

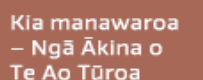
# Resilience to Nature's Challenges Natural Hazard Research Platform

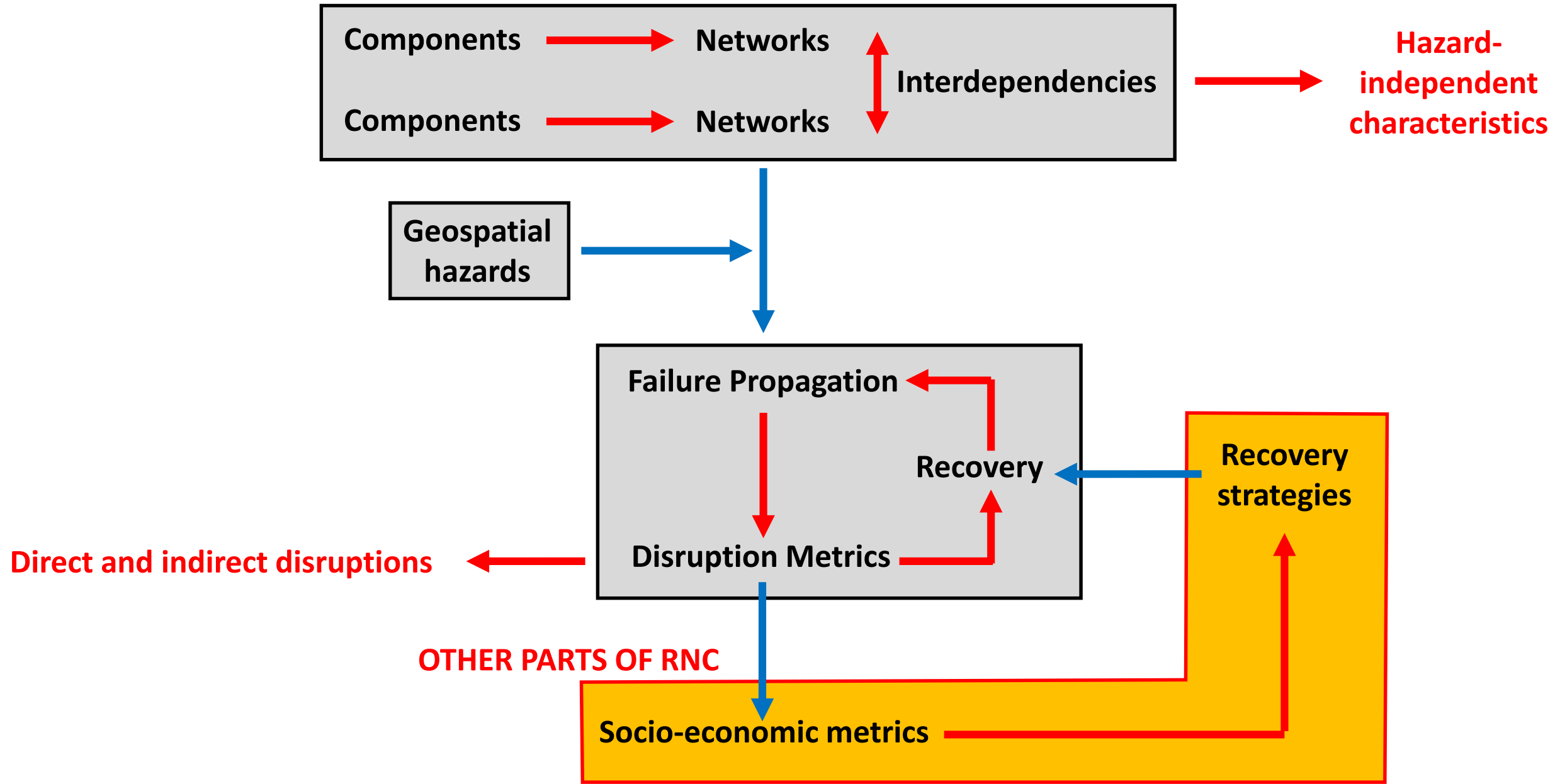
## Distributed Infrastructure Network Research

# Research-Practice Collaboration

- Real-world data, real-world complexity, real-world perspective

## Infrastructure Advisory Group

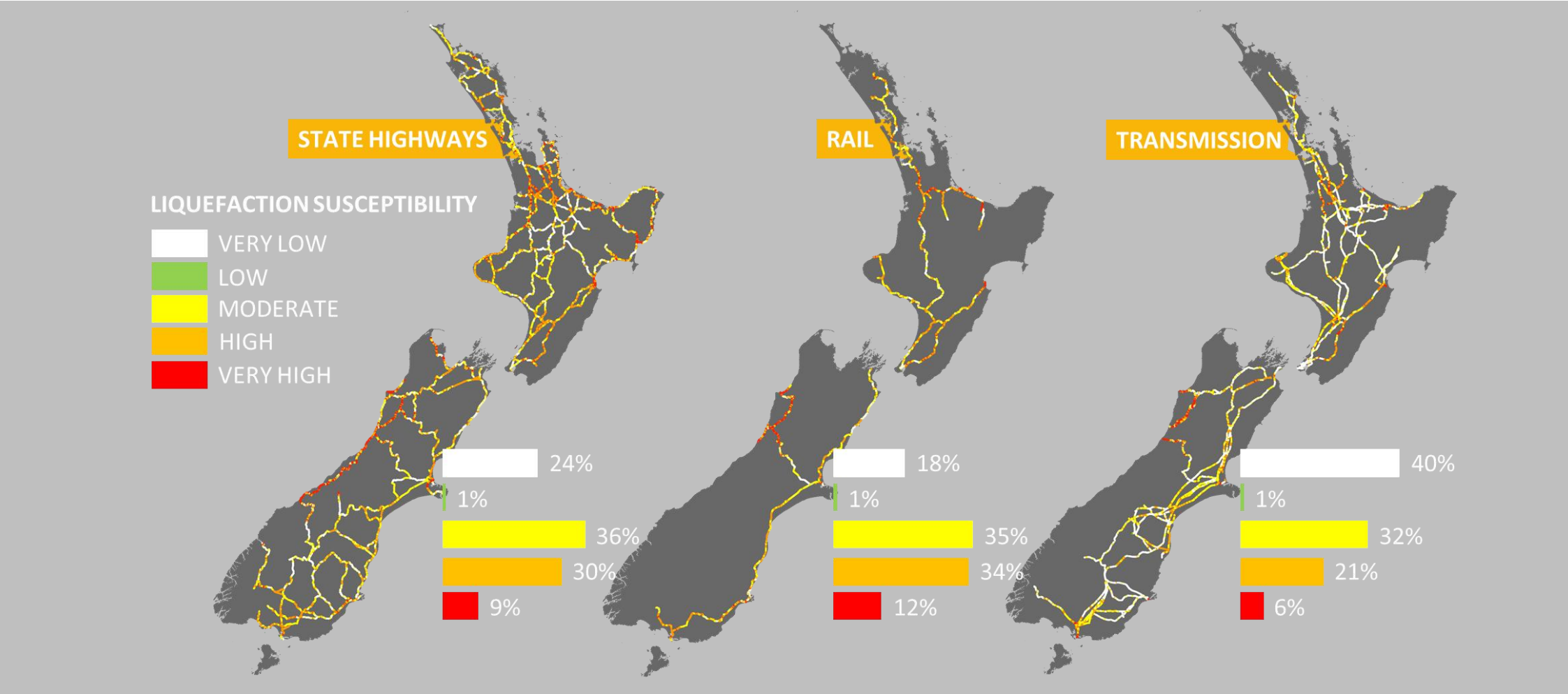




# Hazards Exposure

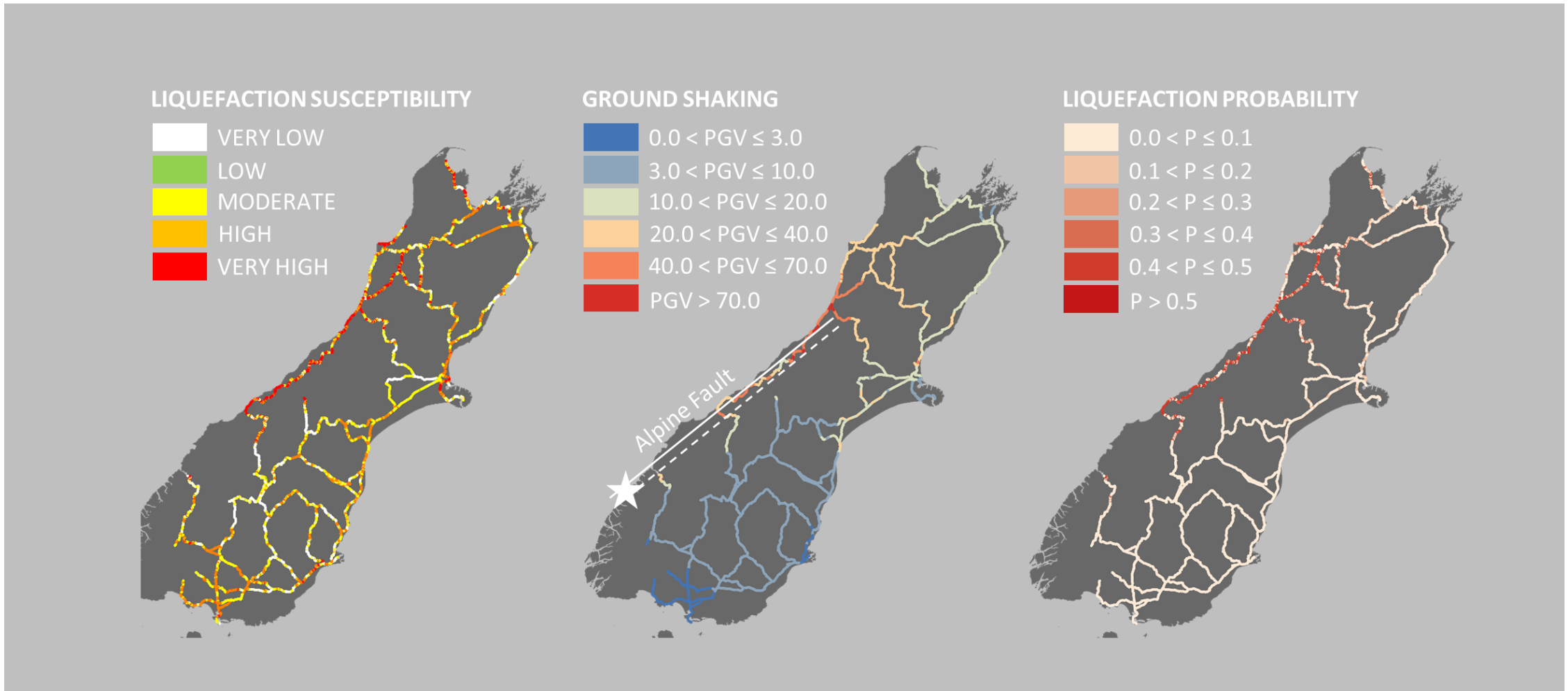
- Balance site specific and broader characterisation of infrastructure networks
  - Seismic hazards
  - Co-seismic hazards
- Integrate site specific outcomes into broader geospatial approaches
  - Update and improve tools
- Detailed assessments at key sites

# Liquefaction Susceptibility



Lin et al.

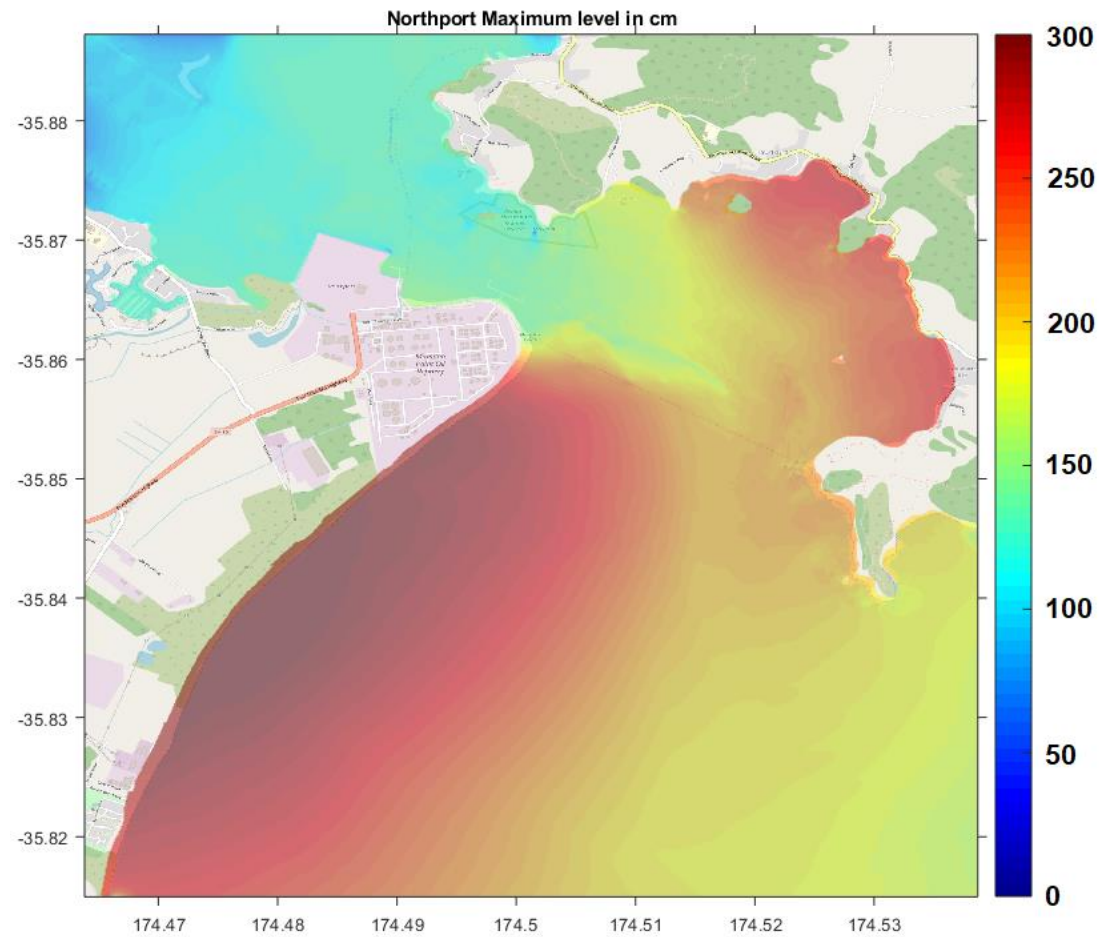
# Seismic and Co-seismic Hazards



Lin et al.



# Tsunami



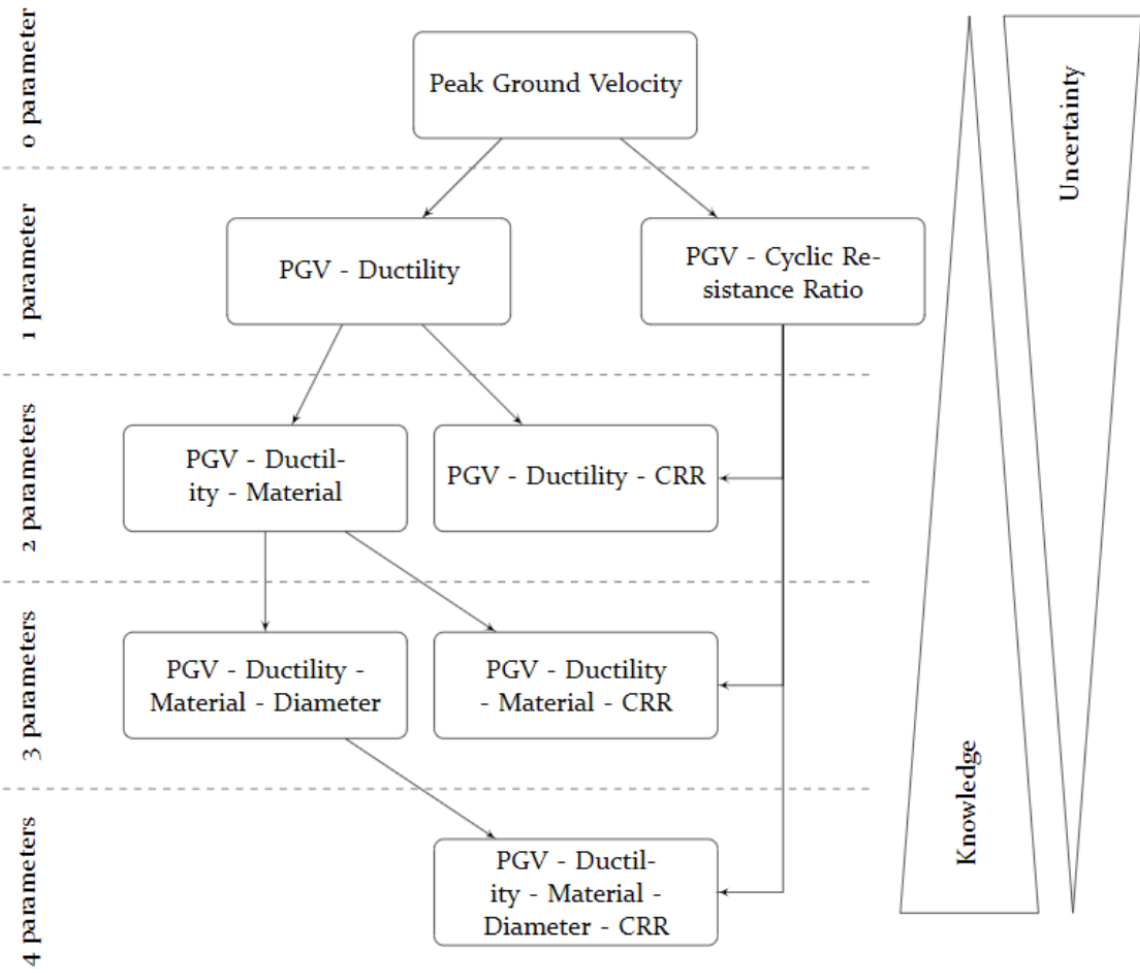
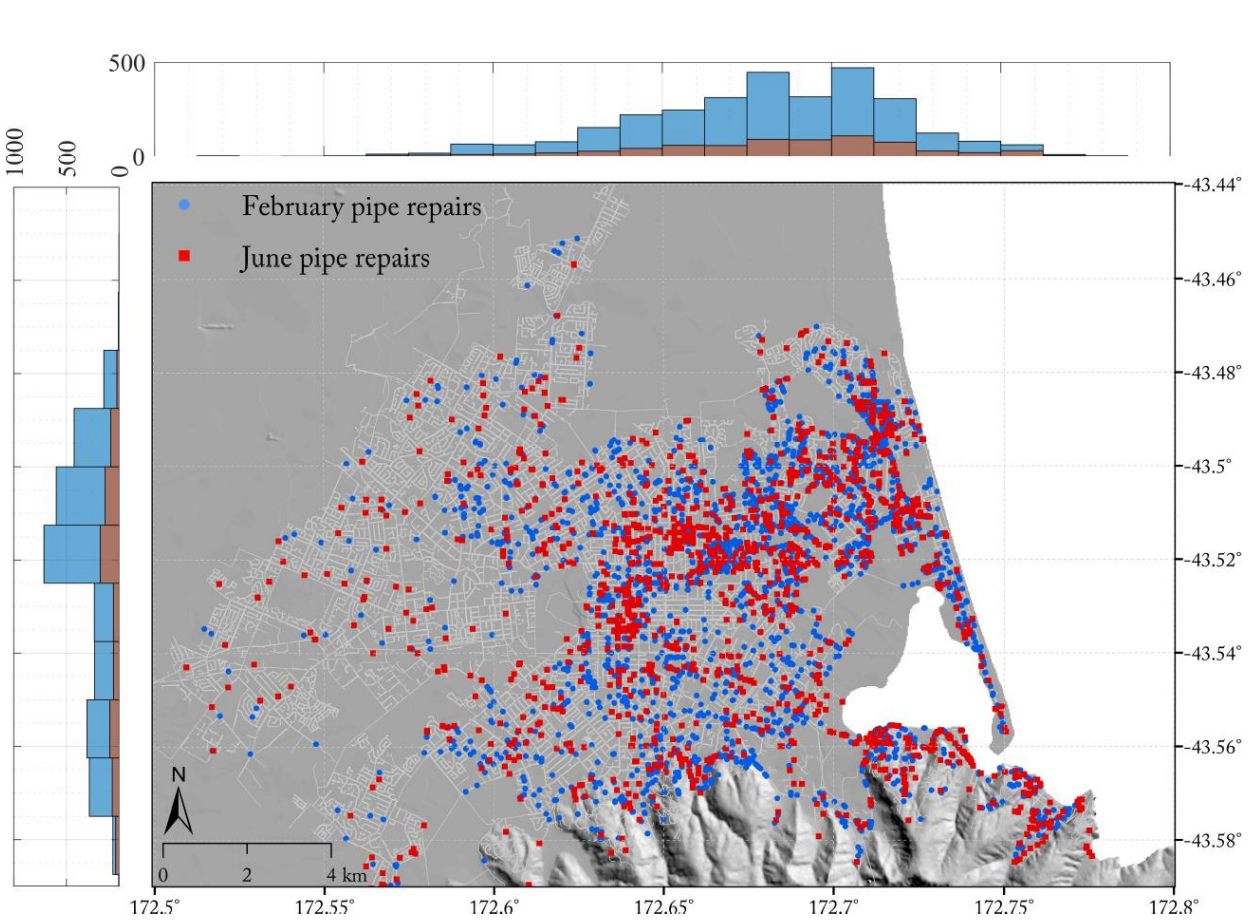
Popovich et al.

# Infrastructure Components

- We learn more about physical performance following each event
  - Strong stakeholder support in NZ enables this
  - Learn from case history datasets
  - Improve component models
- Where case histories sparse, physical testing can be undertaken

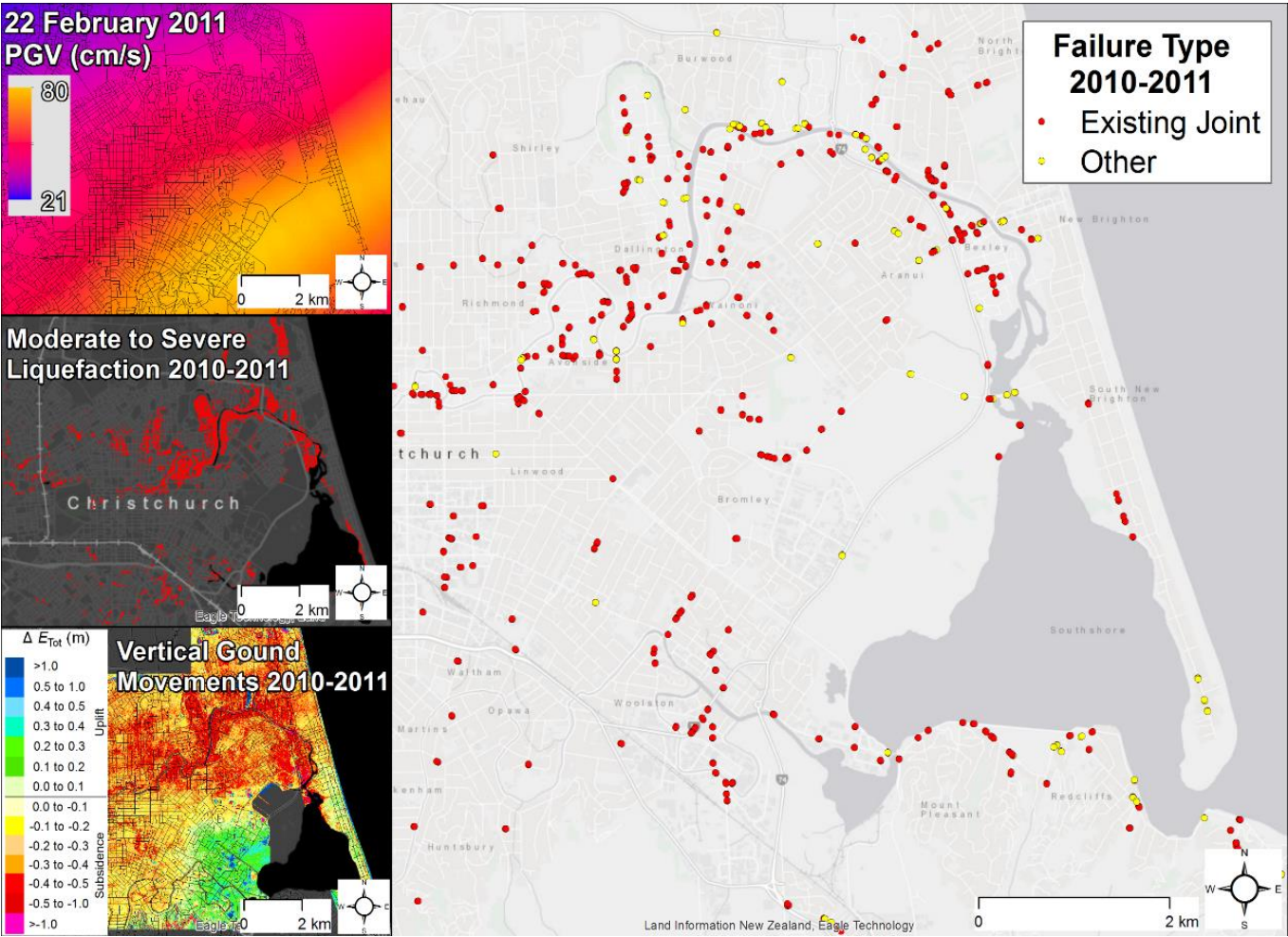


# Potable Water



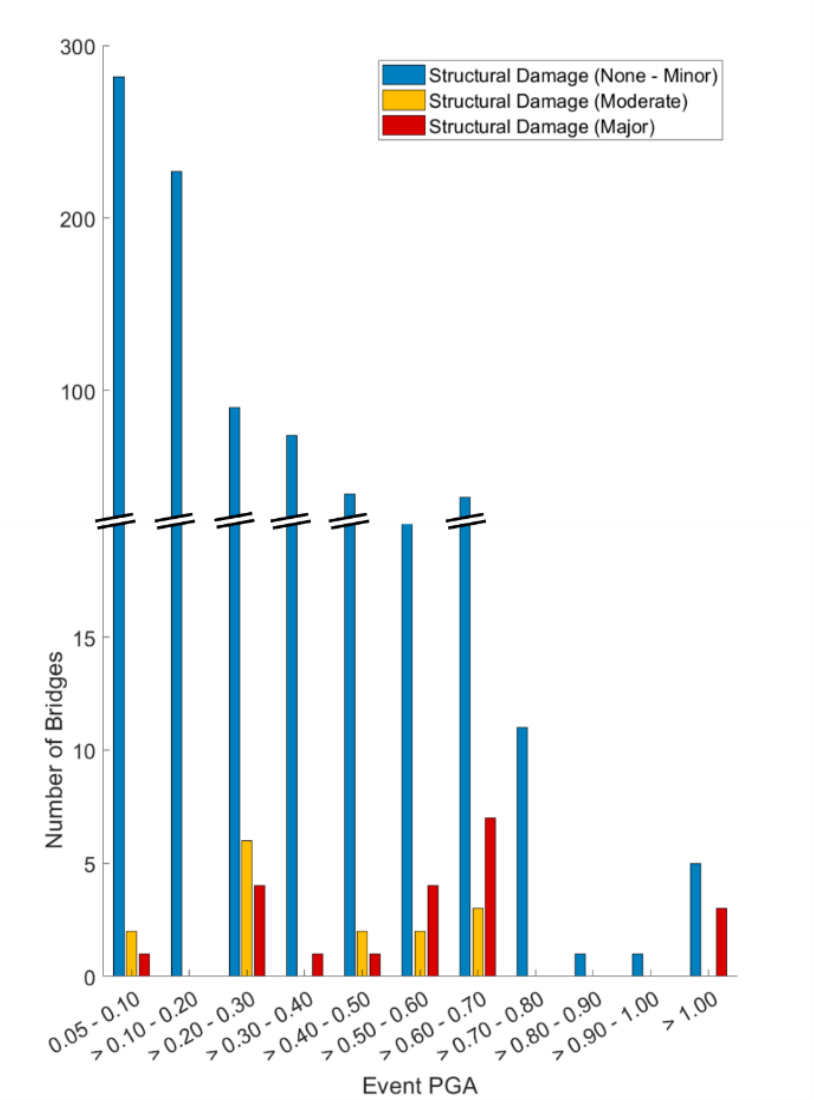
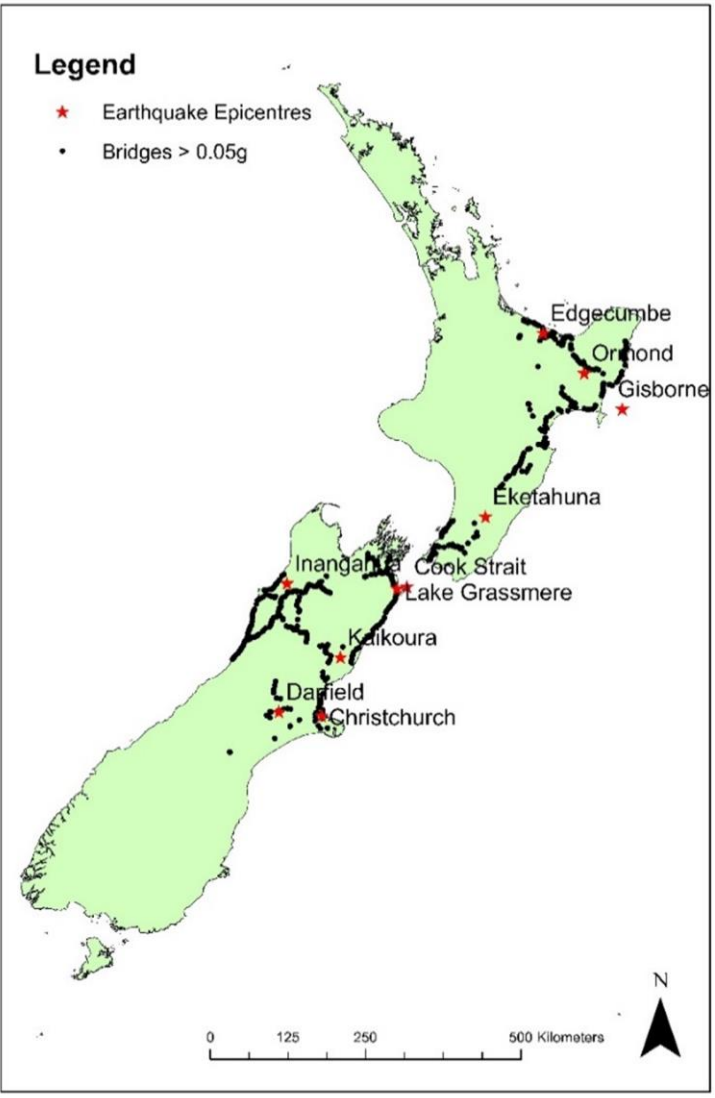
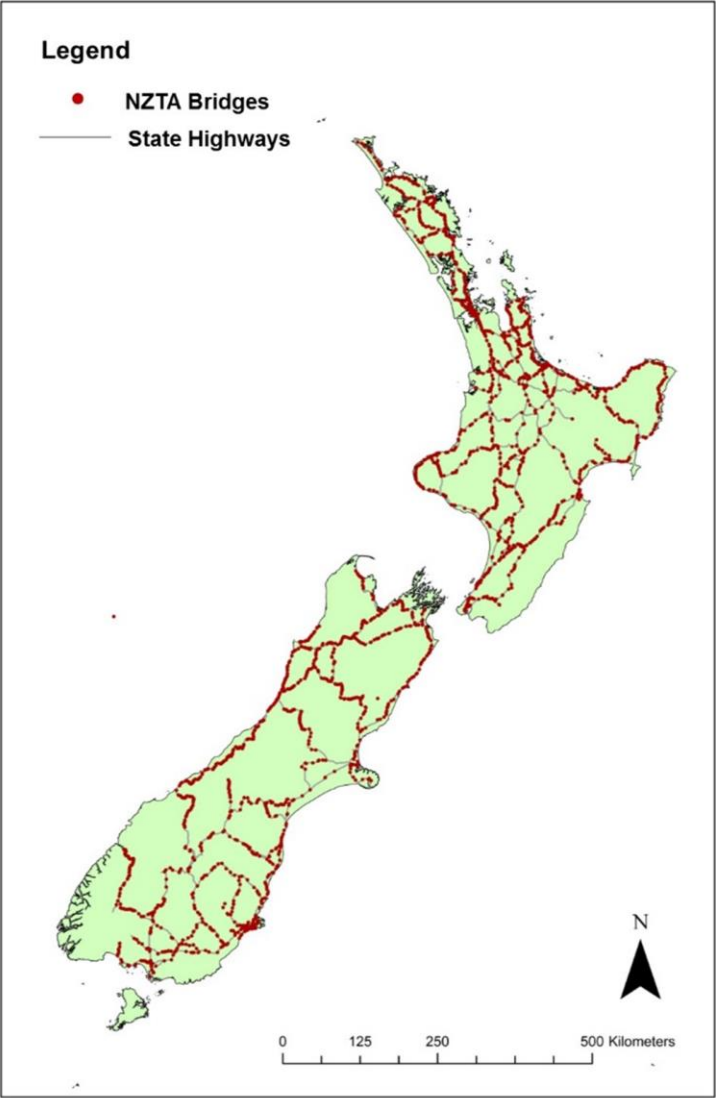
Bellagamba et al.

# Electricity Distribution





# Bridges



Lew et al.

Lew et al.



QuakeCoRE  
NZ Centre for Earthquake Resilience  
Te Hiranga Rū



National  
**SCIENCE**  
Challenges

RESILIENCE  
TO NATURE'S  
CHALLENGES

Kia manawaroa  
– Ngā Ākina o  
Te Ao Tūroa

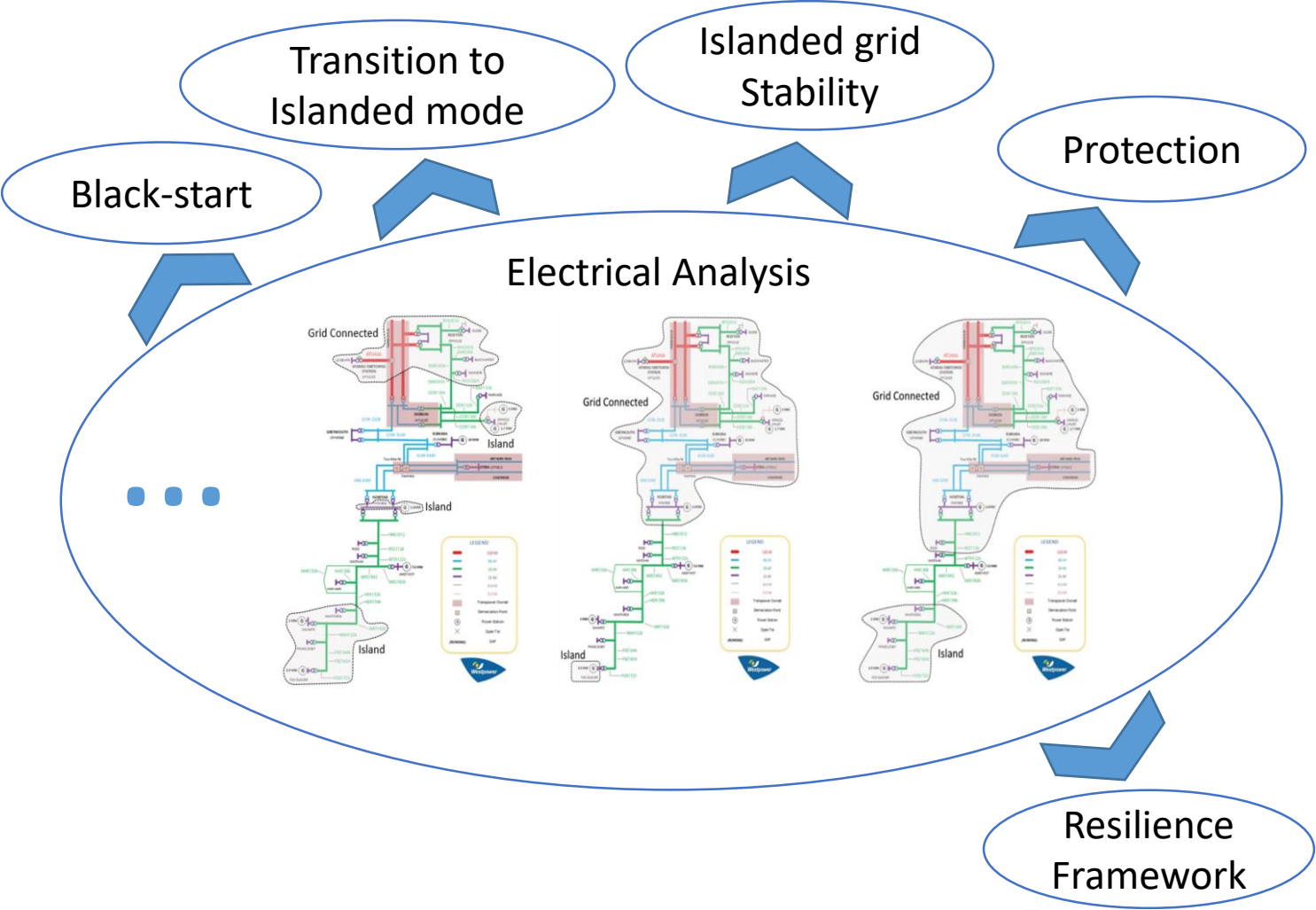
# Tsunami



# Infrastructure Networks

- Network process models rather than physical damage models
  - Represent the flow of the network
  - Enables assessment of network management strategies
  - Immediately post event: Functionality controls
  - During recovery: Damage controls
- Collaboration with network-specific researchers

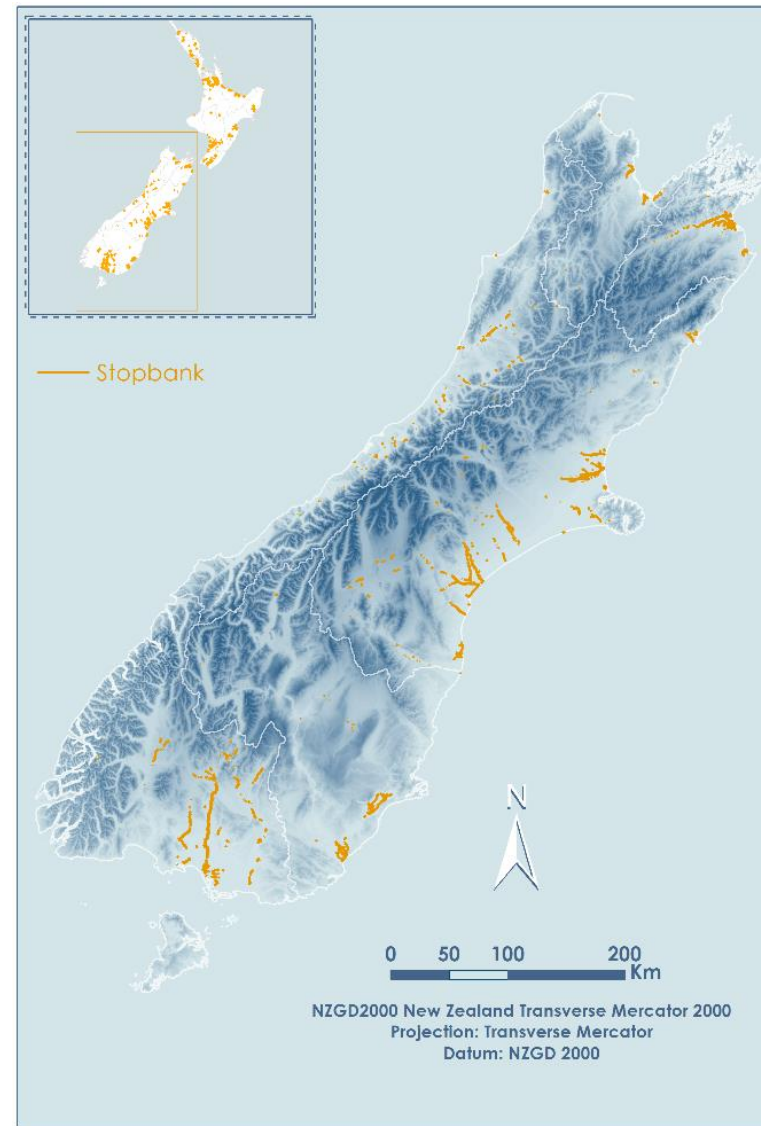
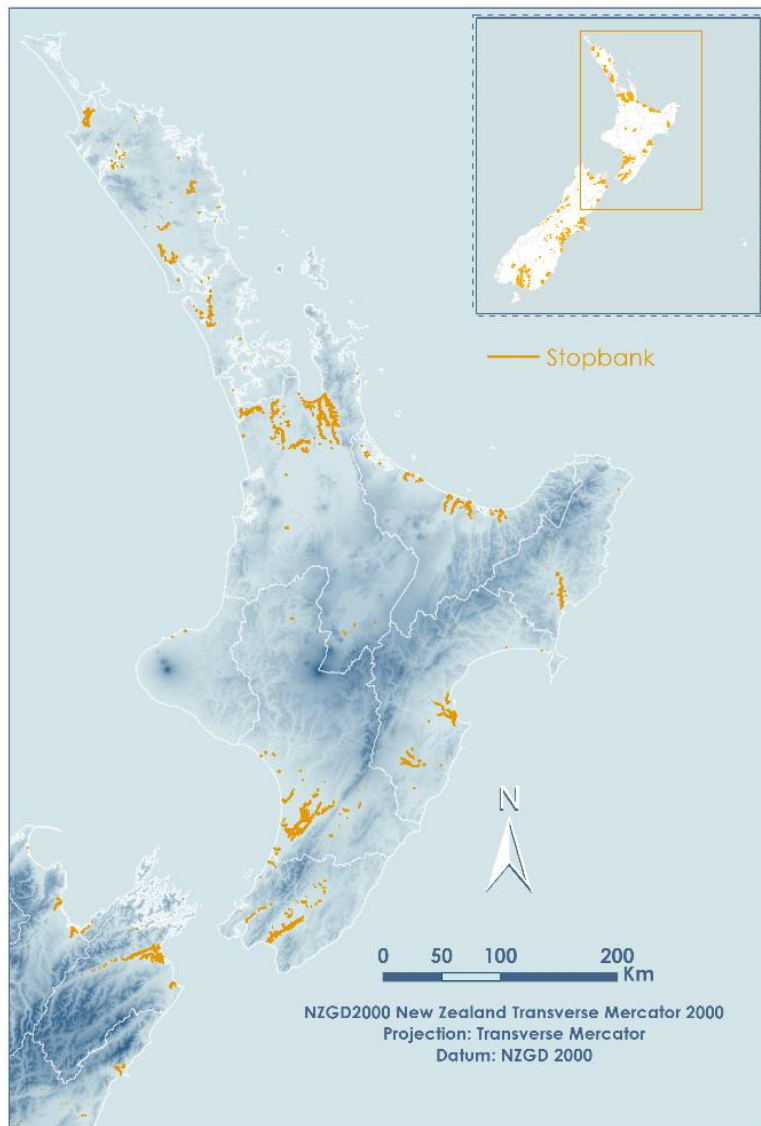
# Electricity Distribution



Nair et al.



# Flood Defence - NZIS



Blake et al.



QuakeCoRE  
NZ Centre for Earthquake Resilience  
Te Hiranga Rū

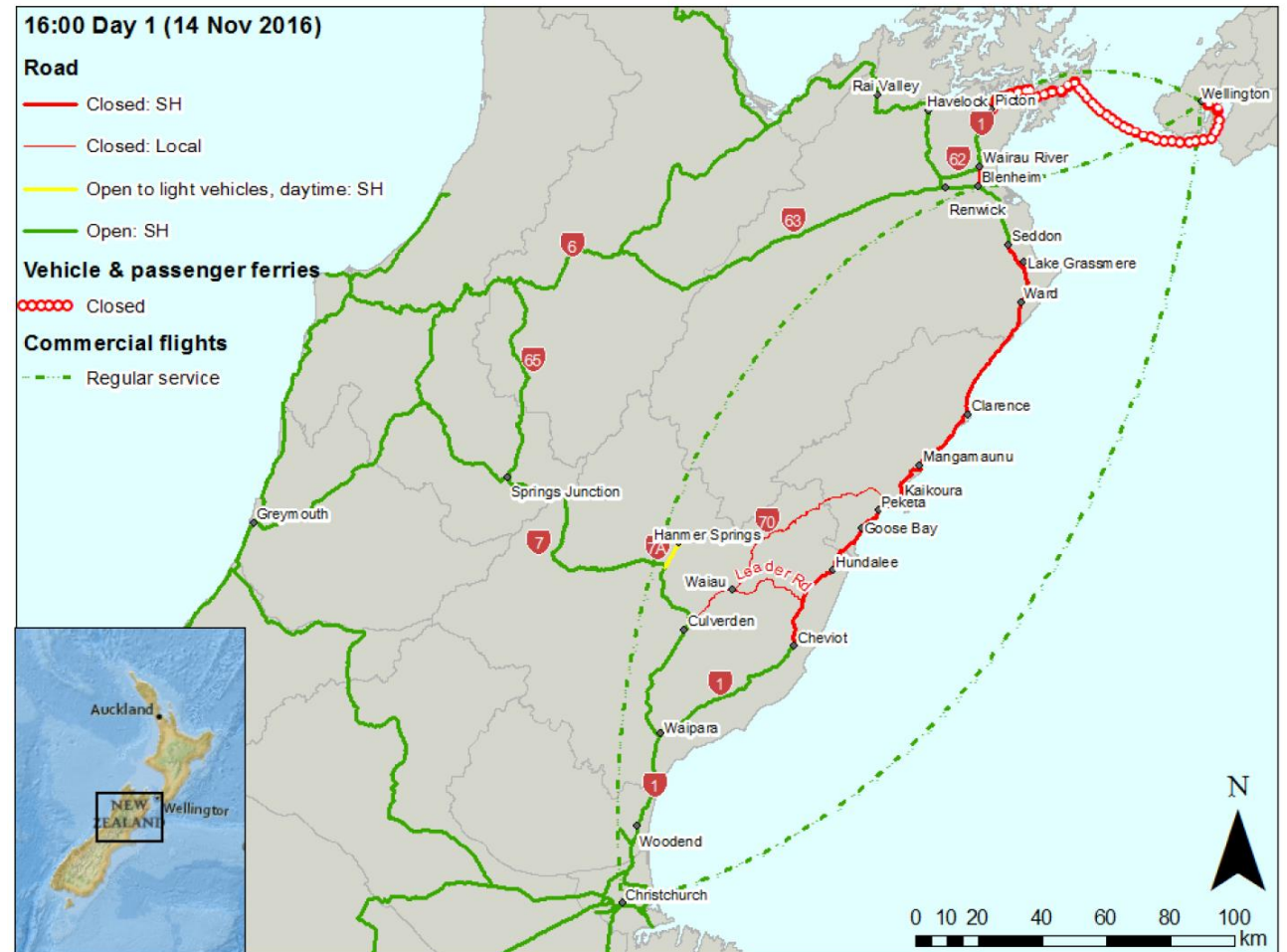
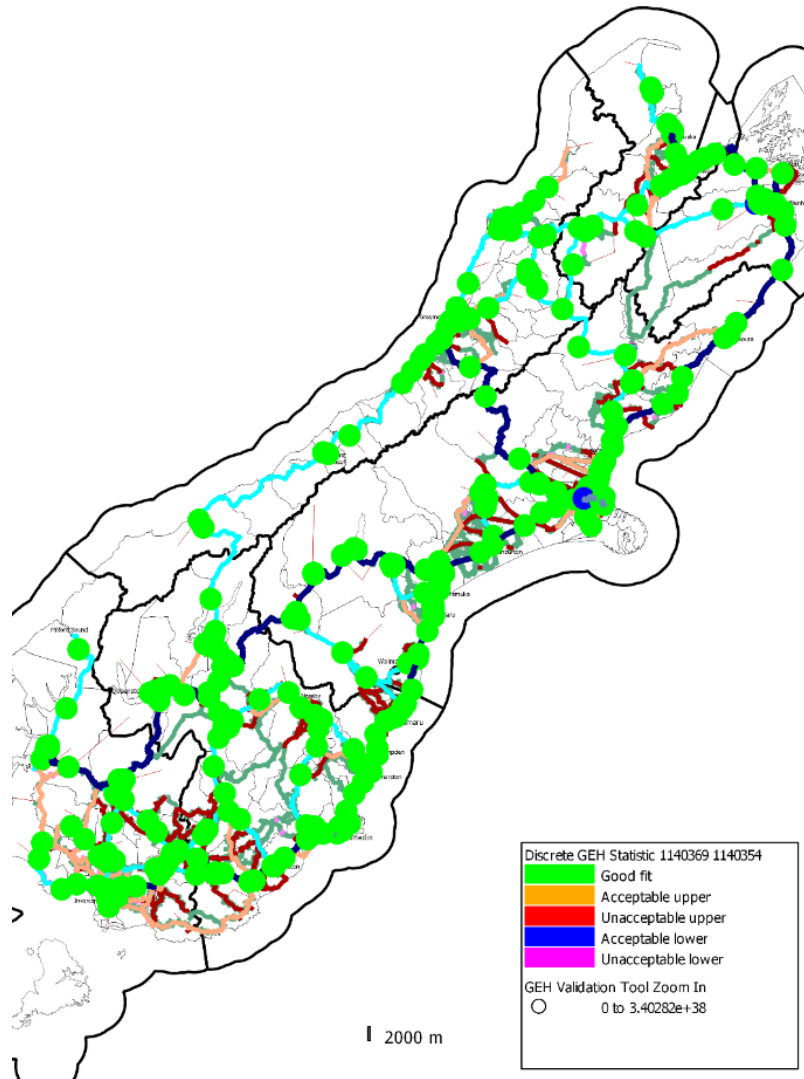


National  
**SCIENCE**  
Challenges

RESILIENCE  
TO NATURE'S  
CHALLENGES

Kia manawaroa  
— Ngā Ākina o  
Te Ao Tūroa

# Transport



**QuakeCoRE**  
NZ Centre for Earthquake Resilience  
Te Hiranga Rū



National  
**SCIENCE**  
Challenges

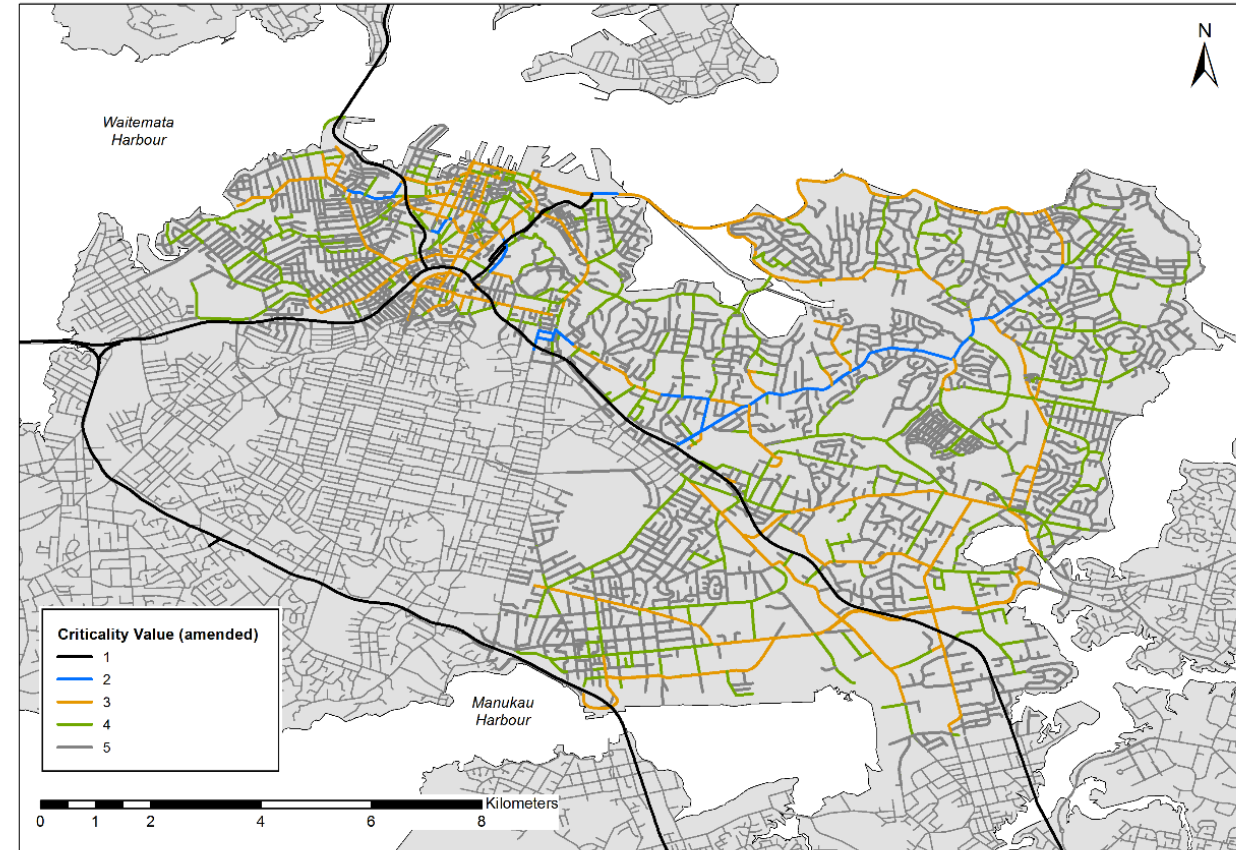
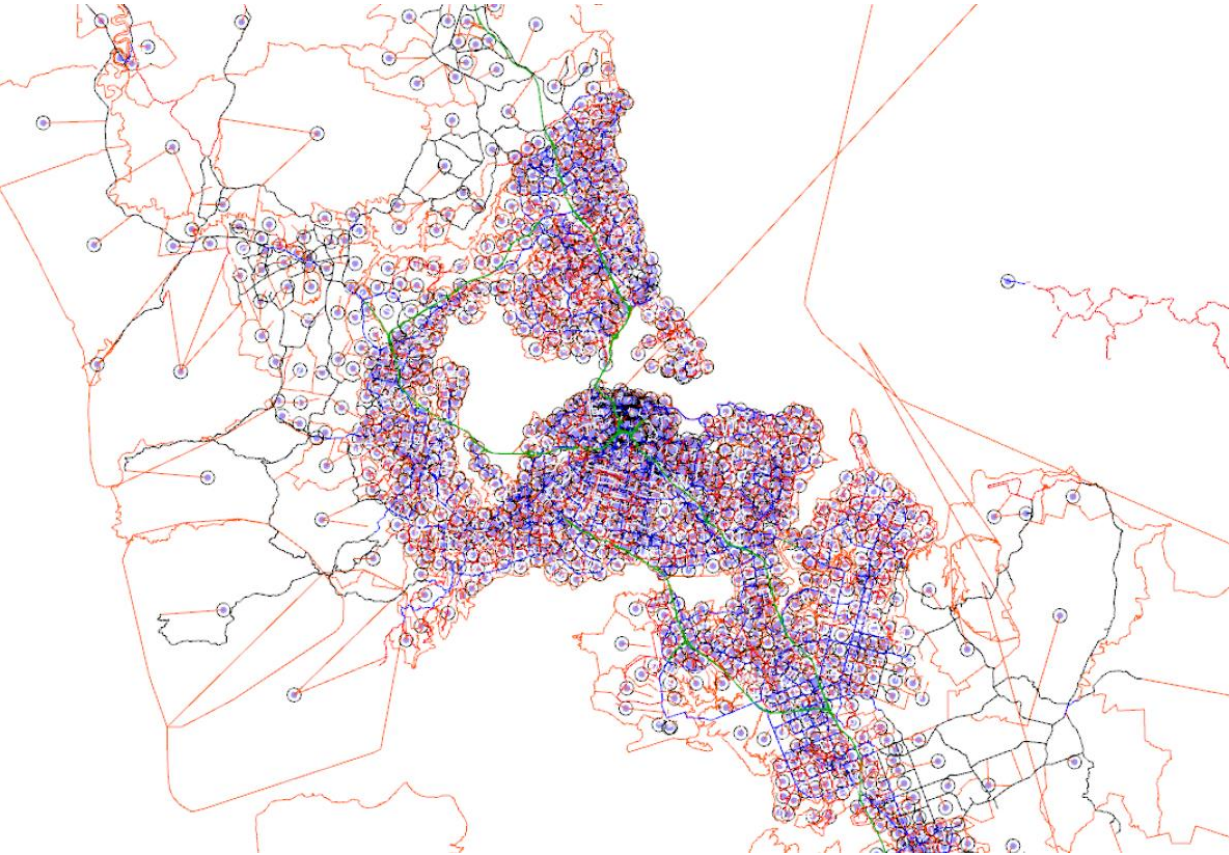
Aghababaei et al., Davies et al.

**RESILIENCE  
TO NATURE'S  
CHALLENGES**

Kia manawaroa  
– Ngā Ākina o  
Te Ao Tūroa



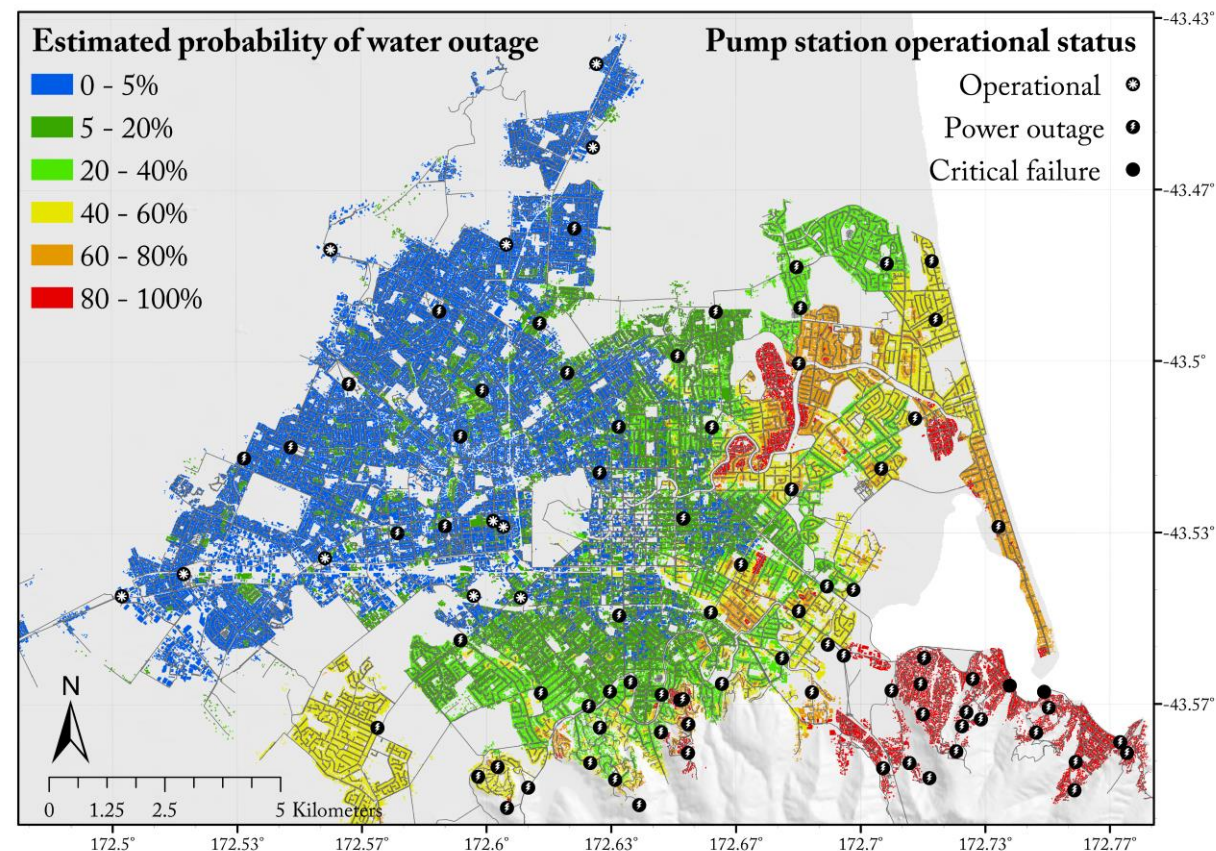
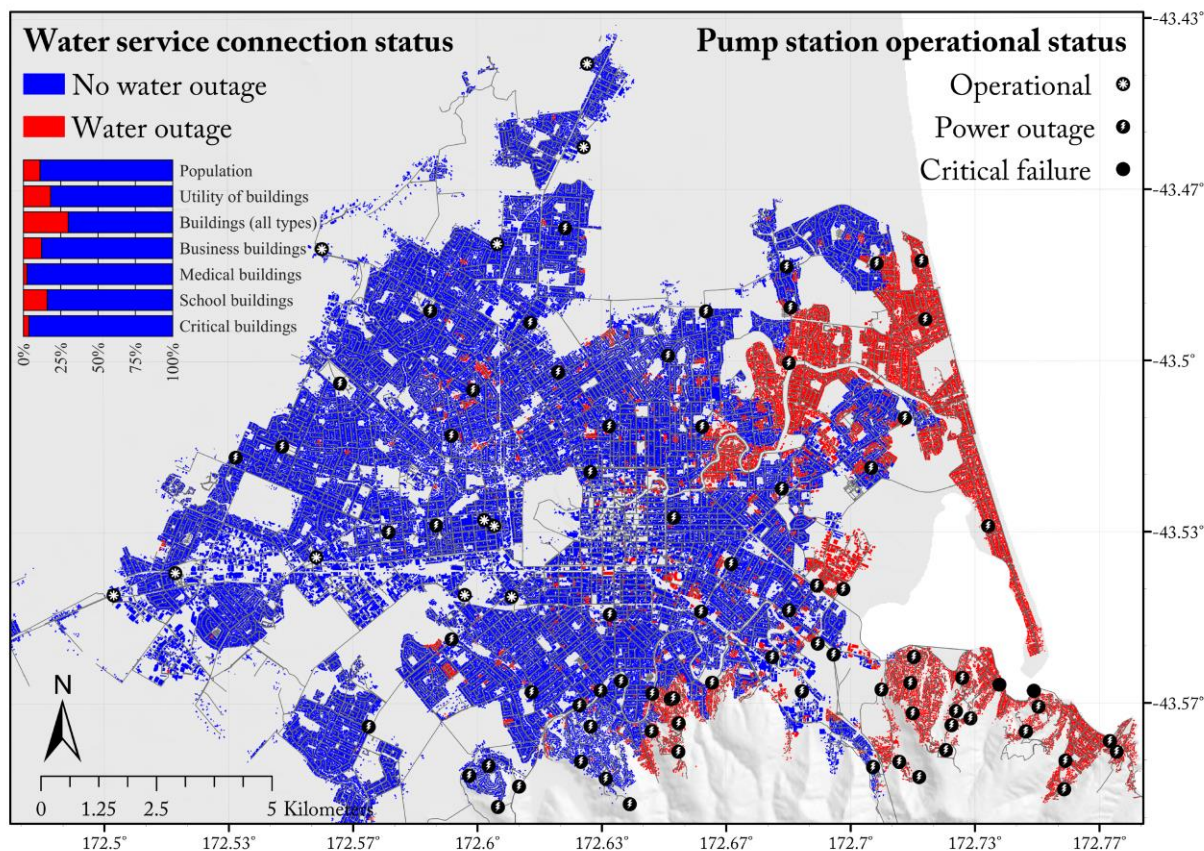
# Transport



Afzal et al., Rebello et al.

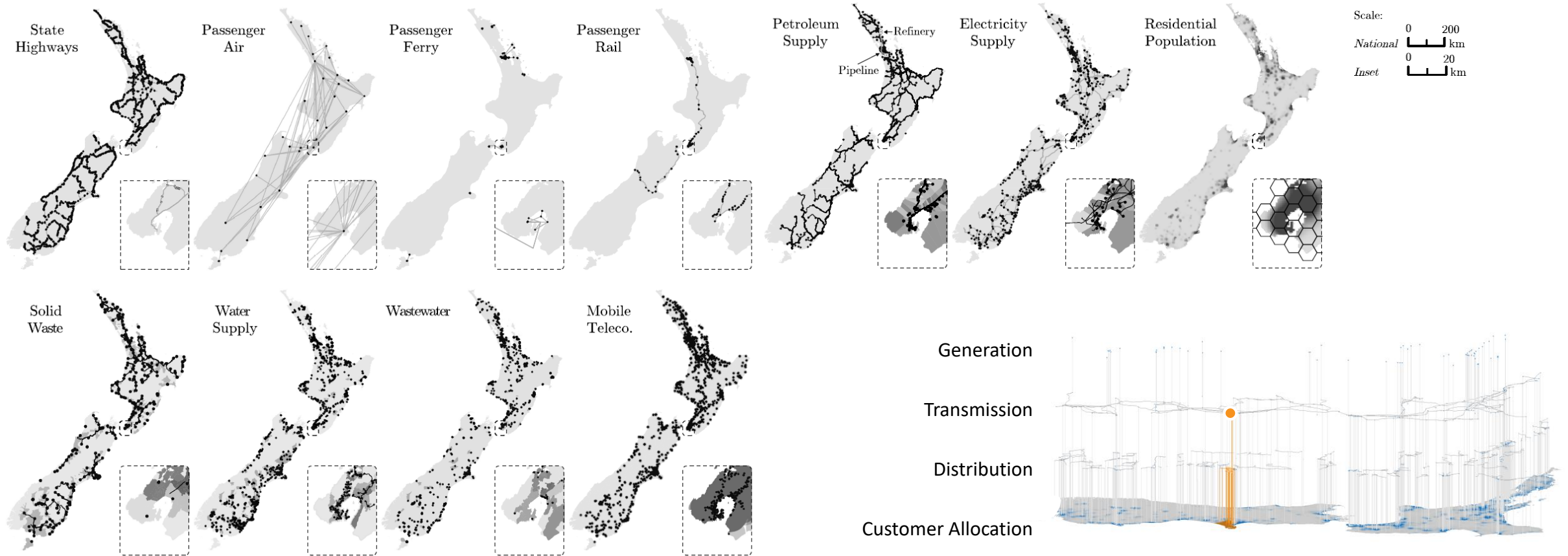


# Interdependencies: Potable Water + Power



Bellagamba et al.

# Interdependencies: National Scale



Zorn et al.

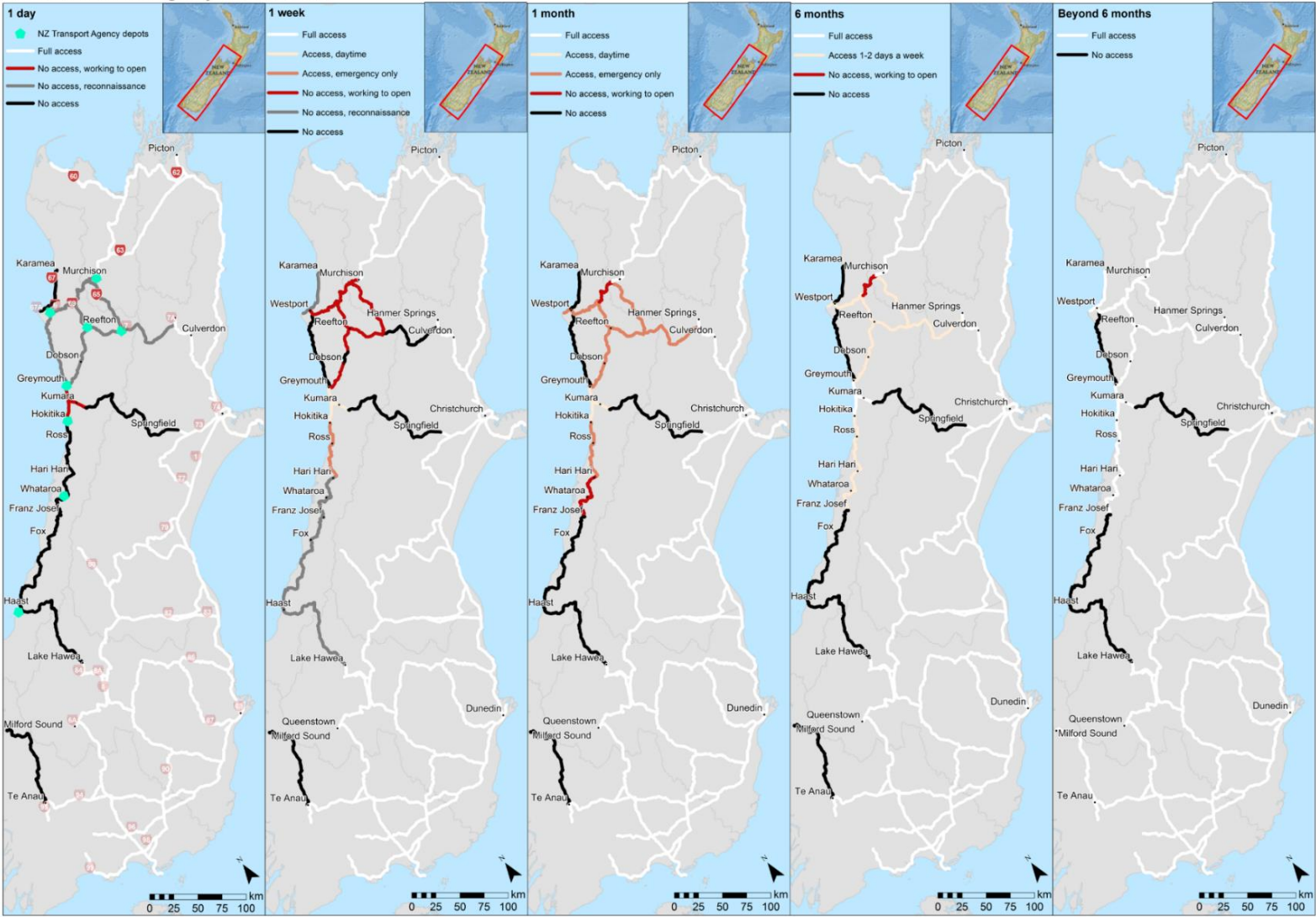
# Recovery

- Immediate response strategies
  - Rapid network management decision making
- Assess potential recovery strategies + timing of interventions
- Integrate with building damage and habitability/usability
  - Change in pre- and post-event demand levels



# Recovery Co-creation

AF8+ scenario State Highway levels of service



Davies et al.



QuakeCoRE  
NZ Centre for Earthquake Resilience  
Te Hirainga Rū



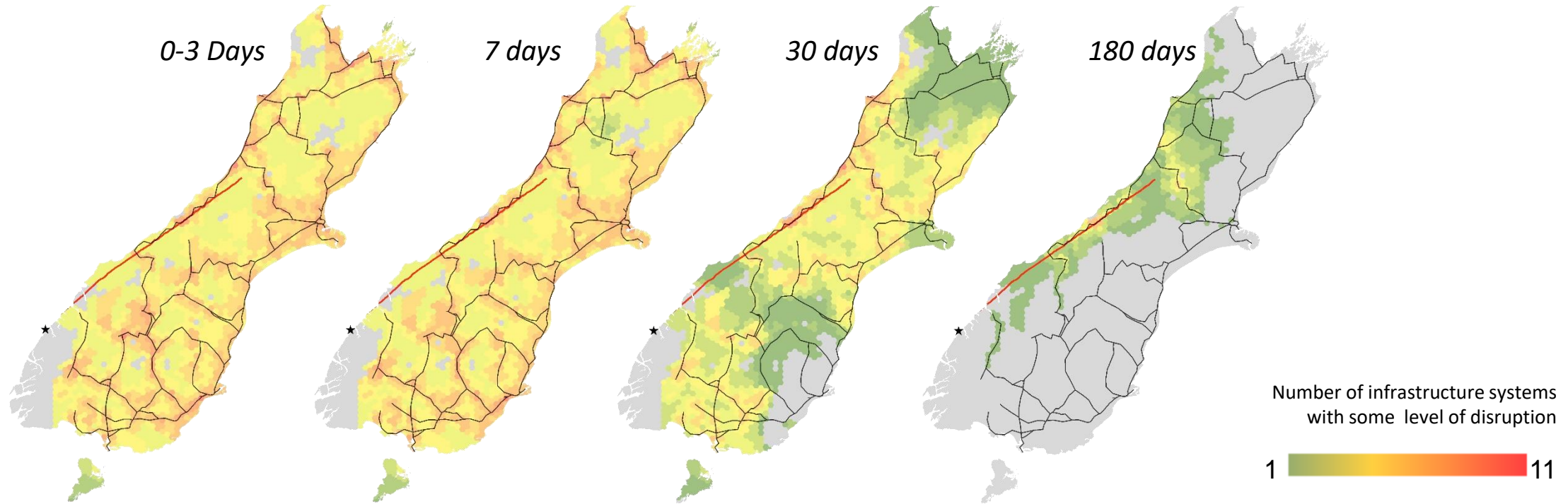
National  
**SCIENCE**  
Challenges

RESILIENCE  
TO NATURE'S  
CHALLENGES

Kia manawarao  
– Ngā Ākina o  
Te Ao Tūroa

# Recovery

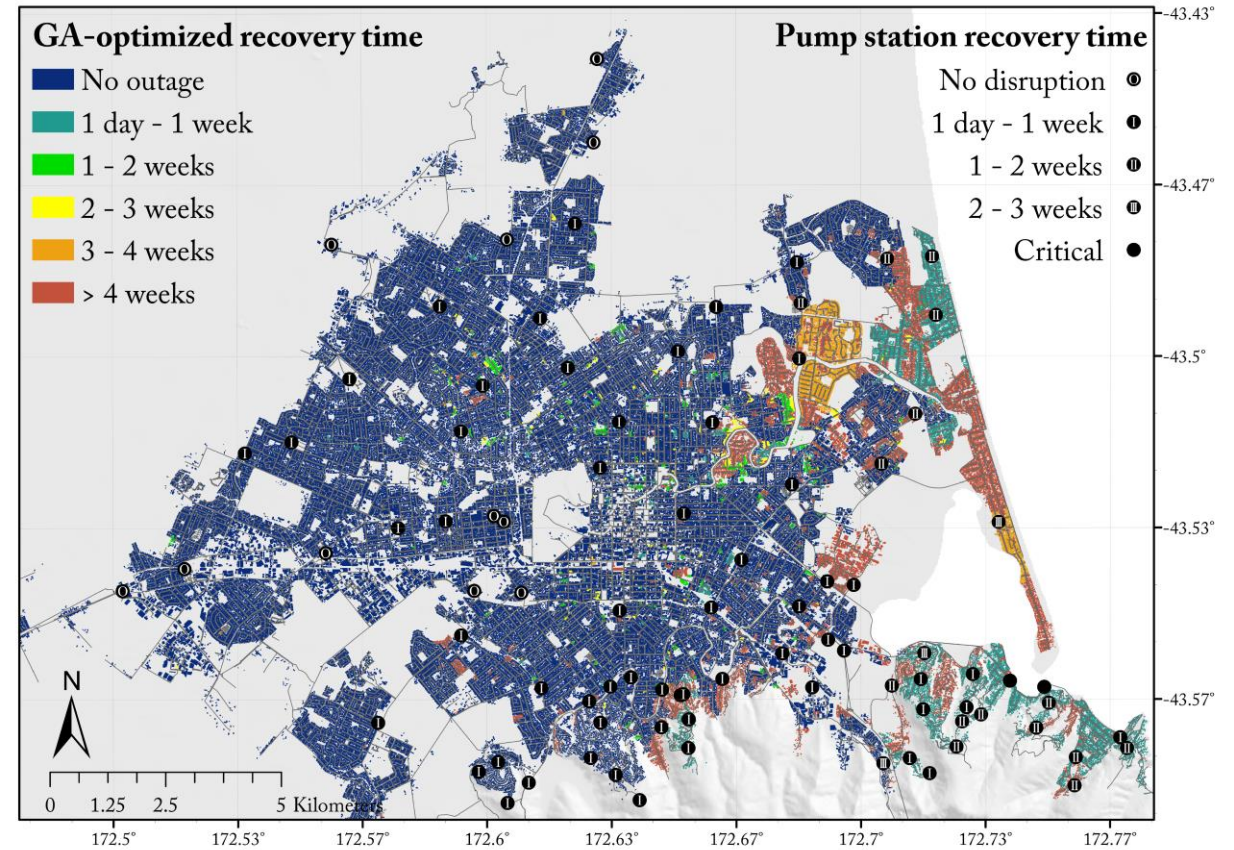
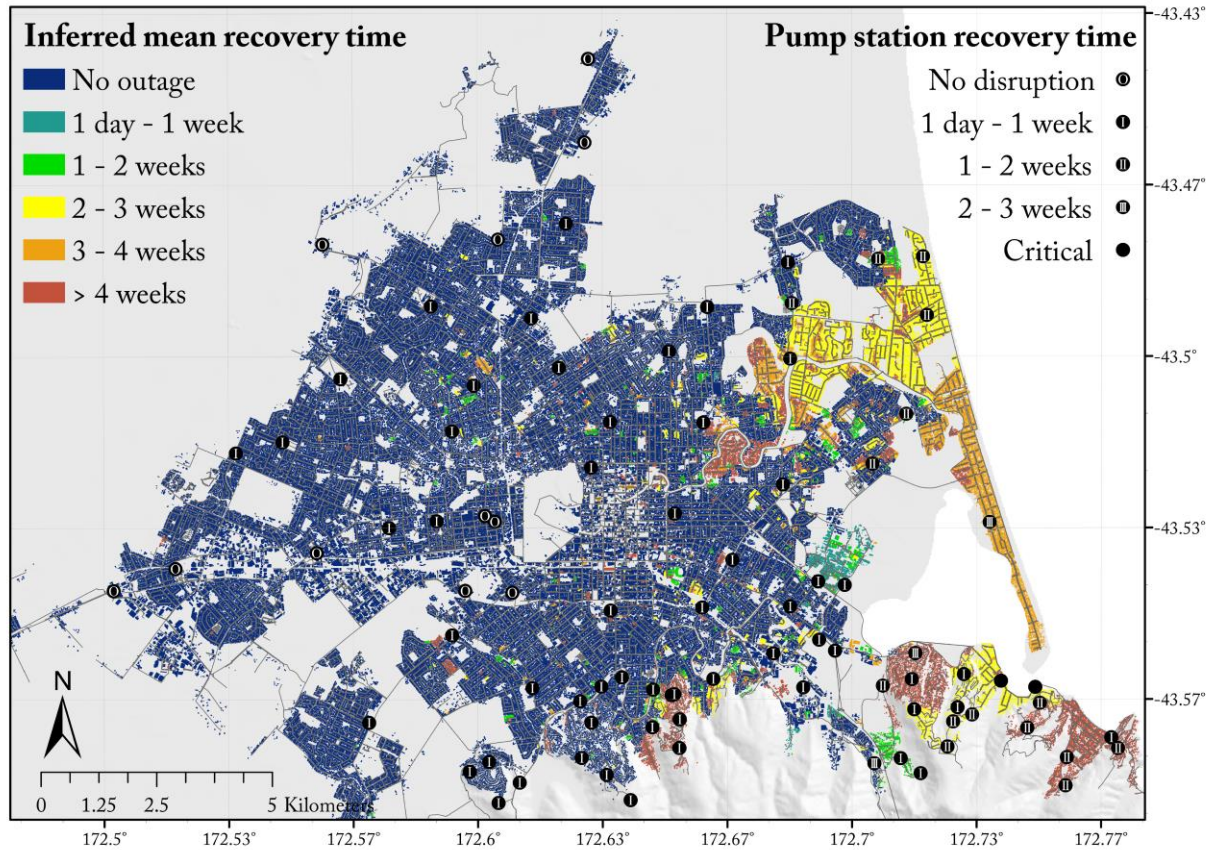
- S-N Scenario – Cumulative disruption



Zorn et al.



# Recovery Optimisation



Bellagamba et al.

# Forward to RNC2!