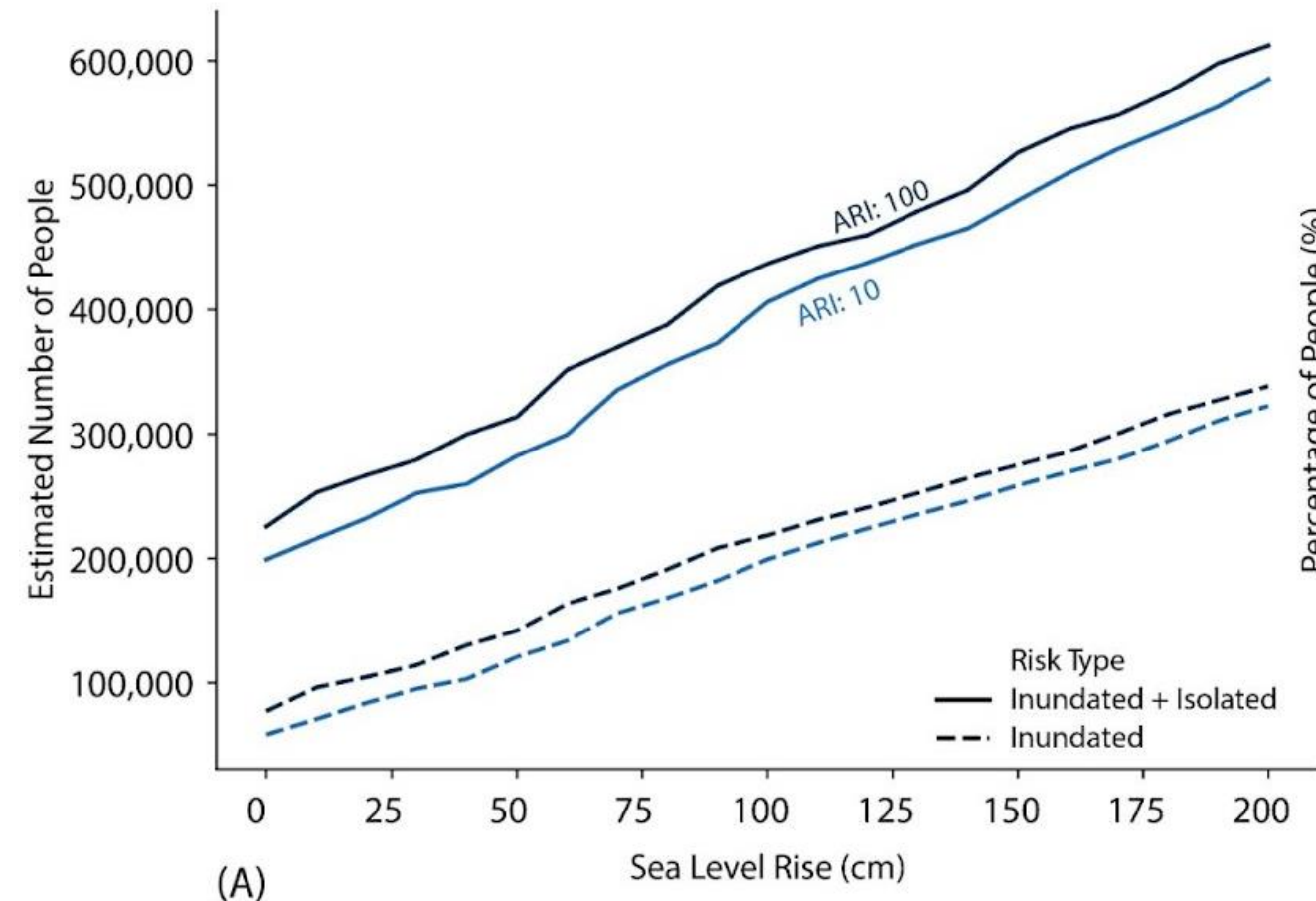
- New Zealand wide coastal flooding maps for 9 extreme sea level annual recurrence intervals and 21 sea level rise scenarios (Complete).
- National road network exposure and probabilistic loss analysis (In progress)
- National network and interdependency modelling of service disruption (In progress)

Lower Hutt 100-year Annual Recurrence Interval Flooding with Sea Level Rise (SLR)



Community Isolation

When we consider isolation caused by coastal flooding, the number of people at risk is much higher



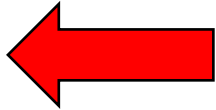
Tsunami Inundation

- 2D geospatial inundation modelling approach

- Tsunami height at coast
- Topography
- Land use roughness

- Modelling levels

- Level 1
- Level 2
- Level 3
- Level 4



Kaikōura Example



Flooding Risk to Infrastructure

Expert Elicited Flood Vulnerability Models



Image: John Bisset (Stuff)



Image: John Bisset (Stuff)



Image: RNZA

DESIGN

Existing models



METHOD

Expert workshops

Refined for local conditions

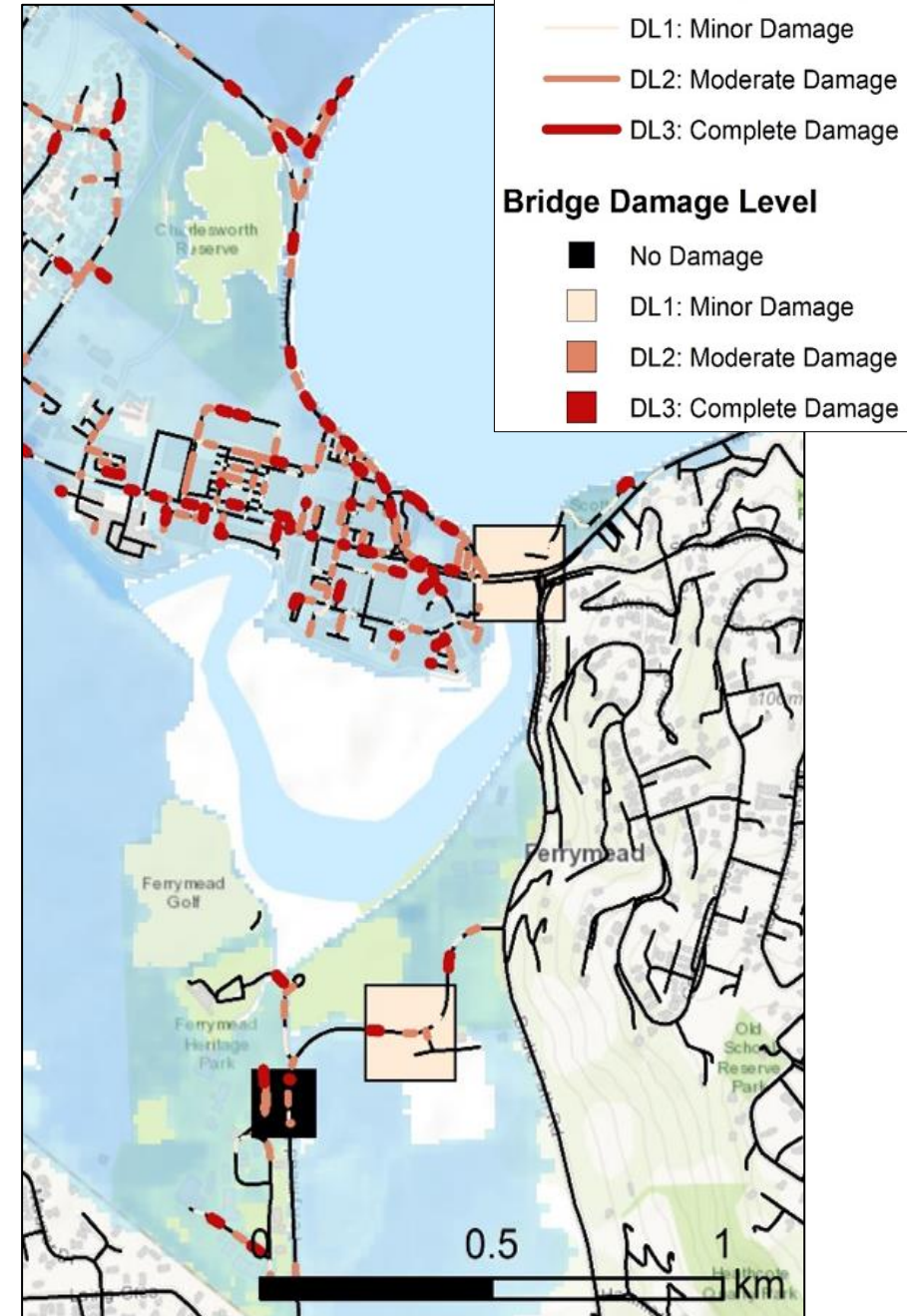


OUTPUT

NZ specific models

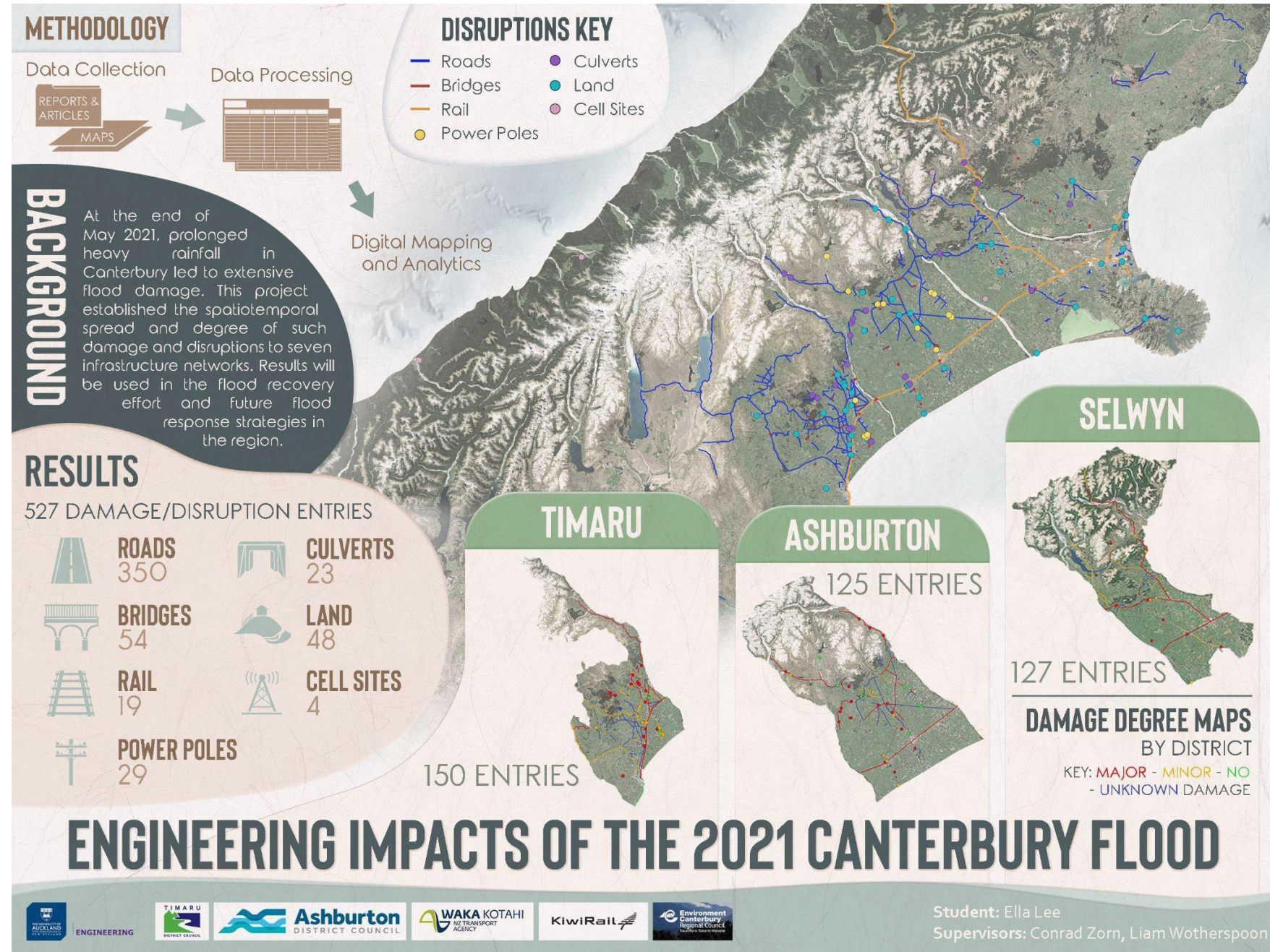
Direct physical damage

Direct loss (\$)

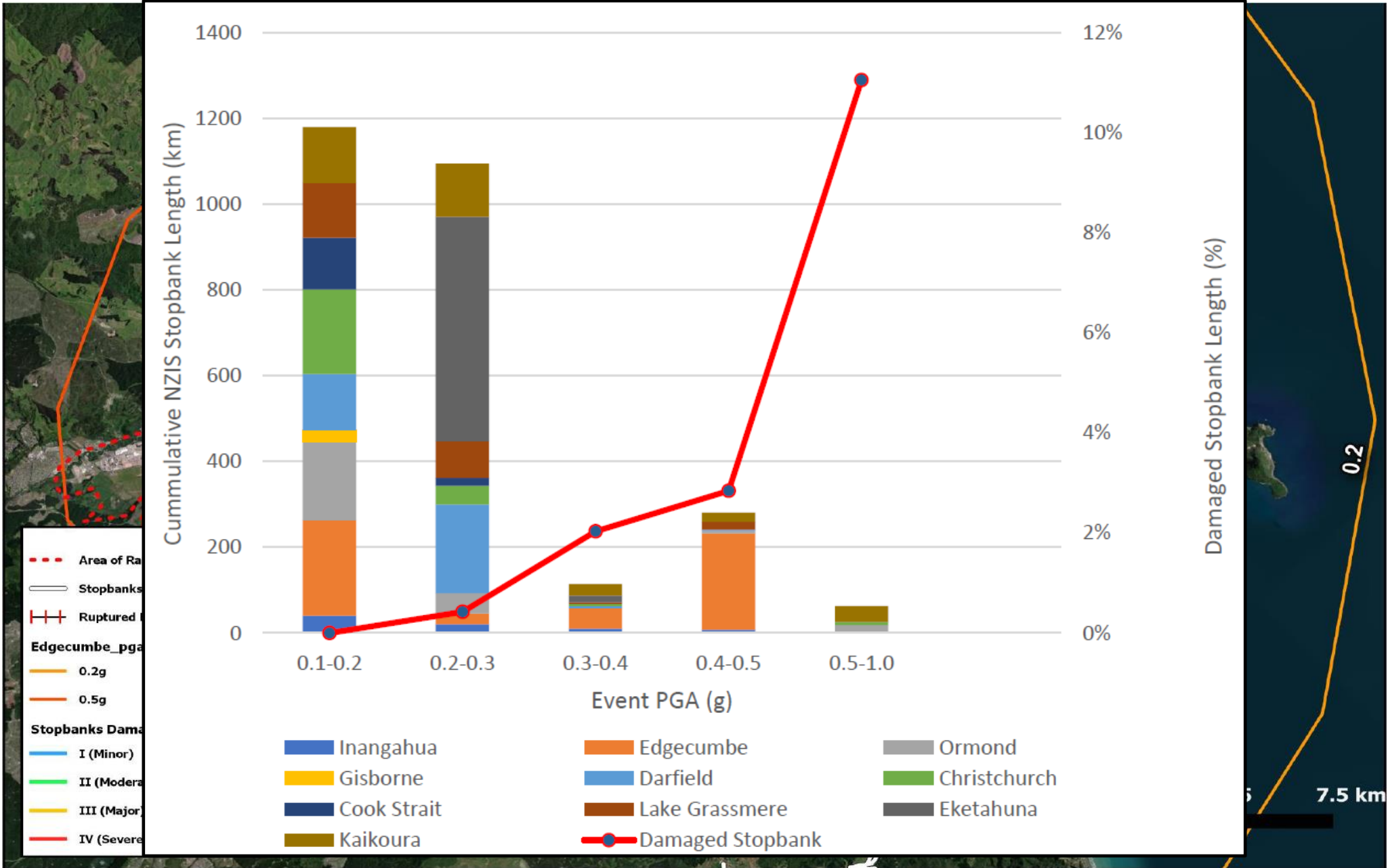


Past Events

- Spatio-temporal impacts of past flood events on infrastructure
- Case Studies (so far)
 - 2020 Rangitata Floods
 - 2021 Canterbury Floods
- Assess damage states/recovery times
- Time-stamped outages/restrictions
- Simulate transportation impacts using SI transport network model in Aimsun (ongoing)



Stopbanks in Earthquakes



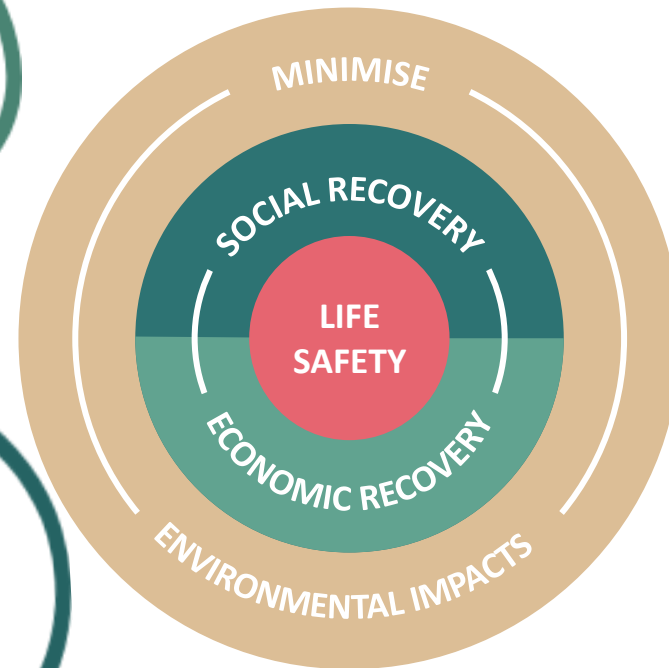
Societal expectations for the seismic performance of buildings...and infrastructure?

QUESTION: How do Kiwis want buildings to perform during and after an earthquake?

"I think we need to aspire to something greater than [life safety]. I think the experience out of Christchurch suggests that society wants and expects more than that."

"You've got to think about what the occupier wants, not necessarily what the investor wants, because they are the people using the assets."

FINDINGS:

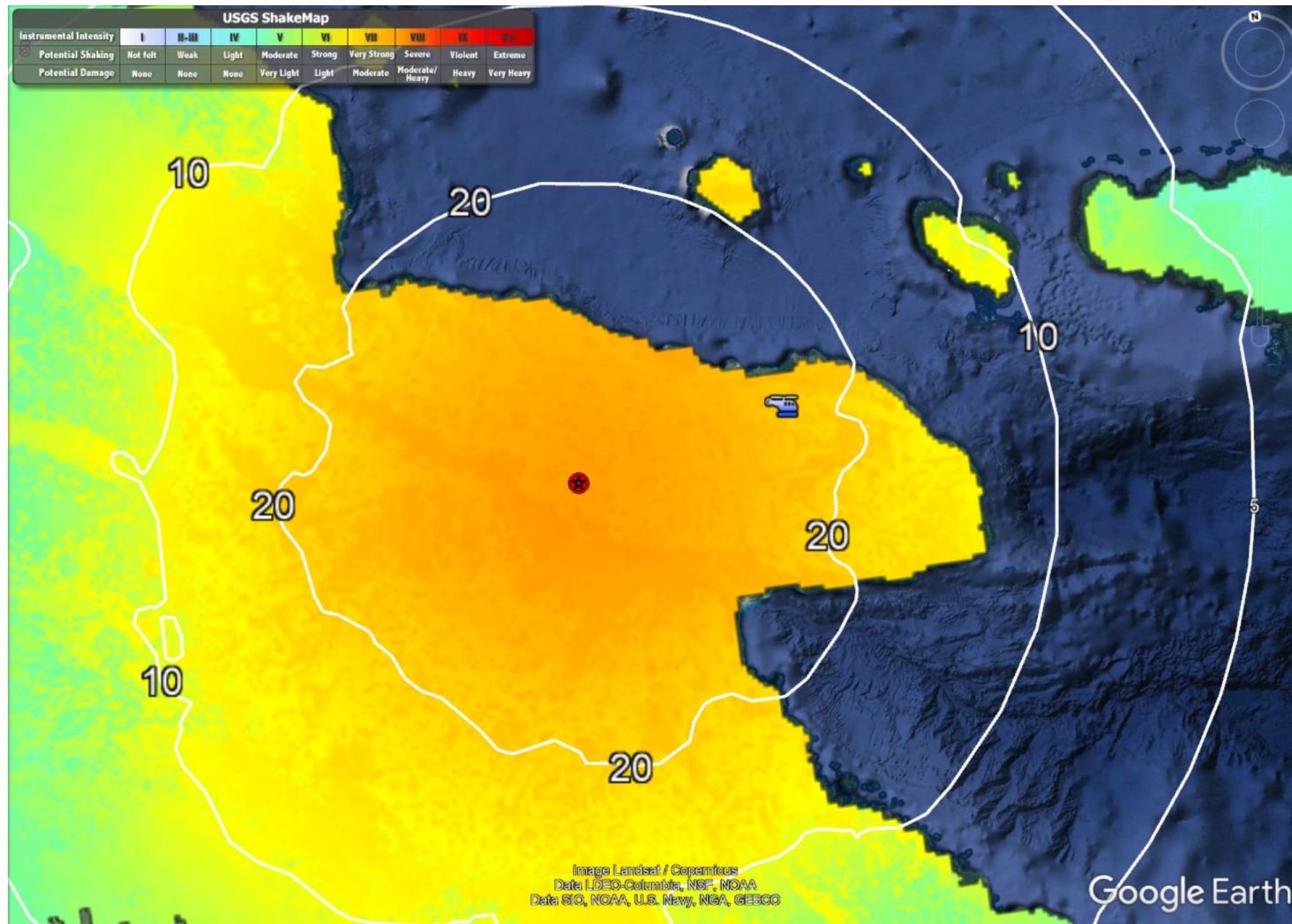


Relevance for infrastructure:

- Community recovery priorities
- Factors influencing community risk tolerance (hazard, isolation, density of built environment, community characteristics)
- A method for talking to communities about risk tolerance

Helicopters in Earthquakes

- M_w 7.6 Papua New Guinea 10/9/22
- $\sim 0.25g$ PGA at helicopter location



Invite

- Infrastructure Research Day
 - 22nd November 2022
 - University of Auckland
- Presentations from research and industry
- Discussion sessions and scoping
- l.wotherspoon@auckland.ac.nz