The resiliency of communication infrastructure during (AF8) earthquake scenarios in West Coast, NZ

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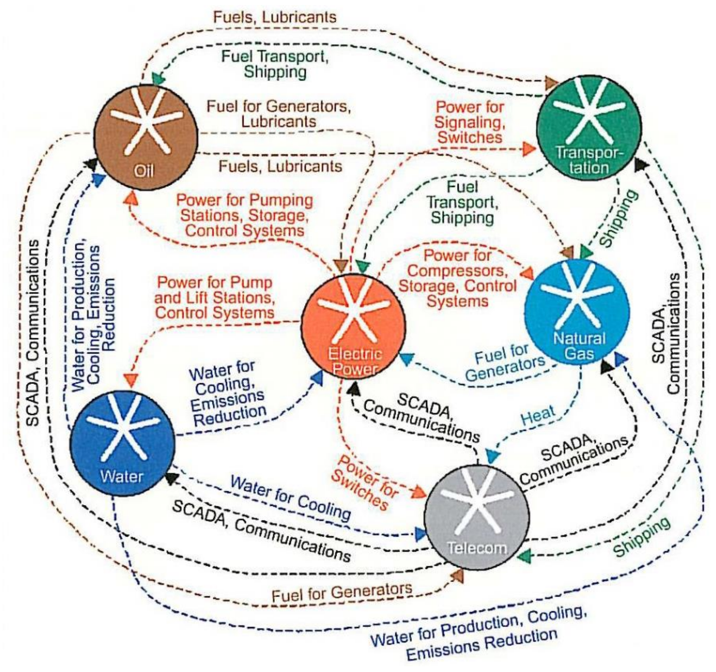
Motivation

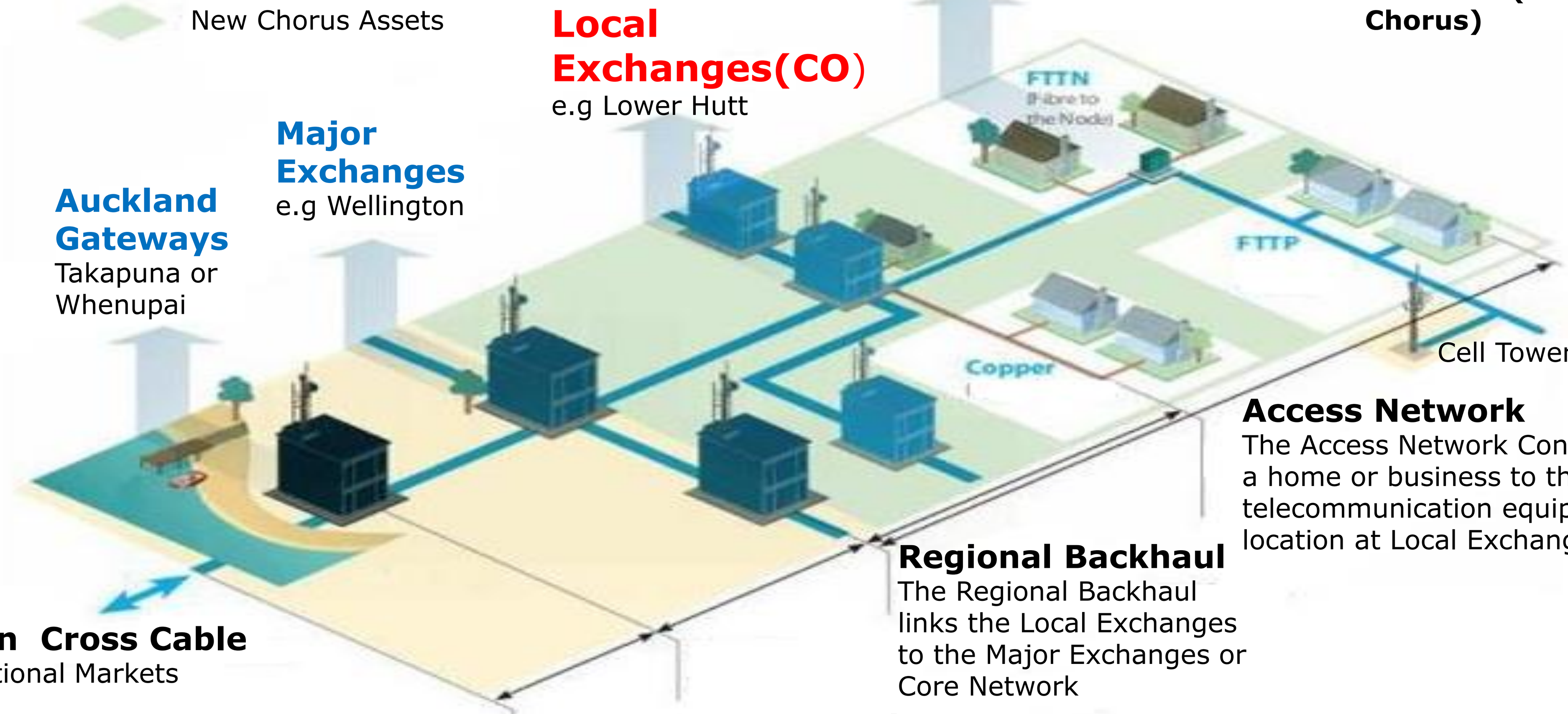
- Any contingency or recovery plan must have communication as one of its most critical supporting elements. Therefore, to keep the communication network up and running becomes most vital in during and post-disaster scenarios, when the services are most needed for restoring other critical lifelines, due to inherent interdependencies (see right), and for supporting emergency and relief management activities.
- In spite of the recognized critical importance, the assessment of the seismic performance for the communication infrastructure is underrepresented in the literature. This research project aims to help to bridge this gap.
- Past earthquakes in New Zealand and internationally have demonstrated their destructive effects on communication infrastructure system functionality and the flow-on impacts on post-disaster recovery efforts. Examples of damage to the communication infrastructure following the 2016 Kaikōura earthquake are shown here.



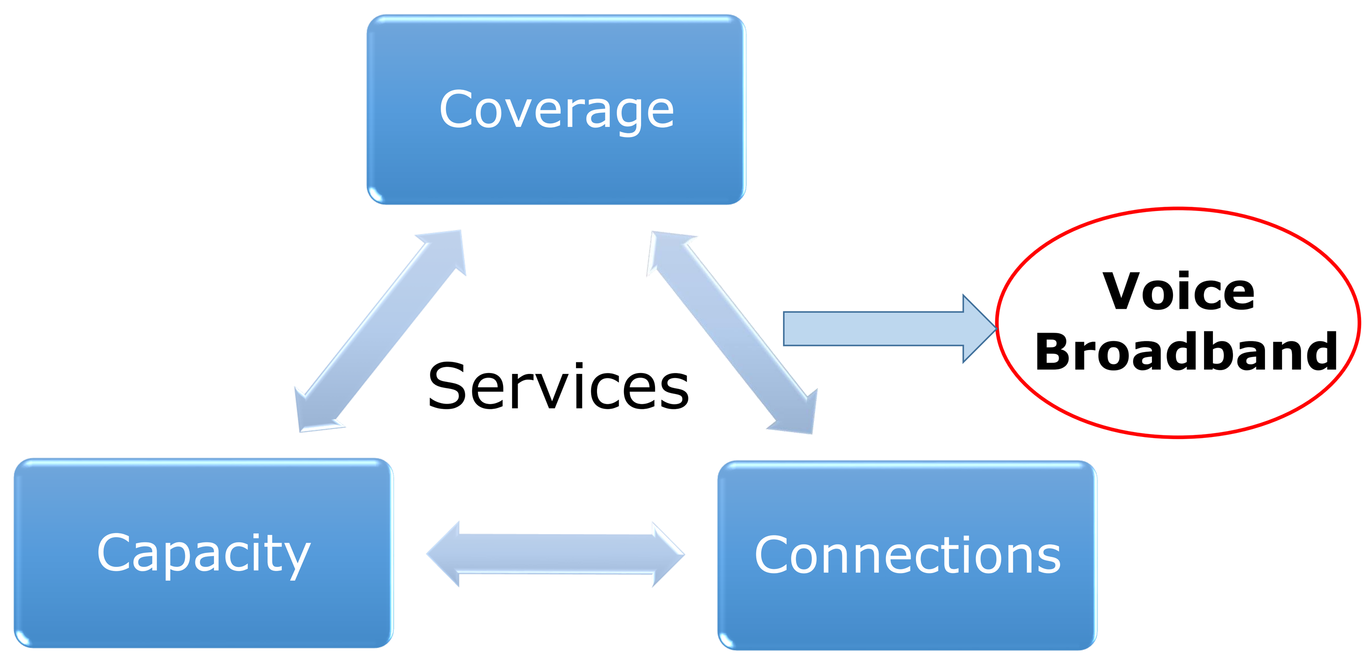
Examples of interdependencies between infrastructure networks (after Rinaldi et al. 2011)

Examples of damage to communications infrastructure following the 2016 Kaikōura earthquake (after Austin 2017)

Communication Infrastructure and Services



Overview of communication network structure (courtesy of Chorus)



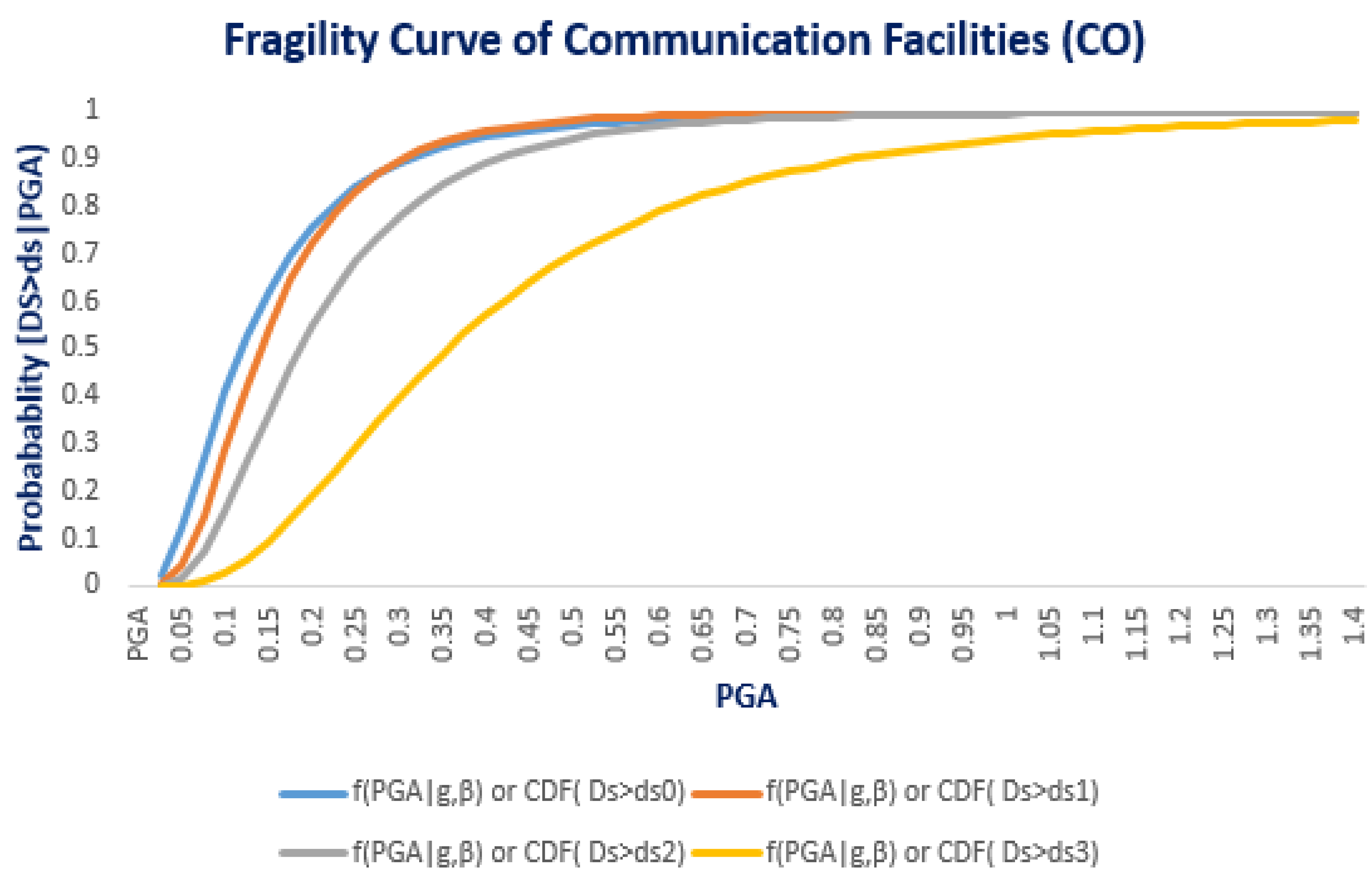
The brain of the Communication network are Exchanges or central offices which are still work in isolated or local mode in some cases during and after the disaster. The focus of this project is on this critical component of overall communication lifeline.

Research Objectives and Approach

- Develop a seismic hazard model to quantify the risk to spatially distributed critical communication infrastructure using Alpine Fault West Coast scenarios.
- Develop a measurement framework for resilient communication infrastructure for seismic hazards.
- Develop guidelines for future resilient communication network architecture for natural hazard events.

A multilevel and 2-dimensional measurement framework can be used to quantify the resilience of current and future communication infrastructure.

	Domain 1	Domain 2	Domain 3
Preparedness	Metric A		
Service Delivery	Metric B	Metric C	
Recovery			

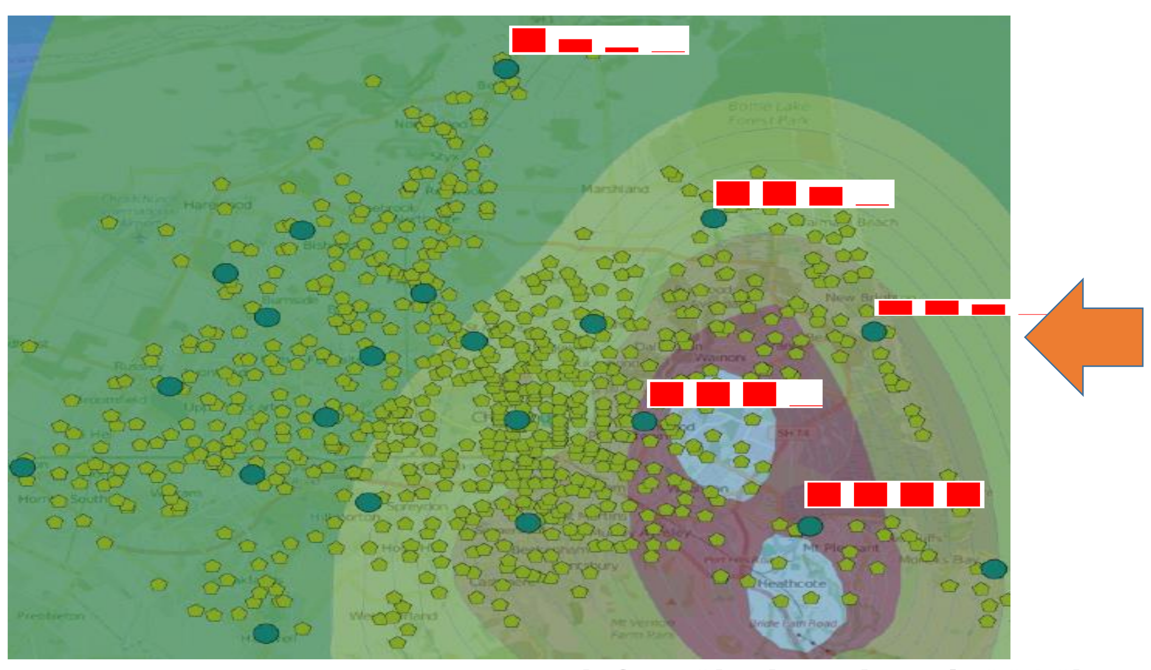


Expected Results and Outcomes

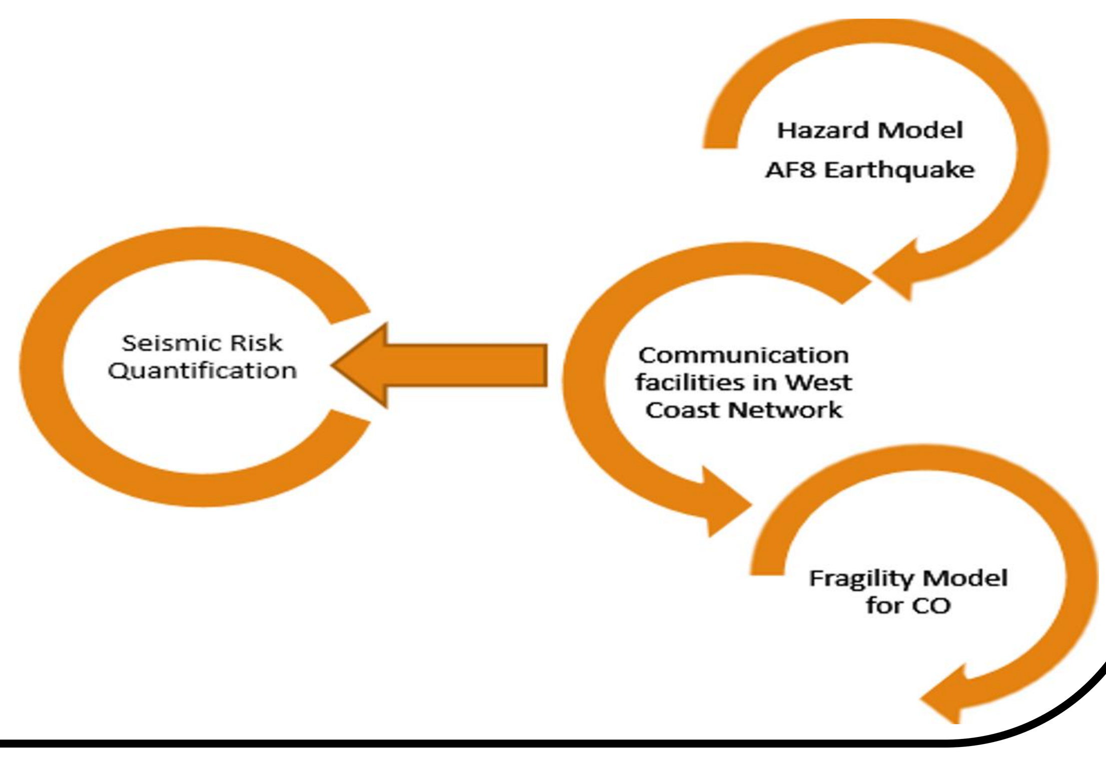
- Geospatial model for communication infrastructure with quantification of damage state and network outages for Alpine Fault events.

Legend:

- Central Offices (Exchanges)
- Service Cabinets
- Probability of Damage Ratio
- PGA Value (0.2001 – 0.4000)
- PGA Value (0.4001 – 0.6000)
- PGA Value (0.6001 – 0.8000)
- PGA Value (0.8001 – 1.0000)



(after Giovinazzi et al. 2016)



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