New Zealand's Coastal and Fluvial Flood Hazard Exposure

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Climate, Freshwater & Ocean Science

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- Local Government

  78 territorial authorities, regional and unitary councils
- Central Government

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  GNS Science, Landcare Research

Research Project and Aims

- To develop an asset exposure model framework and datasets to profile flood inundation hazards under present day and future climate conditions.

- To develop national, region and territory asset exposure risk profiles for coastal and fluvial flood inundation hazards under present day and future climate conditions in New Zealand.

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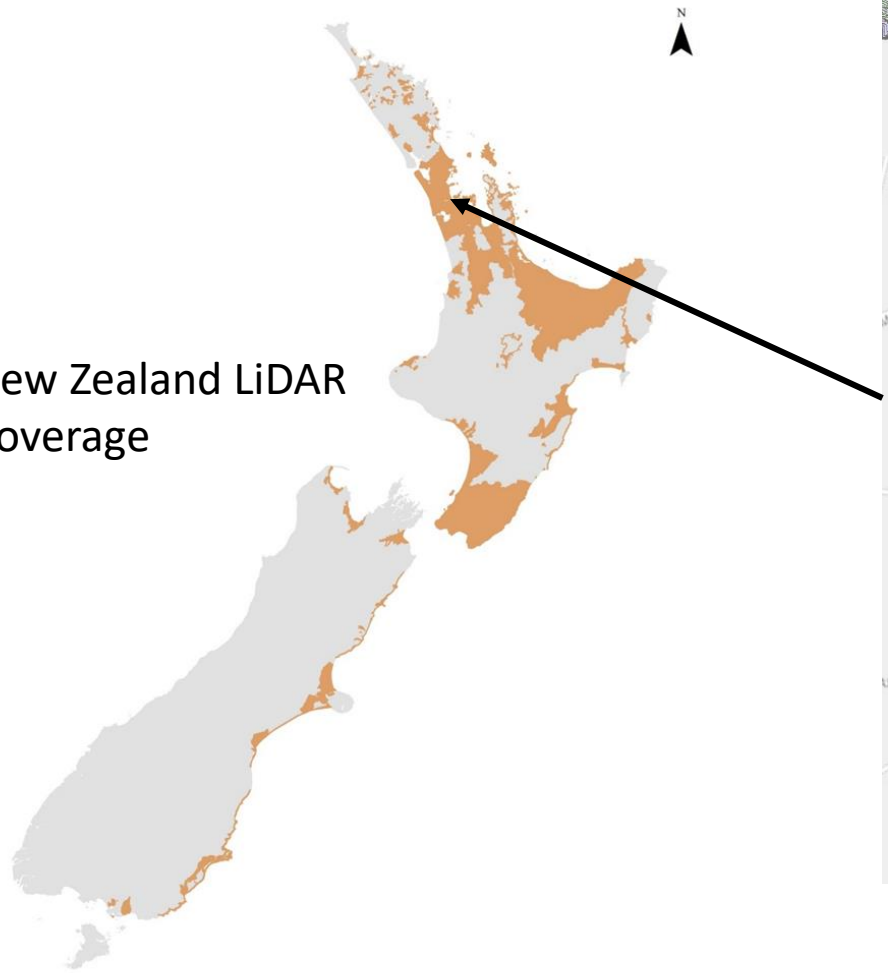
Methods - Exposure to Flood Hazards

Population, built asset and land cover features located on land within spatially mapped coastal and fluvial flood inundation hazard extents.

Methods - Coastal Flood Hazard Maps

New Zealand 1% AEP extreme sea-level flood hazard maps

- Present-day MSL, + 0.1m SLR up to +3m.
- LIDAR DEM (31 Maps)
- Satellite DEM (1 Map)



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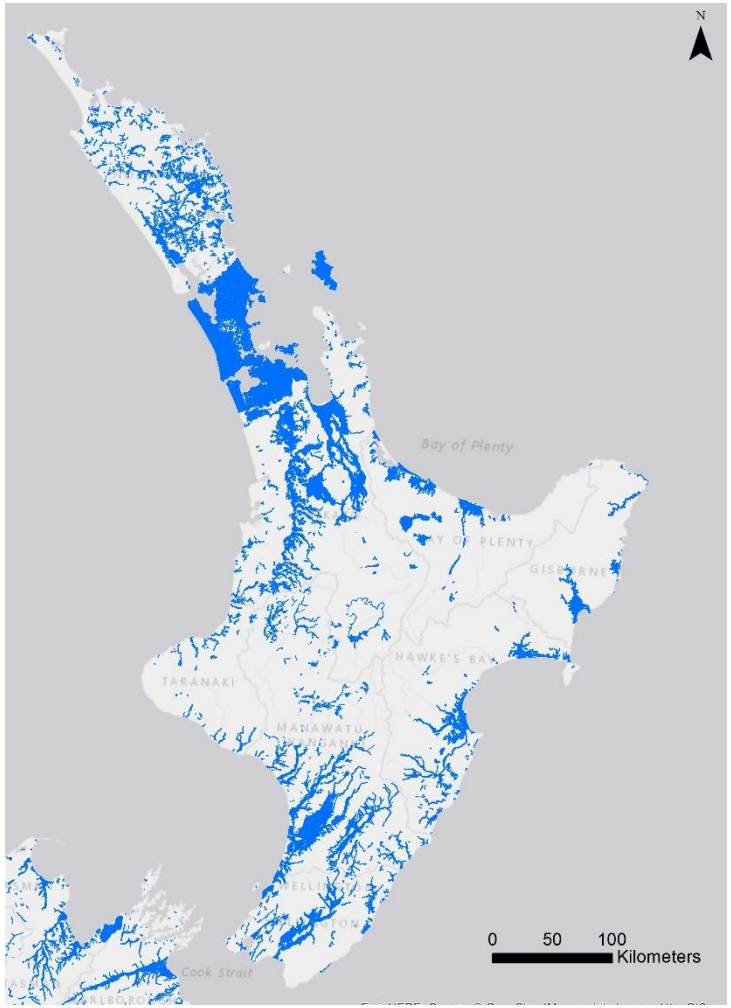
Methods - Fluvial (and Pluvial) Flood Hazard Maps

New Zealand flood hazard area map (FLHA)

The FLHA combines:

- Modelled or historic event flood maps.
- Flood prone soil maps.

Sensitivity of flood regime change under future climate conditions explored using mean annual flood.



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Methods - Elements at Risk

- **Population** (2013 Census)
- **Buildings** (No.; Replacement Value -$2016 NZD)
- **Transport** (Roads, Railway, Airports)
- **Electricity** (National Grid – Lines, Structures, Sites)
- **Three-waters** (Potable, Waste and Storm water nodes and pipes)
- **Land cover** (Built, Production, Natural/Undeveloped)

Results – Under Review

Challenges and Opportunities – Flood Hazard Mapping

Extend and update national coastal flood inundation maps for New Zealand.

- More and consistent annual exceedance probability scenarios.
- Detailed 2D flood inundation maps for high risk locations.
- Joint-probability modelling with fluvial flood inundation hazards.

National fluvial and pluvial flood inundation model for New Zealand.

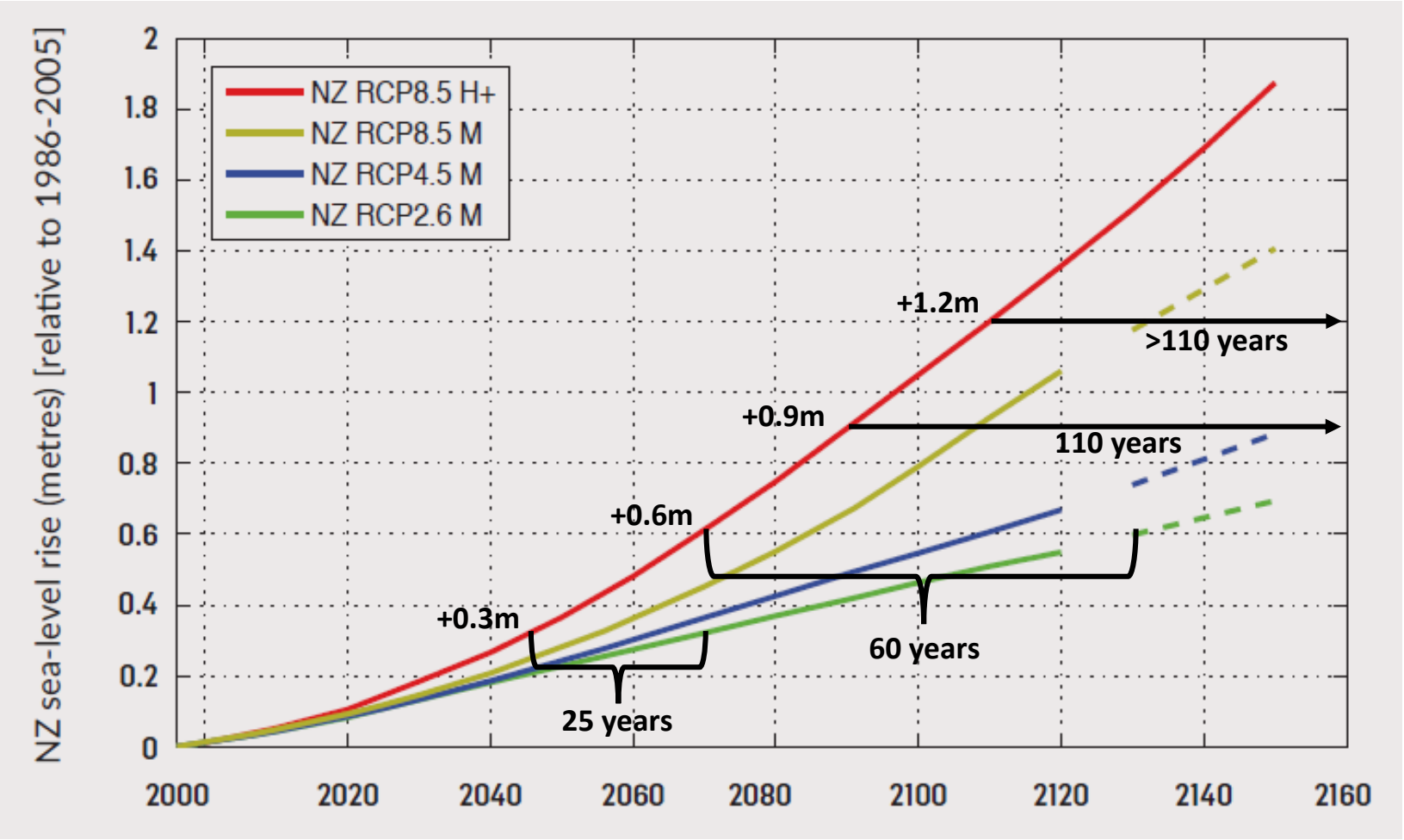
- Consistent annual exceedance probability scenarios.
- Detailed 2D flood inundation maps.
- Implementation of climate change variables (i.e. rainfall and sea-level rise).
- Residual flood inundation hazards.

Challenges and Opportunities – Climate Change Impacts

- Centralise spatial databases for flood hazard maps and elements at risk.
- Standard and available information for national and regional level exposure and impact assessment by researchers and practitioners.

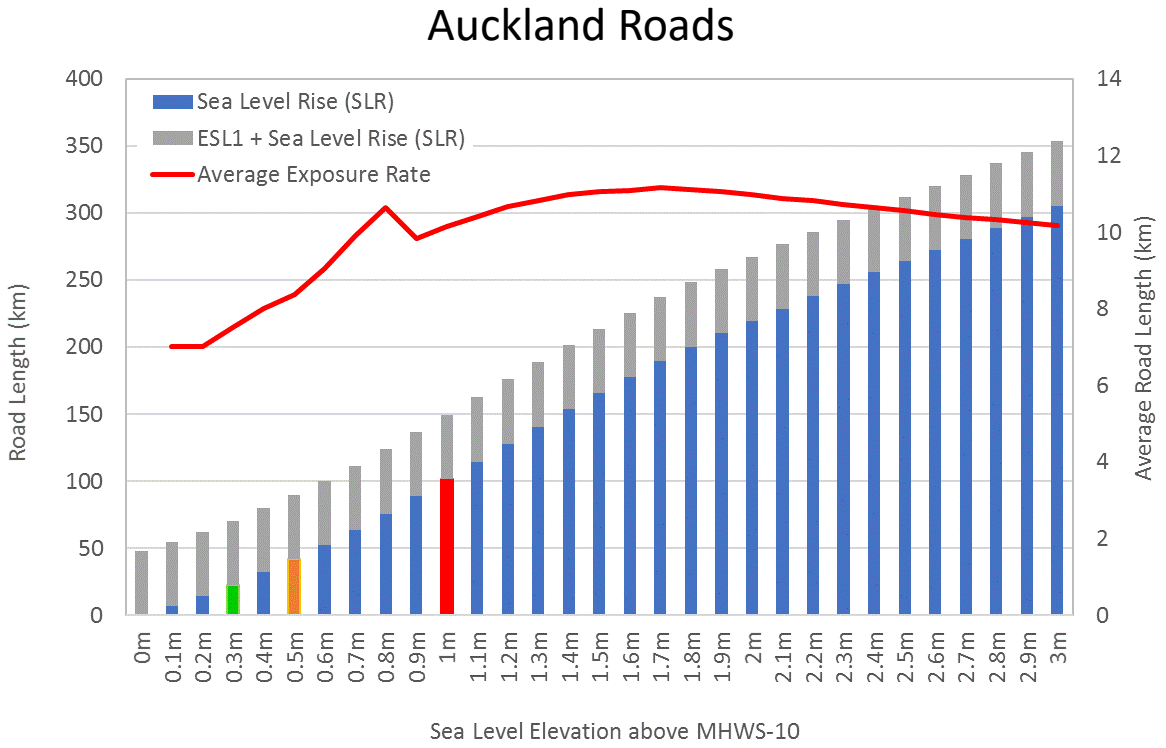
- Quantify direct and indirect damage and disruption from flood hazard exposure.
- Move from exposure to impact modelling at national and regional levels.
- Model how exposure and impacts could evolve over time e.g. Present-day vs future climate scenarios; Present-day vs future land use change

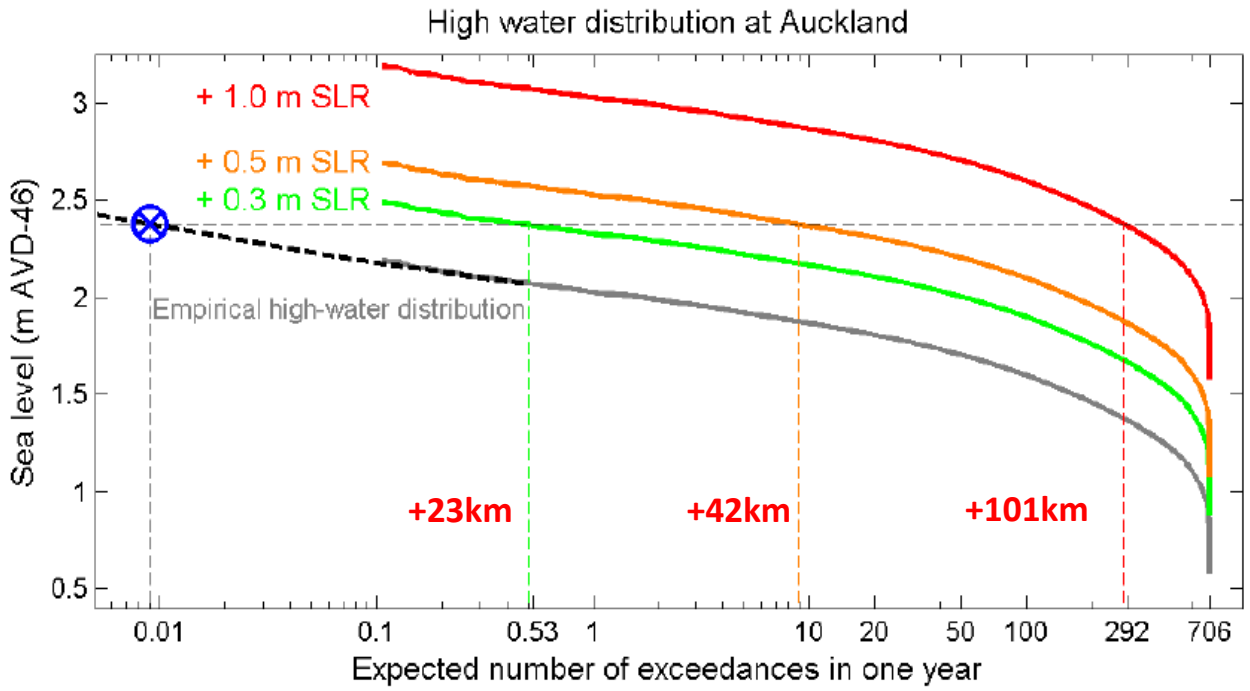
Challenges and Opportunities – Climate Change Impacts



New Zealand median (M) scenario trajectories out to 2120, and high (H+) scenario trajectory out to 2150 (Kopp et al. 2014).

Challenges and Opportunities – Climate Change Impacts





Stephens, S. (2015). The effect of sea-level rise on the frequency of extreme sea levels in New Zealand. Prepared for Parliamentary Commissioner for the Environment. HAM2015-090. p52

Thank you

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