

Lifelines Research

- Delivering NZ a Thriving Transport Network, Stuart Woods
- The Science Challenges & QuakeCoRE, Liam Wotherspoon
- Geospatial – the Power of Where, Anna De Raadt
- Resilient Infrastructures for Resilient Communities, Sonia Giovinazzi
- The Economics of Resilient Infrastructure, Erica Seville

2015 National Lifelines Forum

22 October 2015

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Delivering New Zealand a thriving transport network

Purpose of NZ Transport Agency

Stuart Woods, NZTA

- 11,000 kilometers of state highways
- Our goal:
 - improve the experiences that people have on our highways
 - ensure the state highway network is resilient



The Resilience Project

“Keeping our roads open”

- Build on and improve existing measures
- Develop Best Practice models
- Produce tools and resources



The Resilience Project

“Keeping our roads open”



Our Work

- Business Continuity Plans
- Emergency Response Plans
- Infrastructure Planning



Research



The Resilience Project

"Keeping our roads open"



Working with you

- Engaging with stakeholders
- Share information and knowledge
- New Zealanders can rely on our state highway network, even when the unexpected strikes.



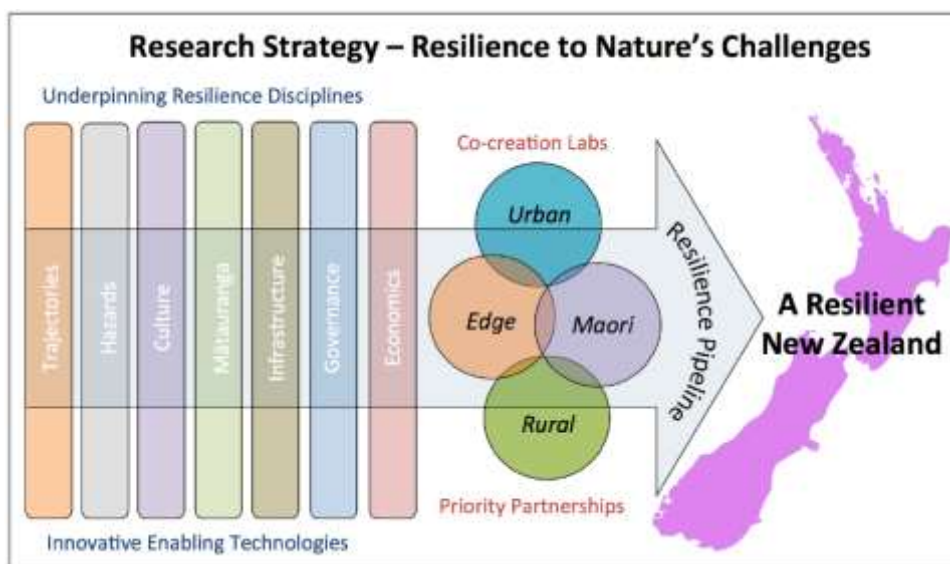
National Science Challenges

- Designed to take a more strategic approach to the government's science investment by targeting a series of goals, which, if they are achieved, would have major and enduring benefits for New Zealand.
- The Challenges provide an opportunity to align and focus New Zealand's research on large and complex issues

NSC10 – Resilience to Nature’s Challenges

- Enhance New Zealand’s resilience to natural disasters
- \$19.4 million/4 years
- Science co-creation model
- Add additional value to existing investments
 - NHRP, QuakeCoRE, EQC, GeoNet, etc

<http://resiliencechallenge.nz>



QuakeCoRE

Centre for Earthquake Resilience

Mission: To place NZ at the worldwide forefront of earthquake disaster resilience through...

Creation of an **enabling national collaboratory** of researchers and stakeholders...

for development of **new knowledge** on the **seismic response** of the **built environment** and...

***Overarching goal...** a paradigm shift in design and operation of infrastructure components toward system-level optimisation for earthquake resilience.*

design of **innovative technologies** and **decision-support tools** enabling rapid recovery of NZ communities.

-Hosted at Univ of Canterbury

Partners:

UAuckland
Victoria Univ
Massey Univ
Waikato Univ
Unitec
ResOrg
GNS Science
BRANZ

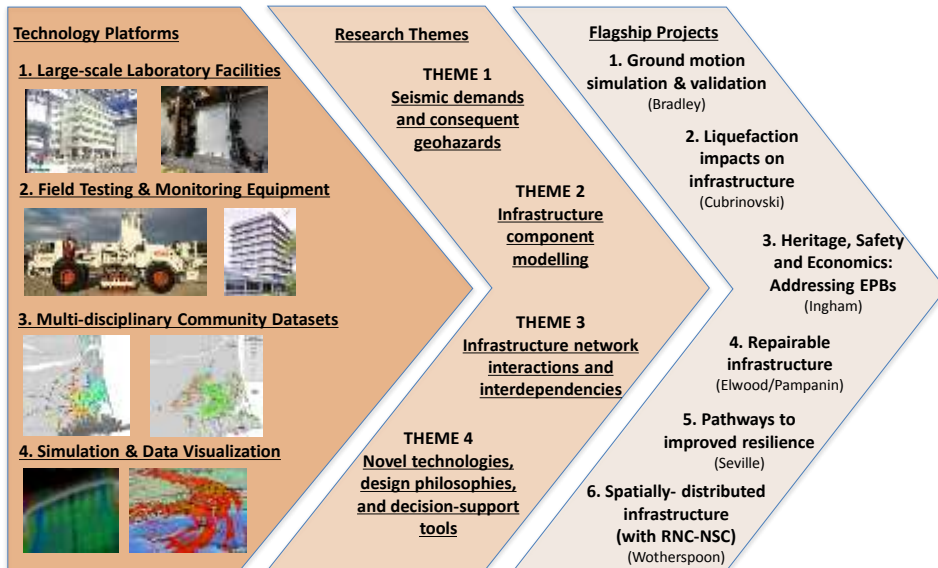


<http://quakecore.nz>

QuakeCoRE

- \$22 million/5 years
- Strong links to industry and end-users
- Add additional value to existing investments
 - NHRP, NSC10, EQC, GeoNet, etc

QuakeCoRE

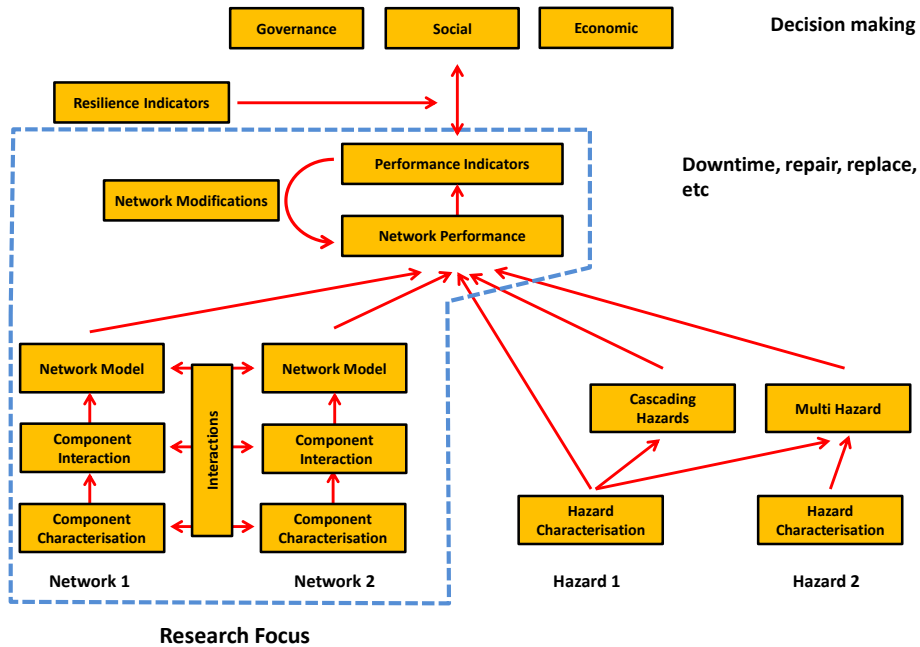


Distributed Infrastructure

- Development of tools to assess the performance of spatially-distributed infrastructure networks subject to extreme natural hazards
- Spatially distributed infrastructure (Lifelines +)
- Quantify resilience, impact of changes to network on resilience, infrastructure resilience rating

Components – Network – Impacts

Research – Outputs – Guidelines/Tools



Canterbury-West Coast Case Study

- Complex multi-hazard environment
- Agri-business & tourism key sectors
- Distributed infrastructure modelling
- End-user and regional partnerships to inform and drive resilience decision-making
- Regional and local focus



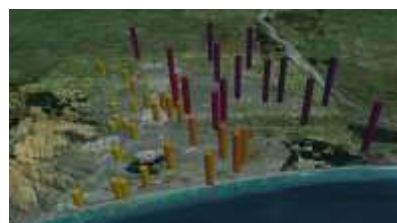
Infrastructure Components

- Wharves
 - Seismic and tsunami
- Bridges
 - Seismic and tsunami



Regional Site Characterisation

- Canterbury
- Auckland
- Nelson/Tasman





Geospatial – the Power of Where

2015 National Lifelines Forum Christchurch 21 – 22 October 2015

Dr Anna de Raadt
Director CRCSI NZ



Land Information New Zealand (LINZ)

- Central government agency, around 500 employees
- 3 Offices around NZ (Wellington, Hamilton and Christchurch)
- Responsible for management of property rights, location information and Crown Land.

CRCSI for Spatial Information (CRCSI)

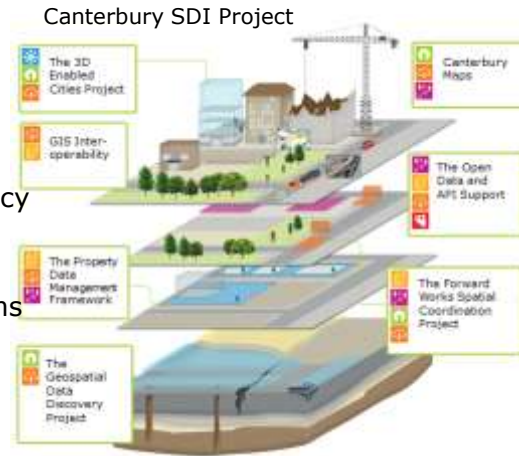
- \$185m joint venture (2010 – 2018) of government, academic and private organisations
- Accelerate the spatial enablement of Australia and New Zealand
- 70 participants – 48 company, 12 Government and 10 universities



Geospatial - The Power of Where



- National Geotech Database
- Forward Works
- Sensing Cities
- Incident response, emergency services
- Aviation
- Intelligent Transport Systems
- Crowd sourcing



NZ Geospatial Research Conference, Christchurch, 7-9 December 2015
www.nzgrc15.canterbury.ac.nz



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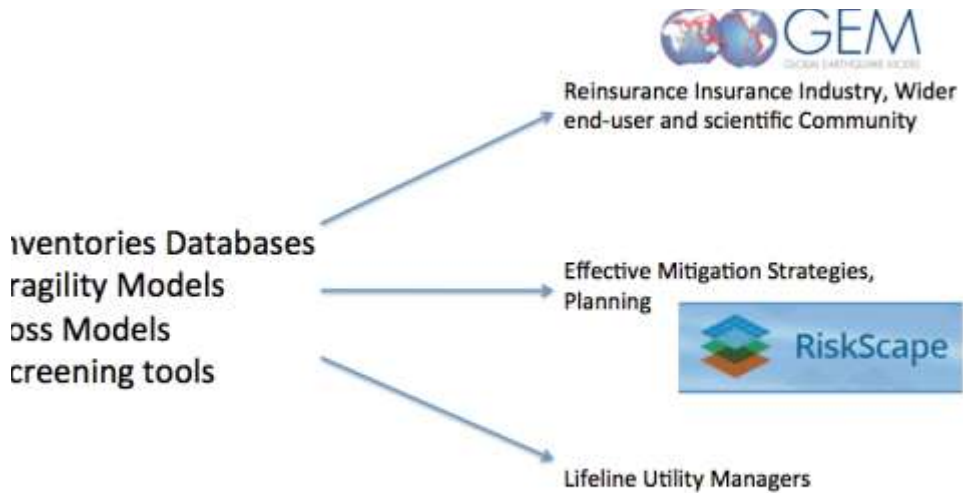
Resilient Infrastructures: Research & Outreach

<https://sites.google.com/site/resilientinfrastructures/>



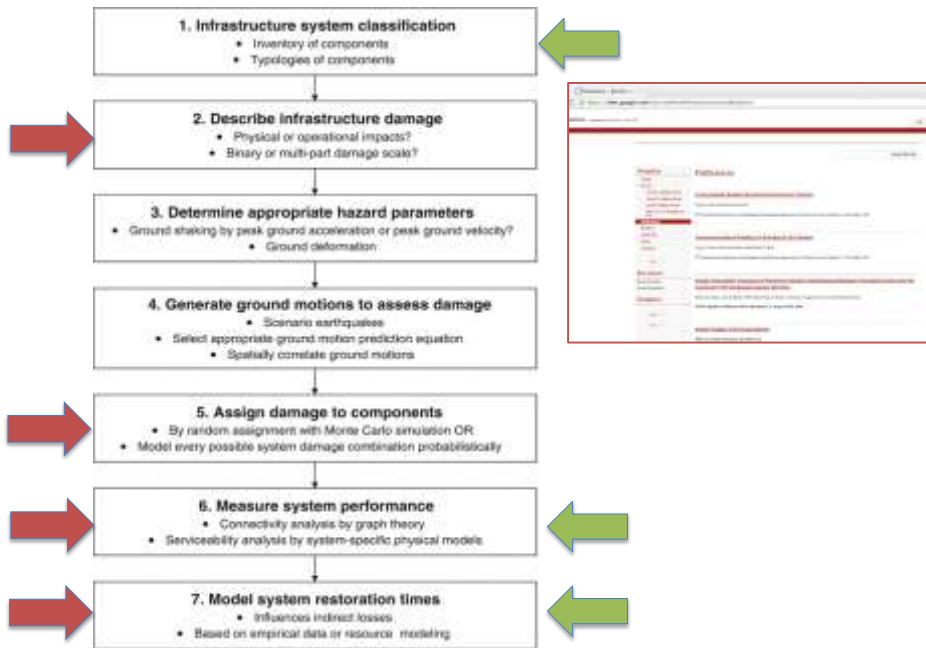
This website would like to serve as a virtual hub for both researchers and practitioners working towards more resilient infrastructures for:

Projecting Damage and Losses 1/2



Projecting Damage and Losses for Buildings and Infrastructures from the Canterbury Earthquake Sequence

Projecting Damage and Losses 2/2



“NZ lifeline culture” a reference best-practice

Towards More Resilient Communities and the Lifeline Week
 22-23 April 2015 | 24-25 April 2015 | 27-28 April 2015

Resilient Infrastructures for Resilient Cities & Communities

A series of lectures, workshops and open discussions by the attendees from New Zealand, Europe and United States will share the experiences and learning of their organisations on fostering the resilience of infrastructure amidst the realities of their cities and communities.

The workshops from New Zealand will take you through both the phases and activities and the learning of their organisations as they collectively engaged in creating a resilient and thriving sector of greater Christchurch following the earthquake sequence that struck the area during 2010 and 2011.

The event aims to foster workshop connections and cooperation among academics, researchers, asset managers and stakeholders working in the space of resilient infrastructure, to join and synergise efforts and engineering towards the identification of their position and strategies.

Key Topics

- Physical threats - social, economic and environmental impacts
- Resilient systems
- Governance and leadership
- Standards
- Information and Data Management
- Delivery
- Research and Development
- Community resilience
- Communication and community engagement

Organised by Dr James O'Connell, University of Canterbury and supported by the following organisations:

- New Zealand Lifelines
- EMRP
- SCIRT
- crc-si
- Land Information New Zealand
- RETE
- EUCENTRE
- EQC
- with telus
- ROADS
- ACE INFRASTRUCTURE RESILIENCE
- ISI
- University of Canterbury
- KIT
- Government of Canterbury



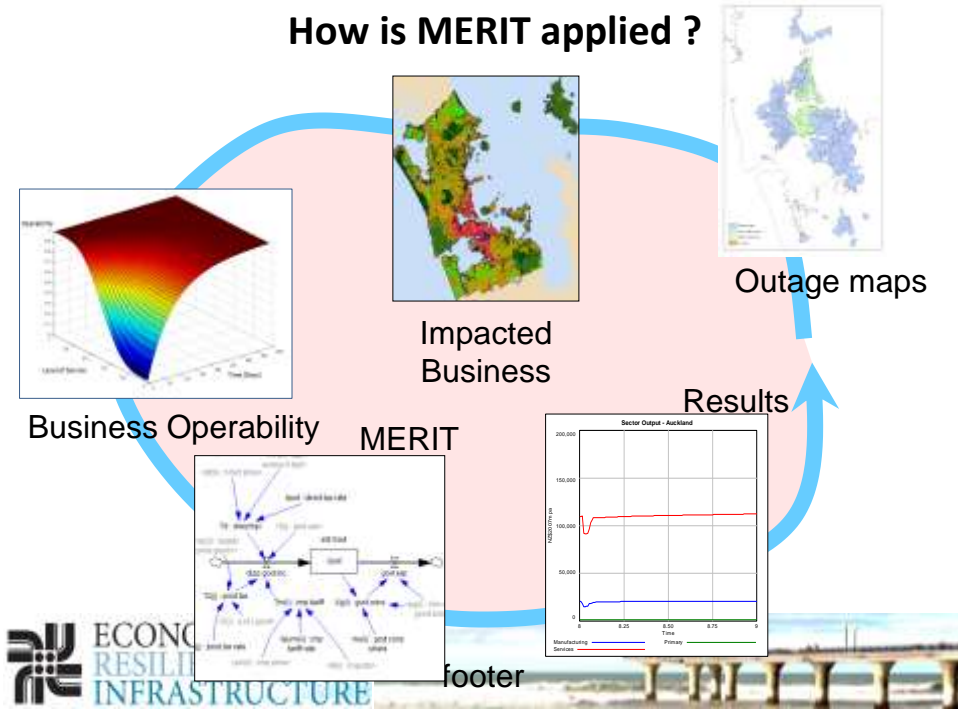

ECONOMICS of RESILIENT INFRASTRUCTURE

Identify and explore:

1. Temporal and spatial changes in GDP, employment, income, labour/capital markets etc. from different types of failure
2. Causal mechanisms through time (interdependencies, cascading effects, feedbacks and lags)
3. The effect different mitigation (pre-event)/response (post-event) options (policy, infrastructure, business) have on the economic impacts



How is MERIT applied ?



Auckland water supply scenario: Impacts on Value Added

- Single infrastructure scenario
- Failure of 2 tunnels leading to loss of supply (62%)
- 40 day scenario

Total Industry Value Added Over Impact Year

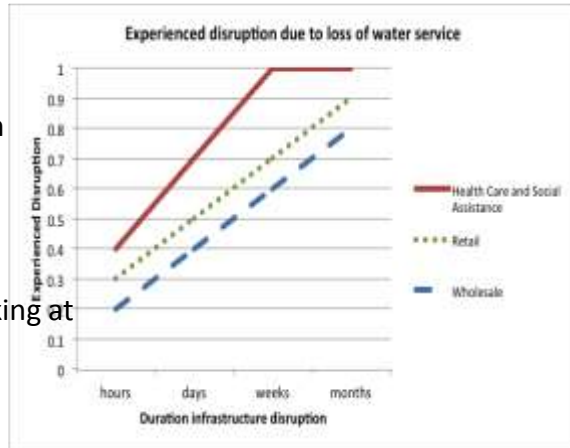
Sector	Auckland			Rest of NZ		
	Baseline (\$ ₂₀₀₇ mil)	Outage (\$ ₂₀₀₇ mil)	Difference	Baseline (\$ ₂₀₀₇ mil)	Outage (\$ ₂₀₀₇ mil)	Difference
Primary	486	478	-1.6%	10,437	10,383	-0.5%
Manufacturing	6,665	6,612	-0.8%	13,886	13,844	-0.3%
Retail, food & accomm. servs	10,859	10,709	-1.4%	13,449	13,382	-0.5%
Finance, insurance & business servs	16,145	15,926	-1.4%	18,127	18,042	-0.5%
Recreation, personal servs	3,977	3,954	-0.6%	8,844	8,833	-0.1%
Other services	28,274	27,782	-1.8%	49,804	49,507	-0.6%
Total	66,405	65,461	-1.4%	114,548	113,991	-0.5%



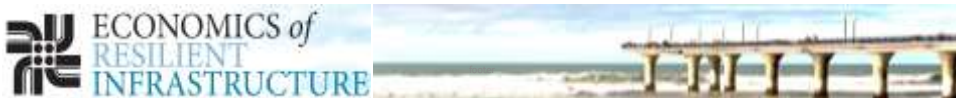
MERIT – Modelling Economics of Resilient Infrastructure

Current Case Studies:

- 36hr power outage
- 1 month water disruption
- 3 month port disruption
- Volcanic eruption
- Alpine Fault earthquake
- Also used in projects looking at airports and roads



Most infrastructure types included



Potential Uses

- Quantifying the economic impacts of infrastructure disruption
- Supporting the business case for infrastructure resilience investments
- Prioritising resilience investment within and between infrastructure types
- Developing service restoration strategies to minimise overall economic impact
- Targeting support for businesses during a disruption



Lifelines Research

Thank you for your attention

2015 National Lifelines Forum

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