

# Exposure to Coastal and Fluvial Flood Hazards in New Zealand

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Climate, Freshwater & Ocean Science

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**Science**  
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# Scene Setting: What is a Flood?

Flooding occurs when land that is normally dry gets wet.



Stormwater (Pluvial)  
Flooding



Riverine (Fluvial)  
Flooding



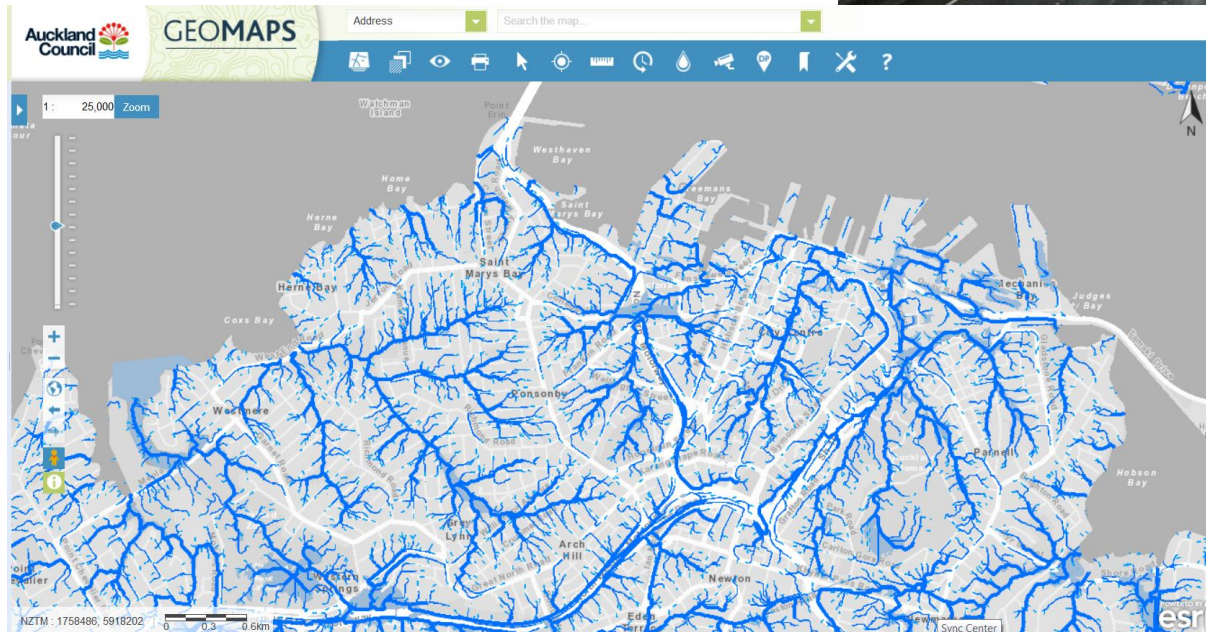
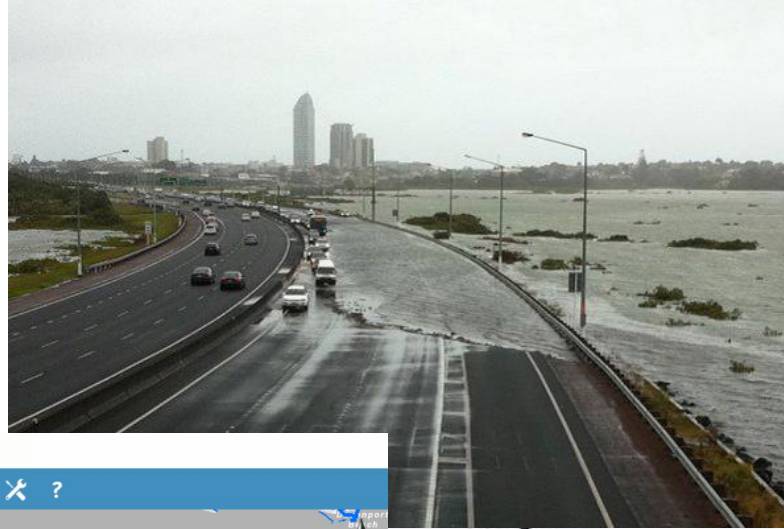
Coastal Flooding:  
Storm-tides, Storm-Surge,  
Tsunami



# What's ahead: Nuisance Flooding

Medium-High Frequency

Low-Medium Impact

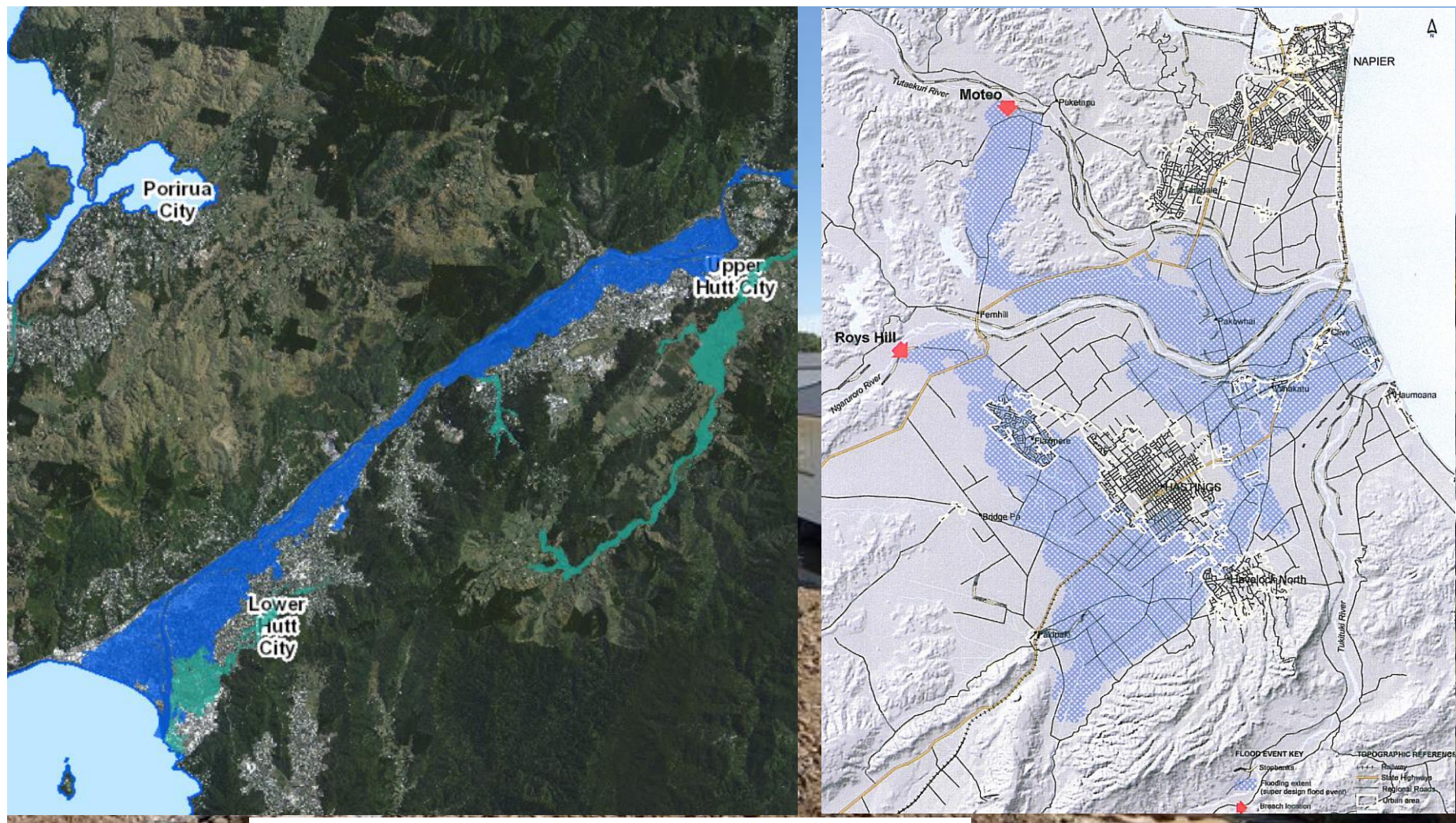




# What's ahead: Stopbank Failures

Low-Medium  
Frequency

Medium-High  
Impact

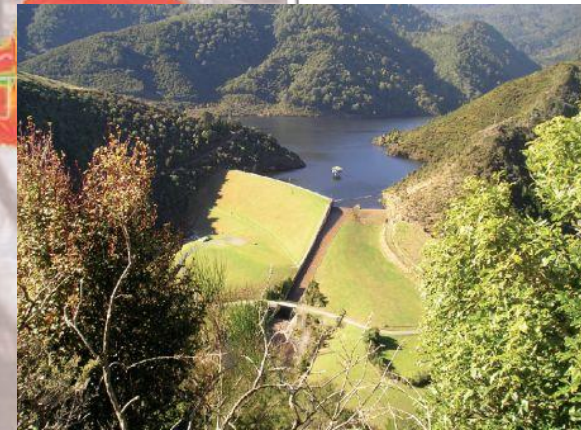
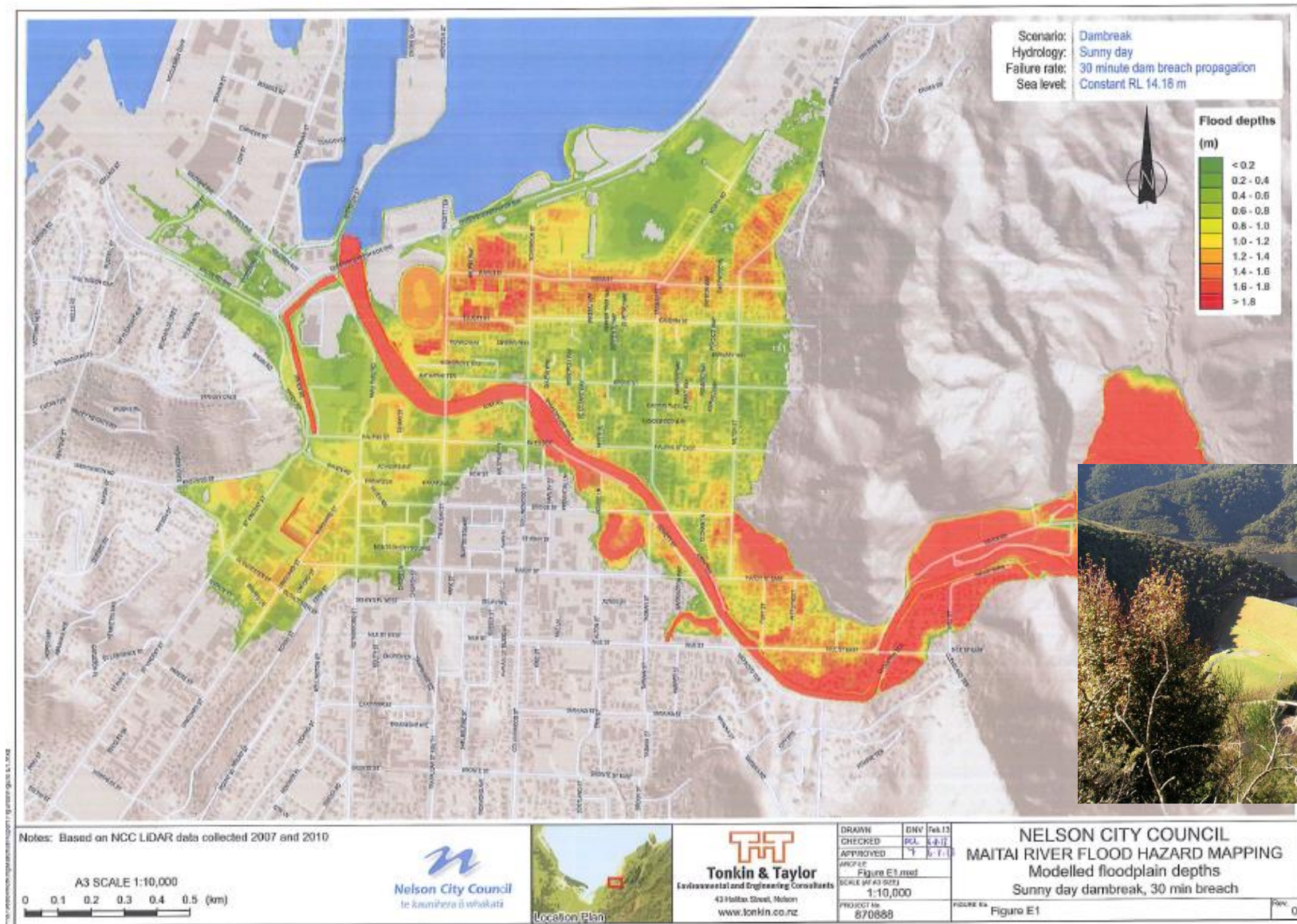




# What's ahead: Dam Break Flooding

Low Frequency

High Impact




# Deep South Challenge Impacts & Implications Research

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Coastal Flooding Exposure Under  
Future Sea-level Rise for New  
Zealand

*Prepared for The Deep South Challenge*

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New Zealand Fluvial and Pluvial  
Flood Exposure

*Prepared for The Deep South Challenge*

<https://www.deepsouthchallenge.co.nz/projects/national-flood-risks-climate-change>



# Coastal Flood Hazard Mapping

**New Zealand 1% AEP extreme sea-level flood hazard maps (ESL 1) for present-day MSL:**

- Increments of + 0.1m SLR up to +3m.
- LIDAR DEM (31 Maps)
- Satellite DEM (1 Map)



# Fluvial/Pluvial Flood Hazard Mapping

**New Zealand flood hazard area map (FLHA)**

The FLHA combines:

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

FLHA maps used were publicly available.

The FLHA maps represent a range of flood magnitudes and frequencies.



# National and Regional Coastal Flood Exposure - Buildings

## ESL1 Exposure Summary

### National

Current exposure is 49,709 (\$12.5 B) and increases by 7,043 and \$2.48 B for every +0.1 m SLR.

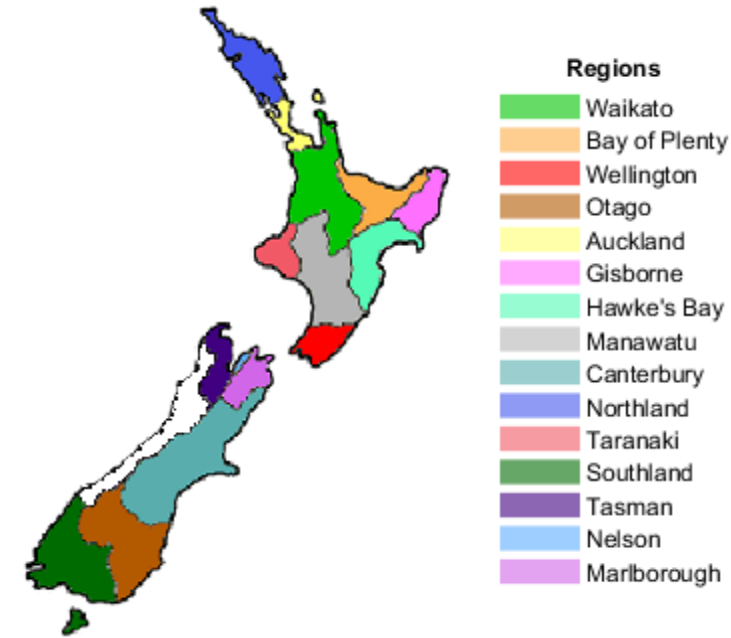
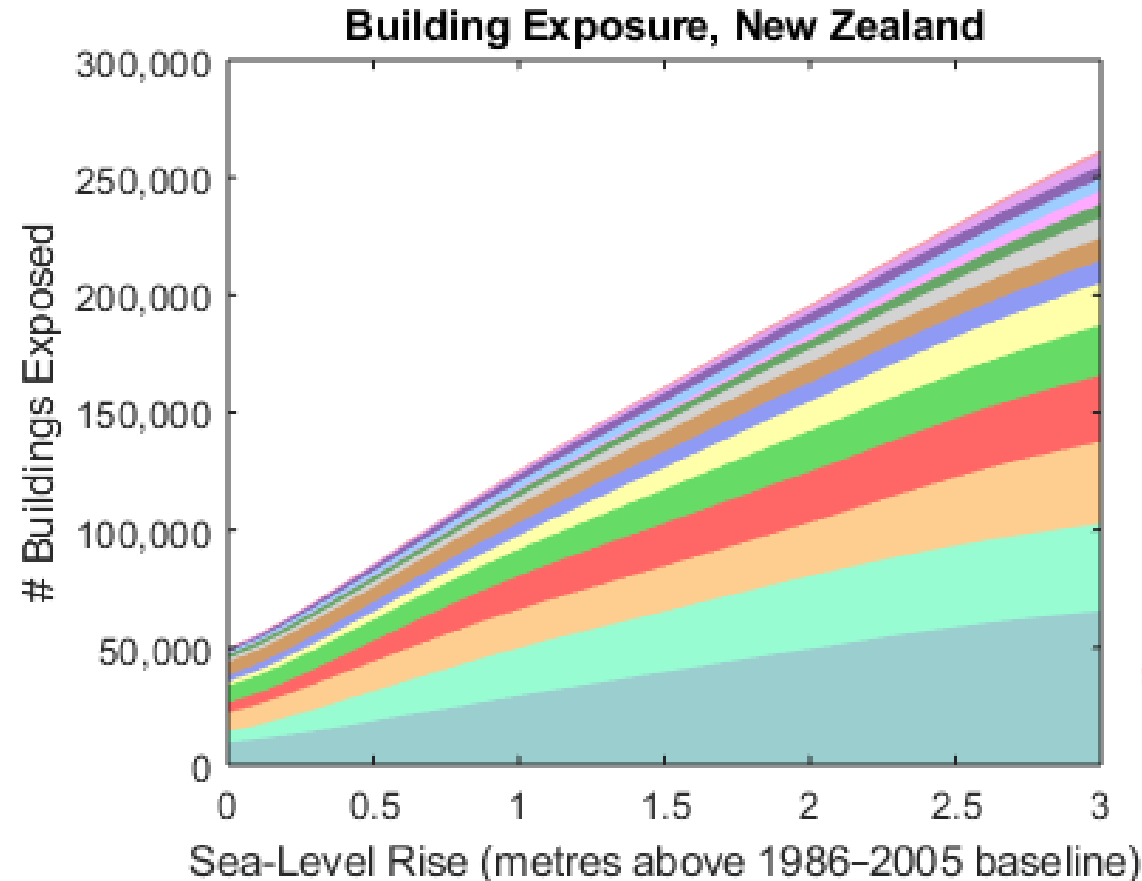
### Regions

Over 10,000 buildings are each exposed in Canterbury, Bay of Plenty and Hawkes Bay at 0.4 m SLR.

Replacement values in Wellington and Canterbury increases by \$5 B each at 1 m SLR.

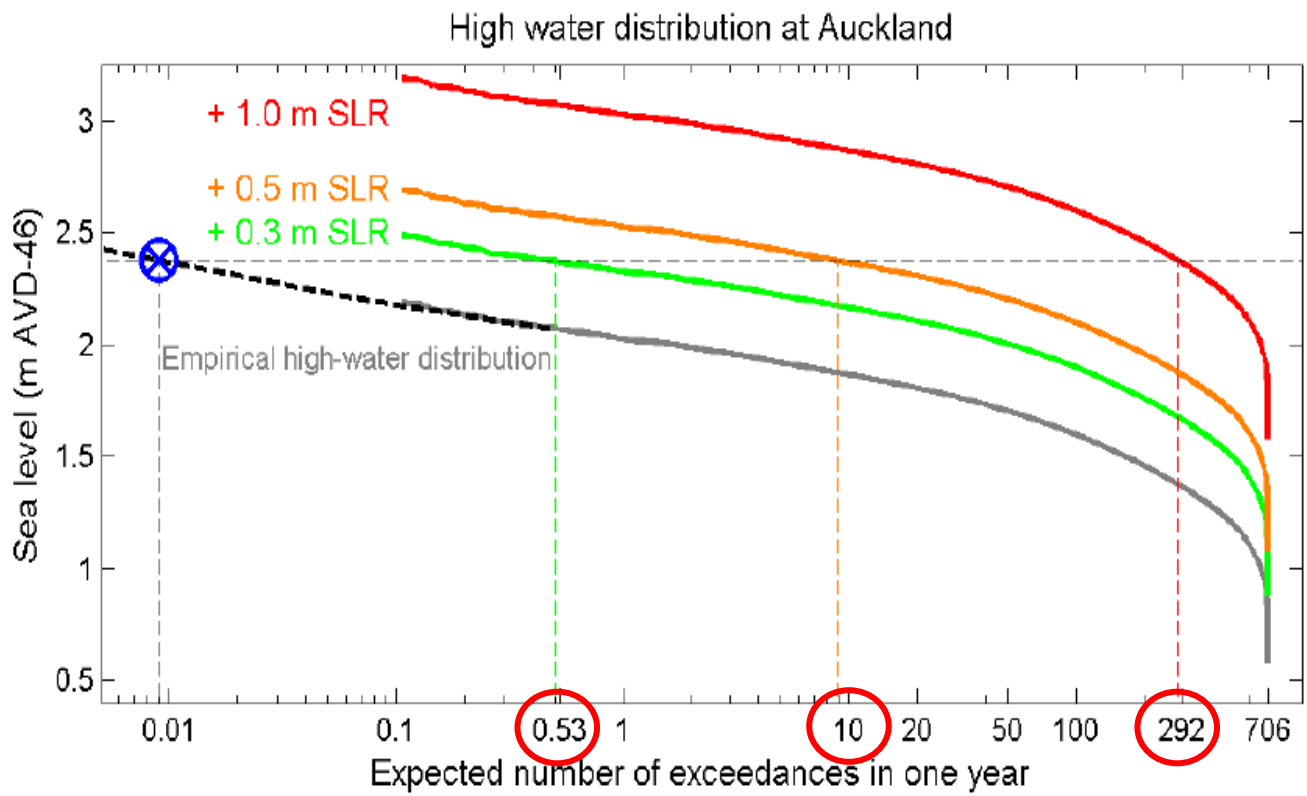
### Territories

Christchurch (14,438) and Napier City (11,321) building exposure more than doubles with 0.5 m SLR.





# Exposure and Sea-Level Rise Projections (MfE, 2017)



SLR (m)	Year RCP8.5H+ (83%ile)	Year RCP8.5H (50%ile)	Year RCP4.5 (50%ile)	Year RCP2.6 (50%ile)	Auckland Building Exposure
0	-	-	-	-	1,790
0.3	2045	2050	2060	2070	2,719
0.4	2055	2065	2075	2090	3,061
0.5	2060	2075	2090	2110	3,420
0.6	2070	2085	2110	2130	3,831
0.7	2075	2090	2125	2155	4,316
0.8	2085	2100	2140	2175	4,820
0.9	2090	2110	2155	2200	5,371
1	2100	2115	2170	>2200	5,921
1.2	2110	2130	2200	>2200	6,559
1.5	2130	2160	>2200	>2200	7,296

<https://www.mfe.govt.nz/publications/climate-change/coastal-hazards-and-climate-change-guidance-local-government>

# National and Regional Fluvial/Pluvial Flood Exposure - Buildings

## FLHA Exposure Summary

### National

Population = 674,534

**Buildings = 411,516 (NZD \$135 B)**

Roads = 19,098 km

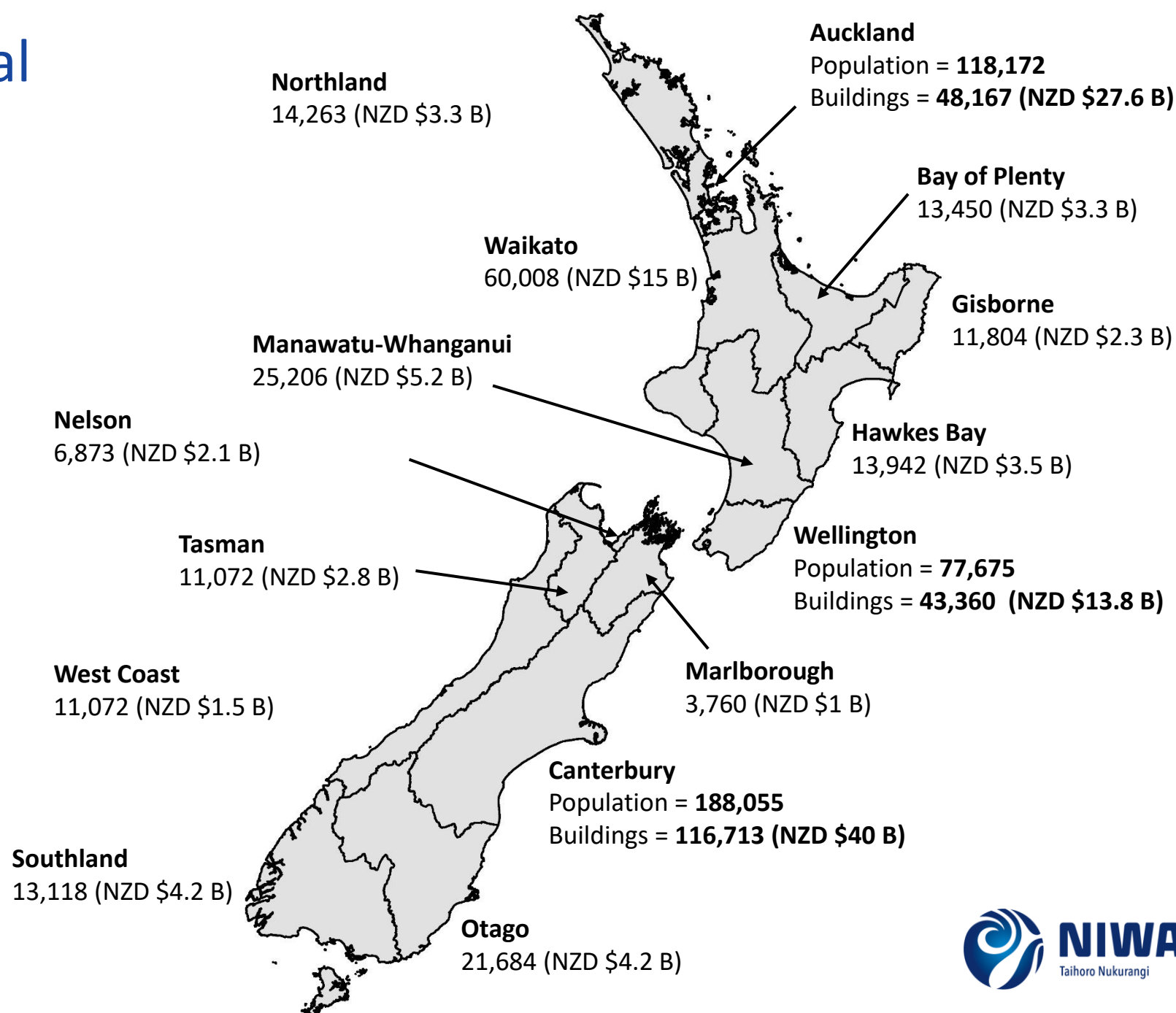
Railways = 1,574 km

Airports = 20

Three-waters Pipes = 21,174 km

Note: These are order-of-magnitude estimates for the FLHA.

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# Fluvial/Pluvial Flood Impacts on Buildings

New Zealand currently lacks a flood loss database for investigating building vulnerability.

Flood events provide opportunities to observe building damage response to flooding.



# Opportunities to Inform Future Flood Adaptation

- Spatial mapping technology is constantly improving the ability to identify future flood hazards and at risk buildings.
- The challenge now is collect more detailed information about floodplain buildings and assess the potential direct and indirect impacts from future flood events.
- Risk researchers and construction experts can team-up and investigate building vulnerability to flood damage and quantify future impacts across New Zealand.
- The ability to quantify direct building impacts will improve our ability to make risk informed adaptation decisions on building construction within or near floodplains.



# Thank you

For more information please contact:

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