Infrastructure Disruptions from Coastal Flooding: Case Study Projects

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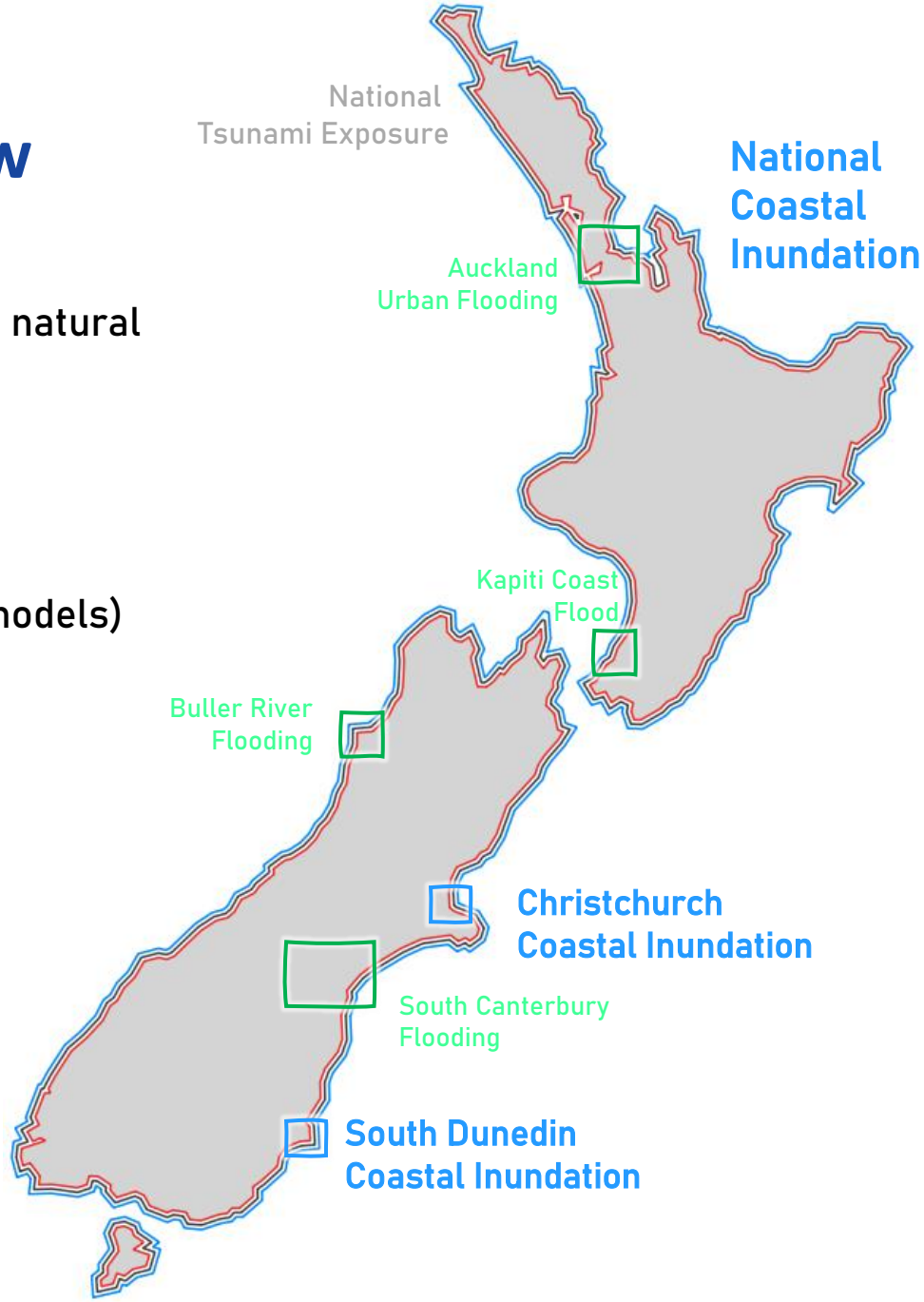
Infrastructure Impact Modelling: Overview

A range of concurrent projects modelling infrastructure impacts from natural hazards:

- **Coastal Flooding (2-1000yr + sea-level rise 0-200cm)**
- Pluvial & Fluvial Flooding

Scale of Analysis

- **National** (big Picture - improving our existing national scale models)
- **Regional**
- **Local**: (higher resolution to answer specific questions)

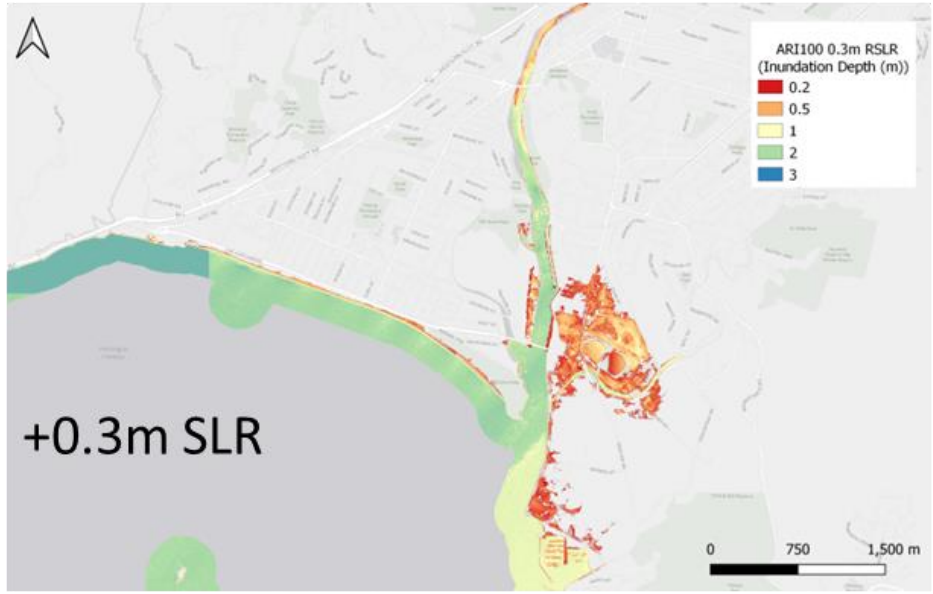


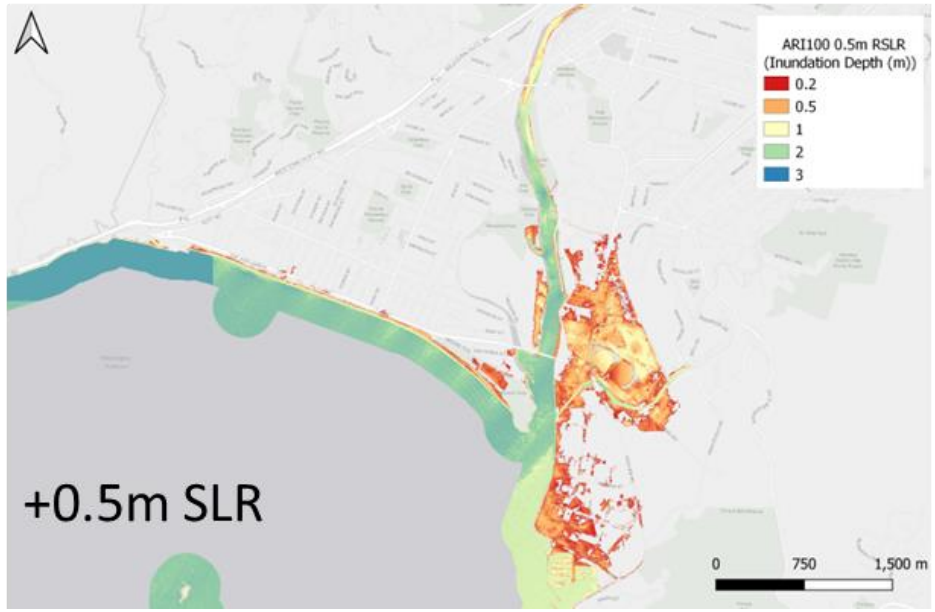
National Coastal Flood Hazard Mapping: Update

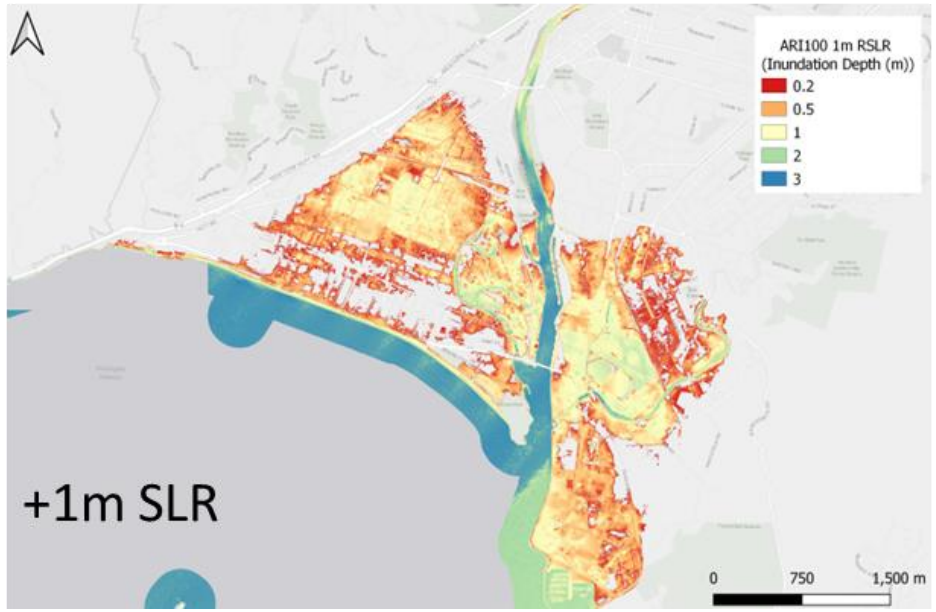
- Nationwide flood map coverage for low-lying land
- Nine ARIs (2-1000years) + 21 SLR scenarios
- Variable grid resolutions (2m Major Urban Areas, 10m LIDAR, 30m SRTM)
- Linear flood protection structures
- Modular model framework

Readily updateable as new LIDAR is available.

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







Methodology:

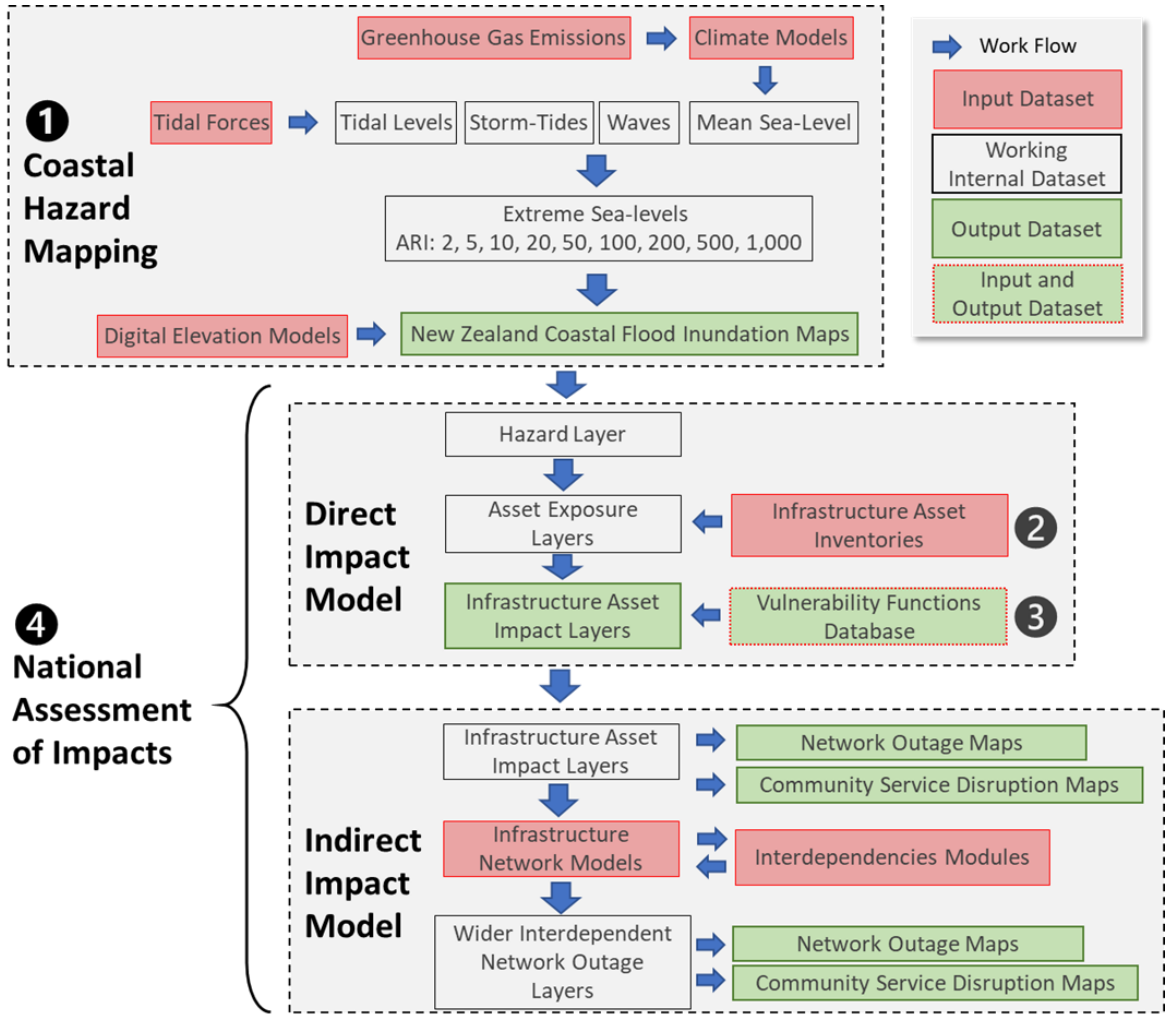
Generic methodology followed across all projects, with key outputs coming in the assessment of indirect impacts:

Direct Impacts – well established

- Exposure
- Damage

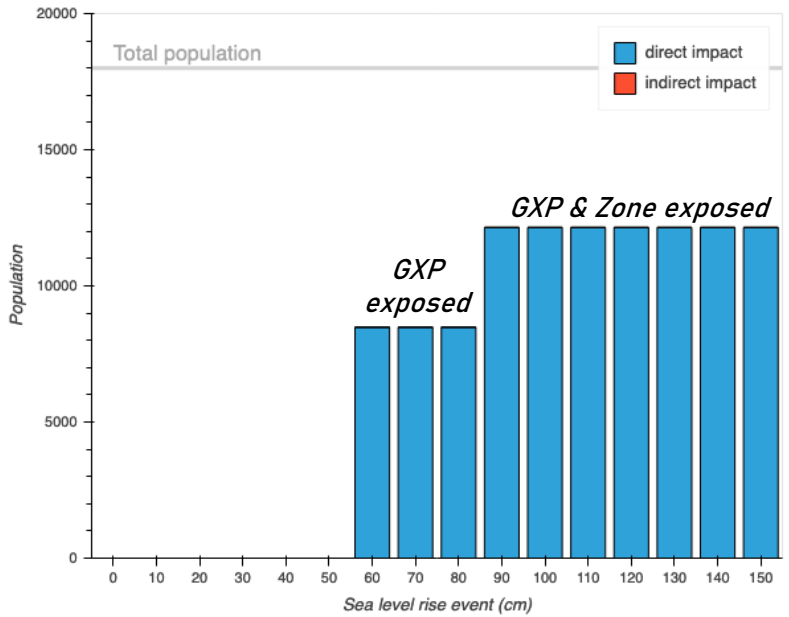
Indirect

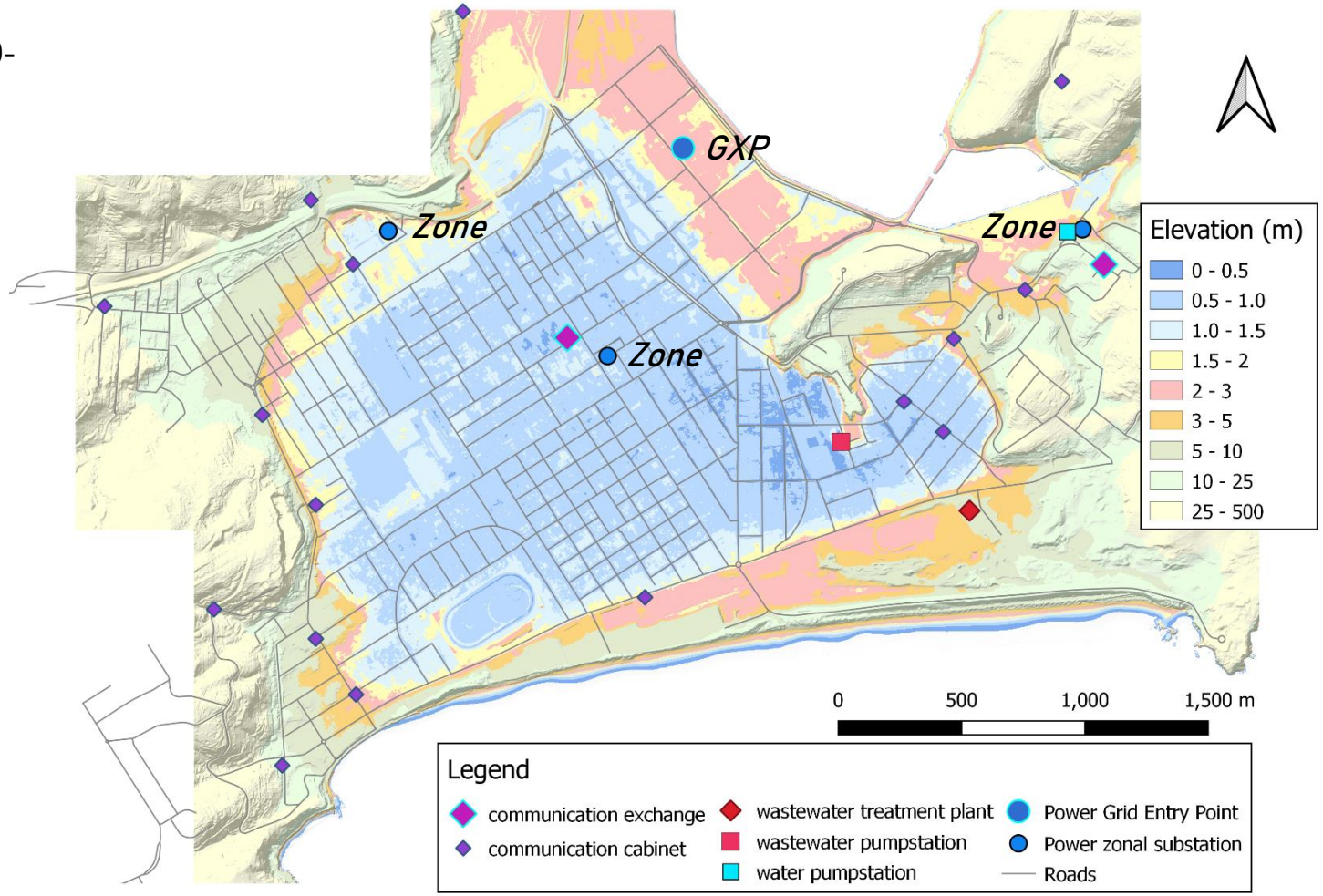
- via Interdependencies
- Flow on effects/cascading failures
- Community connectivity
- Accessibility to key sites
- Supply chain disruptions
- …



Case Study Project: South Dunedin

- Densely populated suburbs with high potential for indirect network service disruption in response to SLR over next 30-50-years
- Significant tipping point at 0.6m to 0.7m SLR observed for 100-year ESLs
- If left to 'fill' – two steps in population impacts from GXP (*Transpower*) and Zone Substations (*Aurora Energy*).
- Without sufficient protection – potential for ~10k affected from power alone – before considering interdependence and impacts to linear assets.



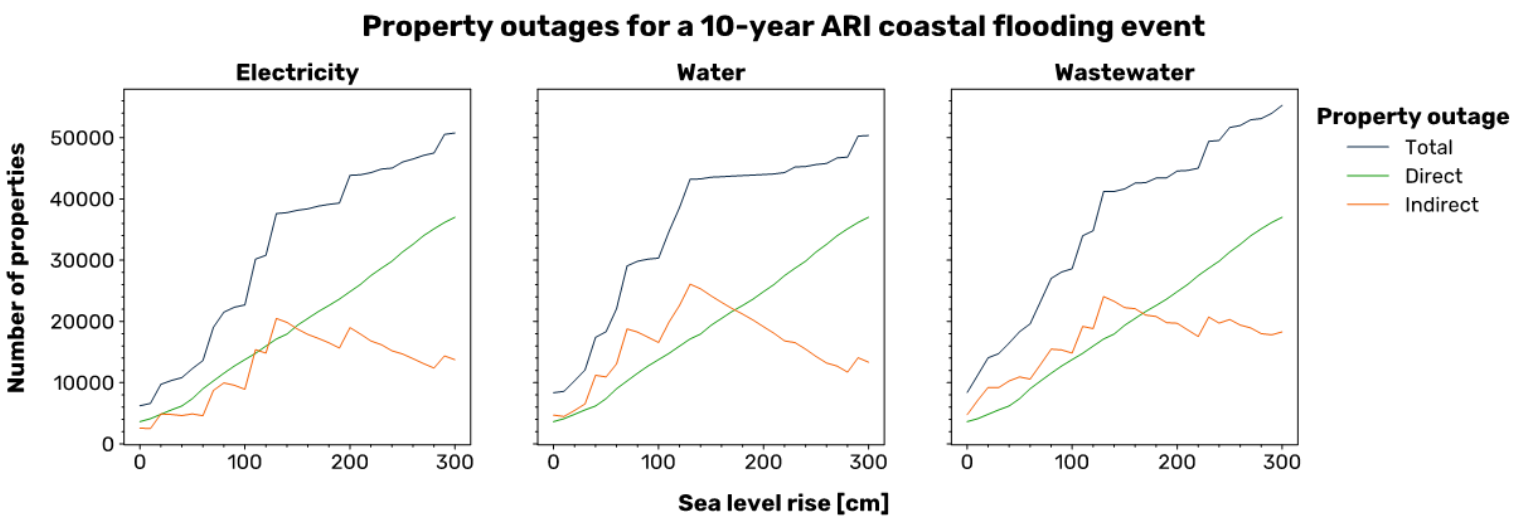


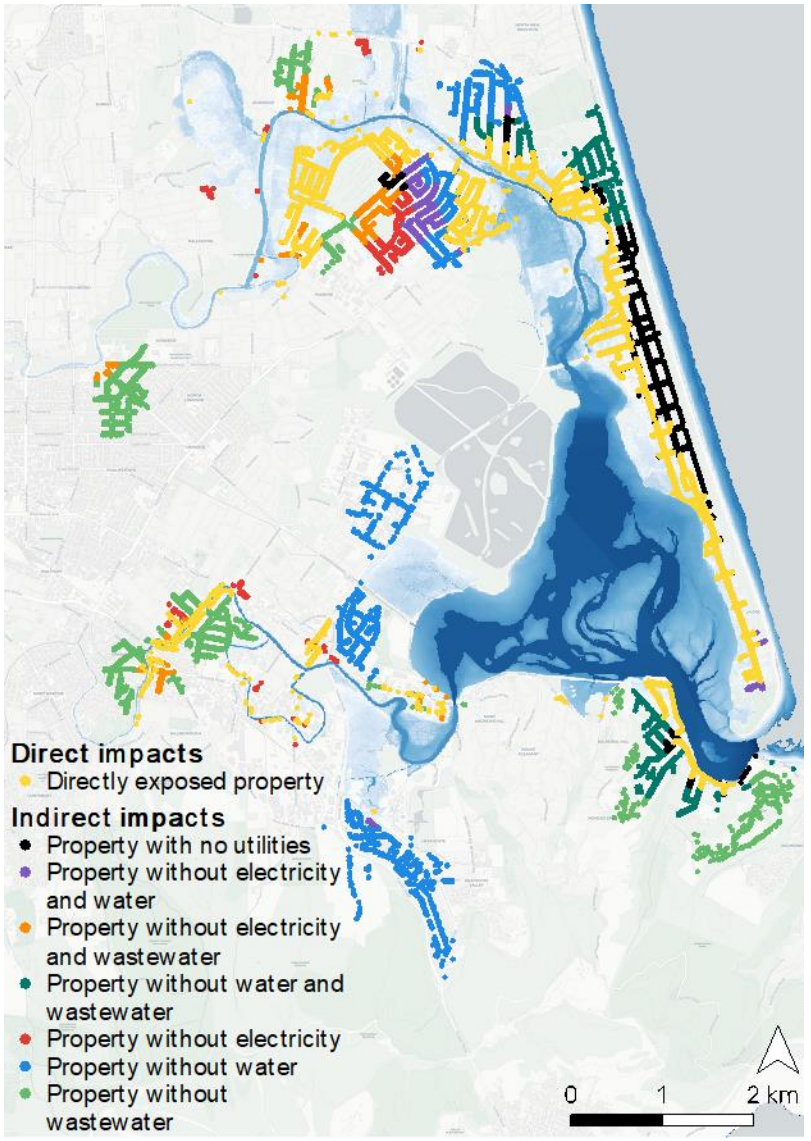
Case Study Project: Christchurch

- Network interdependency model to quantify direct and indirect service disruptions to Christchurch City residents

- Early results:

- Indirect water network service disruptions on properties exceeds direct disruption with up to 1.2 m SLR
- After 1.2 m SLR, indirect service disruptions decrease
- Network disruption varies spatially with single network failures experience in some areas, multiple in others

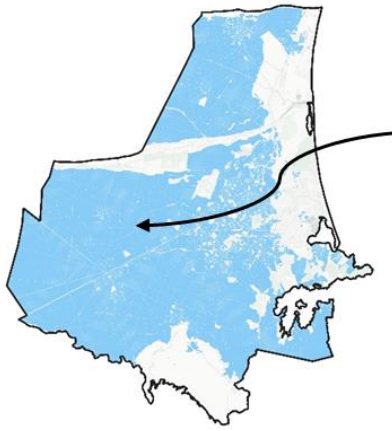




Case Study Project: Christchurch

Spatial Optimization of Christchurch's Urban Development

- Christchurch has high potential for increasing property exposure to coastal flooding in the next 30-50 years.
- Project focus on multi-criteria optimization framework to identify hotspots where coastal populations could relocate to.
- Framework combines hazard, property and network exposure data with social-economic information to determine optimal future growth areas within the current urban area.



Rural land away from existing networks requires, major investment

Improving existing network services can reduce potential disruptions in more optimal development areas away from coastlines

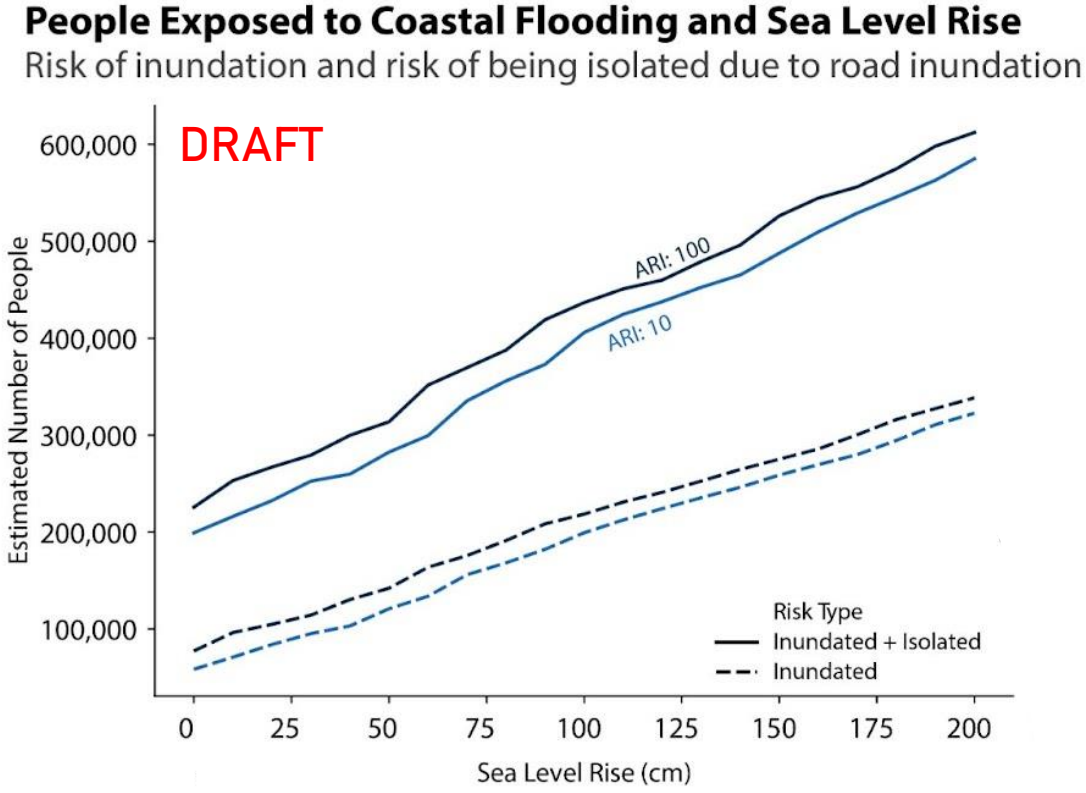
Case Study Project: National/Regional Isolation of Communities

What are the indirect impacts on communities from transportation network disruptions?

Steady increase in the population affected by road inundation from coastal hazards

Significant increase when we highlight those who are isolated as a result - i.e. all routes are affected.

Key considerations for planning redundancies and adaptation of coastal assets.



Infrastructure Disruptions from Coastal Flooding: Future Directions

Year ahead:

- Progress further infrastructure network models at various scales
- National scale assessment outputs
- Further local/regional case studies with interested stakeholders

Thank you for you attention.

Questions?

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