



Te Hiranga Rū | QuakeCoRE

Aotearoa New Zealand Centre for Earthquake Resilience

Resilient Transport System Research Coordination Workshop

IP3: A Resilient Aotearoa New Zealand Transport System

August 2022

Overview

This workshop provided an opportunity for attendees to hear about current transportation research (within and external to QuakeCoRE), and to hear from industry representatives on the ongoing resilience initiatives. This workshop was aligned with the activities of IP3:A Resilient Aotearoa New Zealand Transport System theme. As this is a new stream of research for QuakeCoRE, a key driver of this workshop was the bringing of people together to discuss plans and ideas. A particular focus of the workshop was the comparison of the current research programme outcomes and the needs identified by industry, so that the research programme can meet industry needs going forward. Attendees also had the chance to discuss any challenges they were experiencing with the work, opportunities for further collaboration, and ways to enhance the impact of collective efforts.

Workshop Scope

The workshop was attended by persons from a range of organisations and with varied technical backgrounds. To maximise participation the workshop was a hybrid format with the majority of participants joining in-person and a small group joining remotely. The attendance list is summarised in the Appendix.

The key questions covered during the workshop were:

1. Current research – What recent and ongoing research are you aware of that relates to Transport System Resilience?
 - What are you/others doing?
 - Who is funding the work?
 - What is the timeline?
 - Any challenges or interesting findings to share?
2. Industry research priorities – What are current research priorities in industry? Are there any trends that might create research needs in the future?
 - What are transportation research priorities for key government agencies?
 - Is there anything that is not a priority but might emerge as a priority in the future?

Workshop participants worked in groups to address these questions. There were three groups in person and one virtual group, and the groups comprised a mixture of industry representatives, practitioners and researchers. The workshop session culminated in a final whole group session where research priorities were identified. The main points coming out of each of these sessions are summarised in the following sections.

Current Research and Projects

Projects:

- Lessons learnt from Kaikoura earthquake:
 - Landscape response to earthquakes (Multiple Projects).
 - Impact of landslides on lifelines networks during Kaikoura earthquake (road and rail) (PhD Project).
 - Freight transport disruptions (Researcher and Master's Project).
 - Tourism resilience and decision-making (PhD and Master's Project).
- Alpine Fault Earthquake:
 - Road prioritisation (Consulting project).
 - Emergency logistics response (Consulting project).
- Logistics Disruption and support:
 - Fresh Food (Master's Project).
 - Cruise shipping supply chain (PhD Project).
 - Wine industry resilience (Researcher Project) .
 - Pre-positioning of emergency supplies (PhD Project).
- Climate Change:
 - National Flood Risk Model (Multiple Projects).
 - Coastal Inundation Impacts on Infrastructure (Researcher Project).
 - Decision-making under deep uncertainty and influence of sea level rise (PhD Project).
 - Secondary impacts and isolation due to road disruptions (PhD Project).
 - West Coast Flooding impacts on tourism (Master's Project).
 - Waka Kotahi Climate Change Risk Assessment Tool (Consulting Project).
- Hazard Models:
 - National seismic and rainfall induced landslide hazard model (Researcher Project).
 - Geospatial seismic and co-seismic hazard exposure of infrastructure networks (Post-Doc Project).
 - Modelling of long-term geomorphic hazard cascades due to earthquake and rainfall (Multiple Projects).
- Hikurangi Subduction Zone:
 - Multi-hazard impacts on infrastructure (EQ+tsunami) – Napier Case study (Researcher Project).
 - Impact of Hikurangi subduction zone event on supply chains business and behaviour in Hawkes Bay (Masters Projects).
- Industry driven projects:
 - Assessment of the viability of SH detour routes (Consulting Project).
 - Land Transport Evacuation Routes (Consulting Project).
 - Kiwirail Resilience Business Case (Consulting Project).
 - CDEM Fuel Strategy (Consulting Project).

- Transport Models:
 - South Island Road Transport Model (Multiple Projects).
 - North Island Road Transport Model (PhD Project).
 - Auckland City Transport Model (PhD Project).
 - Agent Based Modelling for evacuation (Multiple Projects).
- Decision Making
 - Incorporating uncertainty into Cost Benefit Analysis for infrastructure investment (Consulting Project).
 - Integrating Transport asset management and resilience decision making (PhD Project).
- Lower North Island:
 - Supply chain criticality and resilience – Wellington Case Study (Masters Project).
 - Planning Emergency Levels of Service (PhD Project).
 - Resilience of transport networks in Wairarapa and Wellington to earthquakes and storms (Consulting Project).
- Impact of volcanic activity of transport networks and impact on people, freight and agriculture (PhD projects).
- Assessment of NZ maritime connectivity characteristics (Researcher Project).
- Development of vulnerability and fragility models for transport infrastructure (Multiple Projects).

Challenges:

- Data quality.
- Modelling of future behaviour.
- Availability of students and relevant skillsets.

Industry Research Needs

Priorities:

- General:
 - Science and research to back up policy and strategy.
 - A solid and consistent evidence base.
 - Coordination across sectors.
 - Early engagement with industry.
- Hazard Impacts
 - Identifying network areas that are more vulnerable.
 - Event scenarios.
 - All hazard risks framework – especially weather-related risk.
 - Climate change, sea level rise and groundwater rise impacts on infrastructure.
 - Assessment of range of hazard intensities – not just worst case.
- Critical Infrastructure expectations:
 - What do we define as critical infrastructure or critical national infrastructure?
 - Who are the critical customers of infrastructure?
 - PELOS (Planning Emergency Levels of Service) approach. Community needs to know their outage supply times. How does the community work with the info?
 - Transportation decision making in the context of managed retreat.
- Interdependencies across all infrastructure and into key sectors.
- Supply chain resilience
 - Interaction and collaboration across sectors.
 - Coastal shipping – opportunities for using the fleet.
- Transport Hubs:
 - Access and egress to ports and airports – reinforcing evidence around their value proposition and opportunities around their resilience.
 - Inland ports – supply chains and logistics impacts will change, with some are more or less vulnerable.
 - Liquefaction risk and mitigation at ports and port access.
- Response and recovery.
 - Need to understand the logistics needed and the time and the resources.
 - Fastest and most economic repair strategies.
 - Response and recovery data.
- Investment and economics
 - The link between asset management, resilience and justification for investment.
 - Assessing adequate insurance cover.
 - Different models of insurance.
- Monitoring:
 - Real-time remote sensing to inform awareness and response

- Instrumentation of key assets to inform knowledge of response and performance.
- Changing behaviour
 - Public transport, car dependence.
 - Commercial decision making and investment.
 - Housing intensification.
- Future unknowns:
 - Climate change.
 - Energy sources.
 - Centralised versus decentralised systems.

Challenges:

- Prioritisation of funding for areas outside of resilience.
- Stakeholder engagement fatigue (both industry and community).
- Tendency for agencies to be response focussed.
- Siloed treatment of the transport system (i.e. by transportation mode) in strategies such as the National Adaptation Plan.

Workshop Summary

The workshop process was able to identify and summarise the ongoing research activities, industry needs and highlight potential areas of collaboration. During the workshop the role that QuakeCoRE and other research programmes can play in supporting collaboration particularly for cross-disciplinary research was discussed. This should underpin the IP3 actions and activities moving forward.

The four main research priorities that emerged during the workshop were:

- Interdependencies – in terms of transportation system restoration and other critical infrastructure, as well as community needs.
- Economic evaluation / measurement of costs and benefits of seismic resilience investment (particularly capturing multi-generation and non-monetary benefits).
- Logistics and Supply Chain – physical and economic disruptions.
- Future unknowns in transportation – technology and climate change implications.

These research areas are either part of current research projects or will be the focus of future research projects in the IP3 programme. These will be developed further, including opportunities to align with the activities within other QuakeCoRE programmes and work in external research programmes.

Appendix

Table 1. List of Attendees

Name	Organisation
Cecile L'Hermitte	University of Waikato
Charlotte Brown	Resilient Organisations
Chris Massey	GNS Science
Christina Magill	GNS Science
Conrad Zorn	University of Auckland
Damon McKibben	HBRC
Daniel Mitchell	Ministry of Transport
Doug Mason	WSP
Jeff Fraser	WSP
Jo Fountain	Lincoln University
Kevin Wang	University of Auckland
Liam Wotherspoon	University of Auckland
Marion Shonfeld	Eye of the Wind
Michel de Vos	Port of Napier
Minh Kieu	University of Auckland
Mitchell Anderson	University of Canterbury
Nadia Trent	University of Waikato
Pathmanathan Brabhaharan	WSP
Paul Bagg	Waka Kotahi
Richard Mowll	WELG
Roger Fairclough	NZ Lifelines Council
Seosamh Costello	University of Auckland
Stefania Mattea	Market Economics
Stuart Woods	Waka Kotahi
Tom Logan	University of Canterbury
Tom Robinson	University of Canterbury