

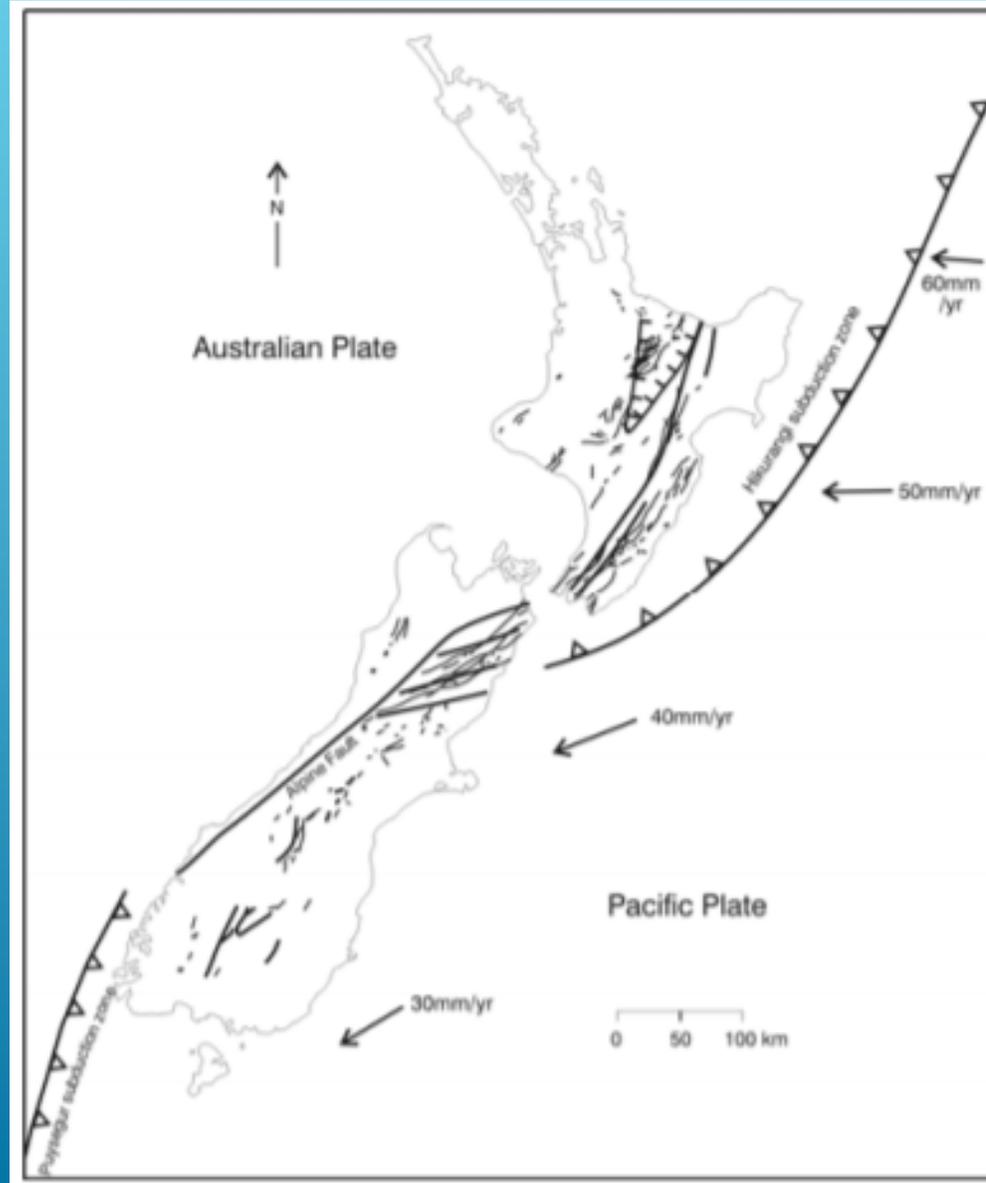
# SMALL SCALE HYDRO INSTALLMENT ALONG WAIKATO RIVER

Connor Higgins

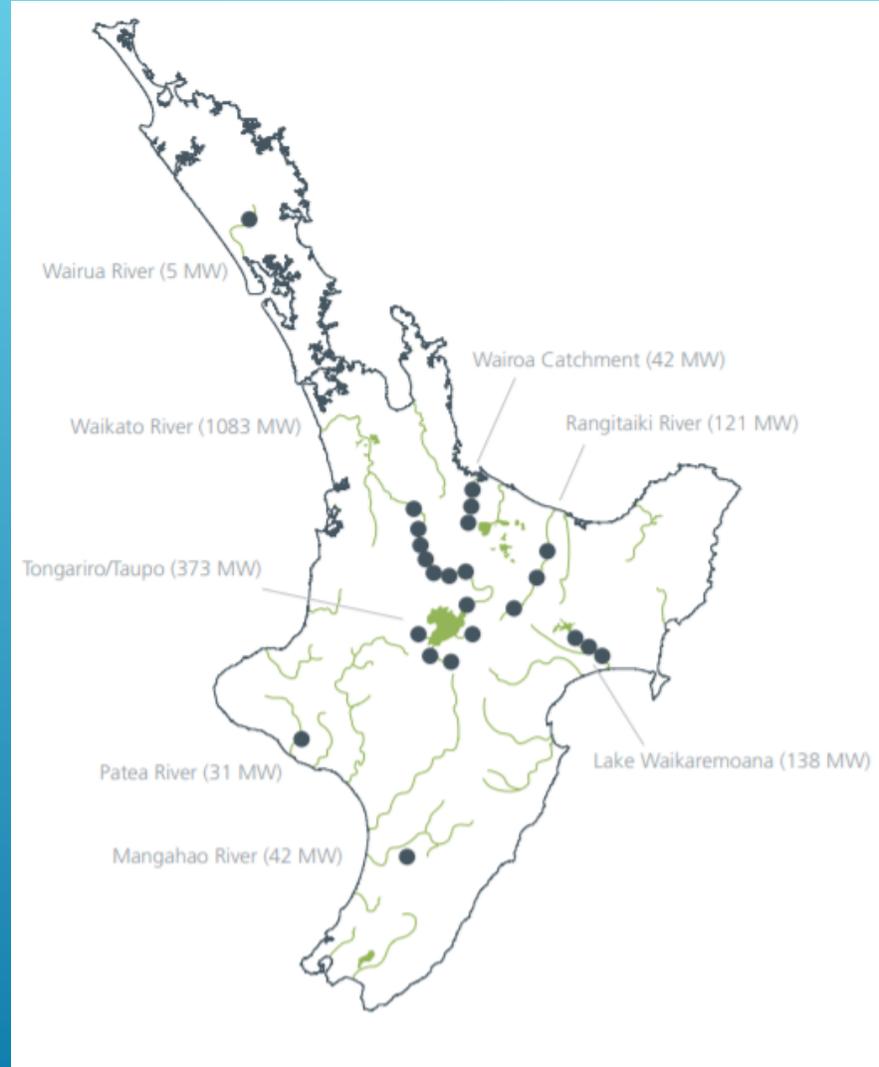
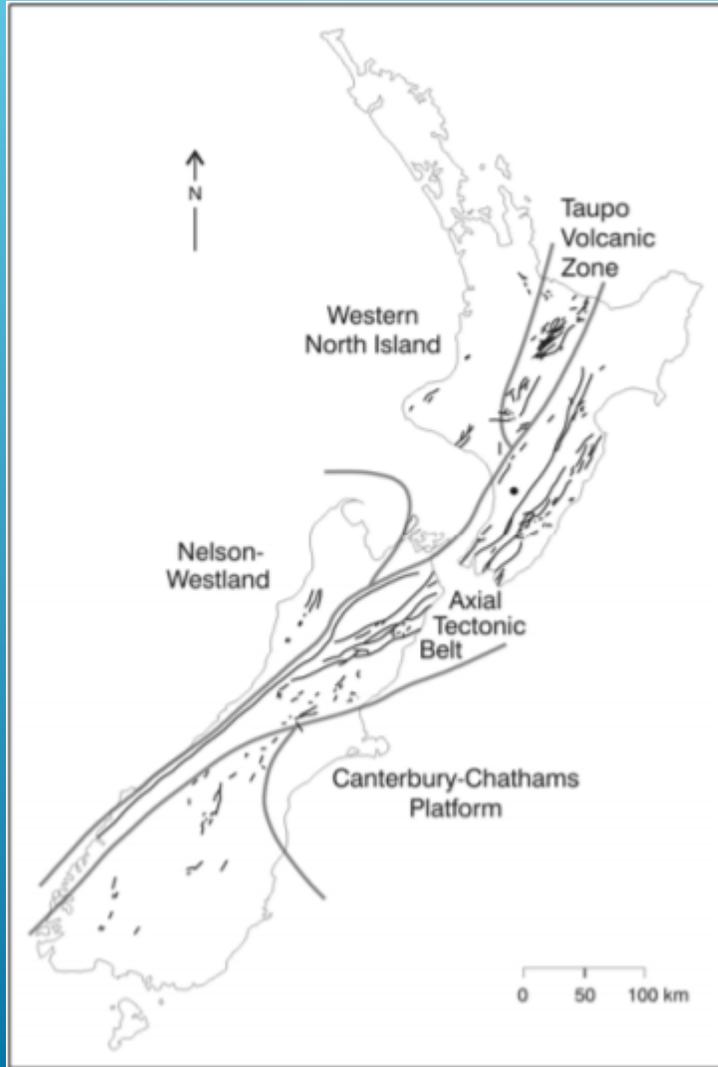
EGEE-497



# The Australian-Pacific Plate Boundary



# Tectonic Provinces of New Zealand vs Hydroelectric Dams the North Island



## The Waikato River



- ▶ 8 hydroelectric Dams
  - ▶ Aratiatia to Karapiro
- ▶ Provide about 13% of electricity Demand (1,008 MW)
- ▶ Provide 25% of peak demand
- ▶ System flexibility to meet daily variations in energy needs
- ▶ Development of local and national economies
- ▶ Provide means of flood control
- ▶ Recreational Amenities

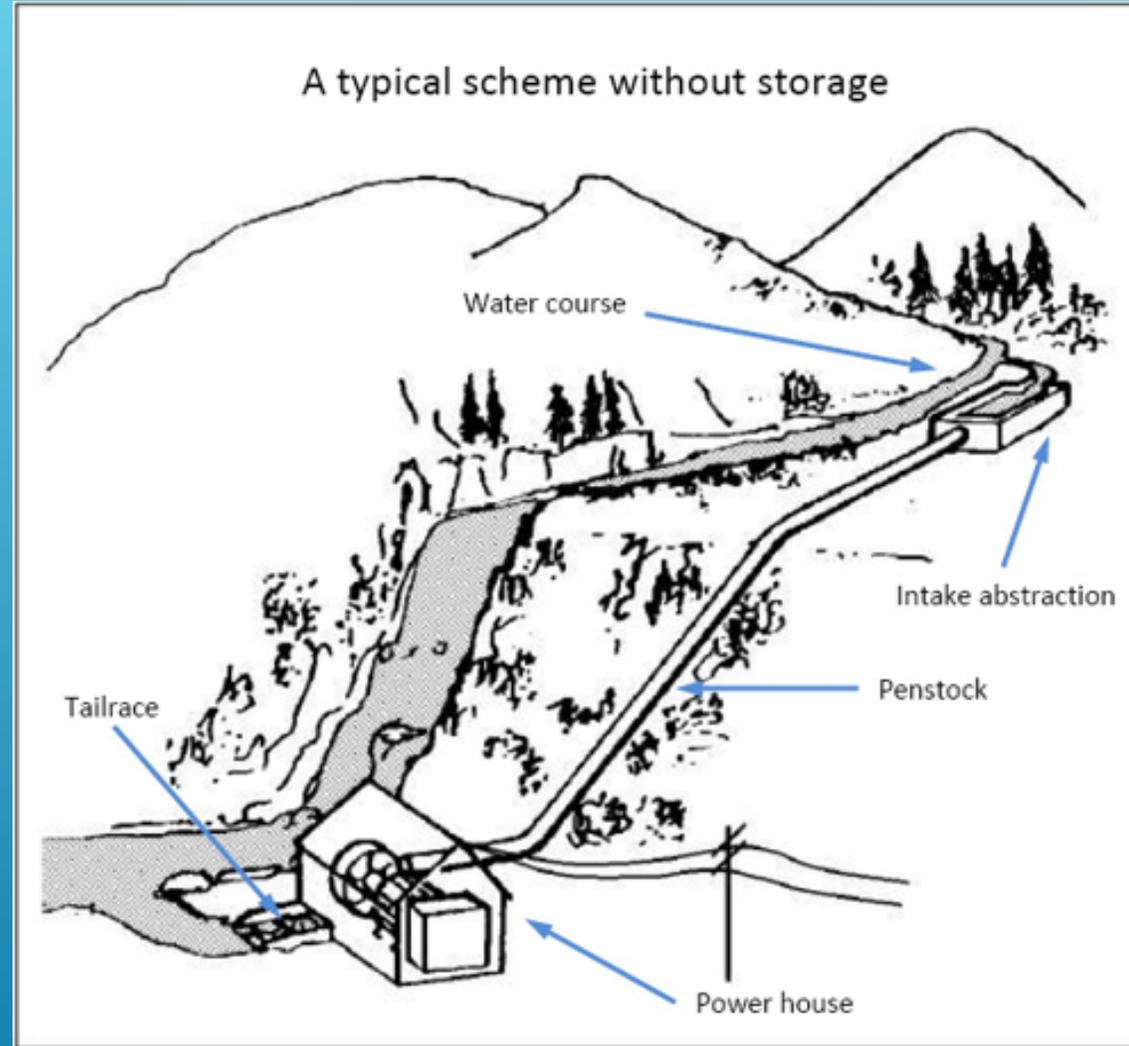
## Negative Impacts of Large Scale Hydroelectric Dams

- ▶ Upstream Displacement
  - ▶ Drowned important cultural and geothermal sites
- ▶ Have Negatively Impacted the Rivers
  - ▶ Ecology
  - ▶ Hydrology
  - ▶ Sedimentology
  - ▶ Morphology
  - ▶ Water Clarity and Quality
- ▶ Iwi relationship with the river



## Small Scale Hydroelectric Generation

- ▶ Produce between 1-30 MW
- ▶ Can be installed successively to increase generation
- ▶ Little or negligible environmental impact
- ▶ Run of River design
  - ▶ No upstream displacement
- ▶ Topographic Versatility
- ▶ Low investment cost



## Replacement of Large Scale Hydroelectric Dams on the Waikato River

Generation Stations	Capacity (MW)	Nominal Annual Output (GWh)
Aratiatia	84	331
Ohakuri	112	400
Atiamuri	84	305
Whakamaru	100	486
Maraetai	360	855
Waipapa	51	330
Arapuni	171	805
Karapiro	90	490

Generation Stations	Small Scale Stations
<b>Aratiatia</b>	<b>3.36</b>
Ohakuri	4.48
<b>Atiamuri</b>	<b>3.36</b>
Whakamaru	4
Maraetai	14.4
<b>Waipapa</b>	<b>2.04</b>
Arapuni	6.84
Karapiro	3.6

## Recommendations

- ▶ Not feasible to replace all 8 dams
    - ▶ High cost, arsenic and mercury levels, loss of generation
  - ▶ Replace the Aratiatia, Atiamuri, Waipapa Power Plants with small scale generation installments
    - ▶ Aratiatia -1964
    - ▶ Atiamuri - 1958
    - ▶ Waipapa – 1961
  - ▶ Further investigation into the termination of three power stations and environmental mitigation
  - ▶ New projects/developments be small scale hydroelectric generation to supplement existing large scale stations
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## References

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- ▶ 4. [http://www.esru.strath.ac.uk/EandE/Web\\_sites/09-10/Hydro/generation/gencph.html](http://www.esru.strath.ac.uk/EandE/Web_sites/09-10/Hydro/generation/gencph.html)
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- ▶ 6. <https://www.waikatoregion.govt.nz/environment/natural-resources/water/lakes/where-are-our-lakes/waikato-river-hydro-lakes-map/>