

Geothermal Resources of New Zealand



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Eastern Hutt Rotary
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Overview

- Introduction
- Geothermal electricity production
- Alternative geothermal uses



About me



Leeds University
2001 - 2005



USF
2005 - 2010



GNS Science
2010 - ???



What we do



RESEARCH PRIORITY AREAS:

- Maximising Geothermal Direct Use
- Knowledge of the Deeper Taupō Volcanic Zone
- Reducing Risks Associated with Geothermal Developments
- Kaitiakitanga of Geothermal Ecosystems
- Superhot Geothermal Fluids
- Energy Efficiency and Storage
- Energy Innovations

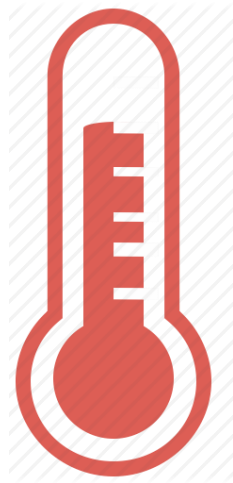


Geo

Thermal



+



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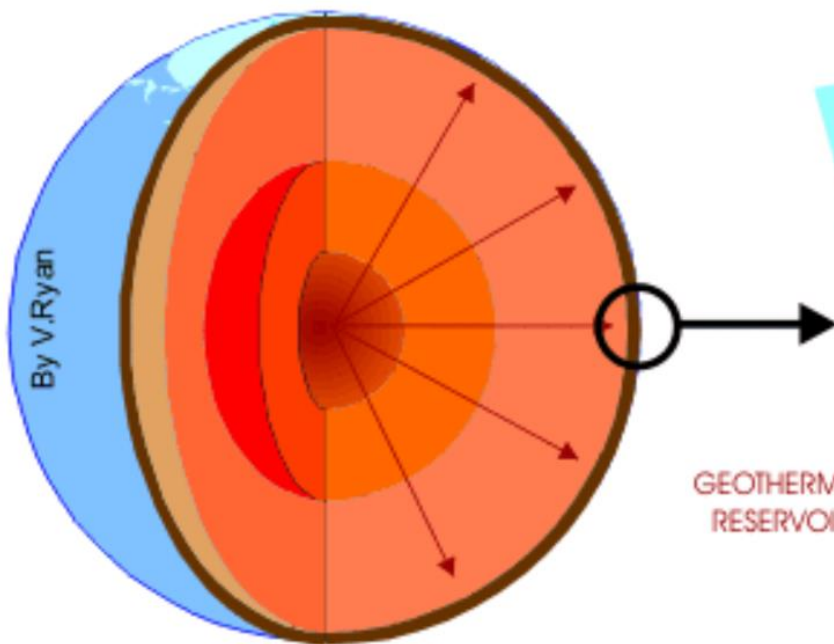
Water



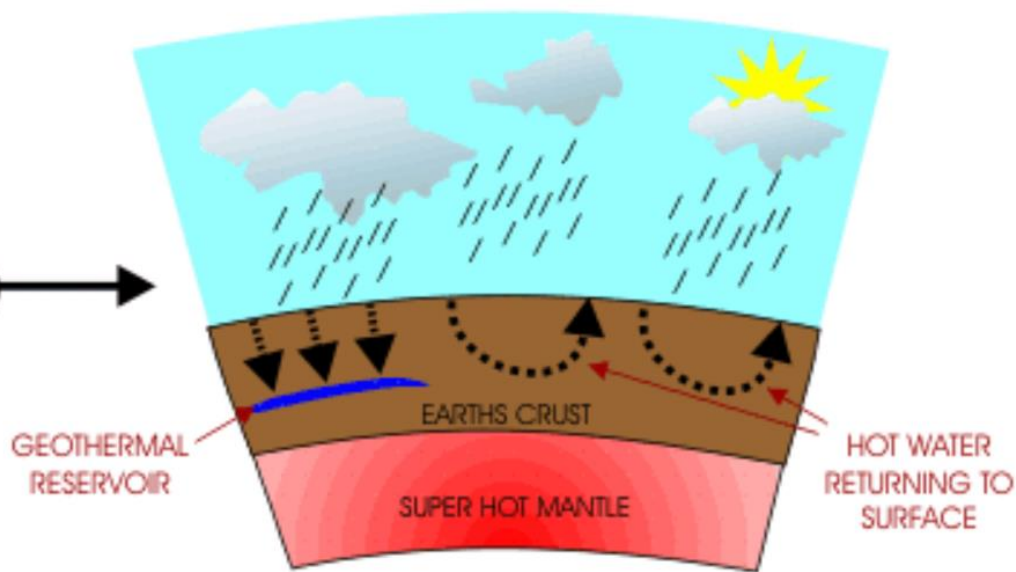
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Earth: a heat factory

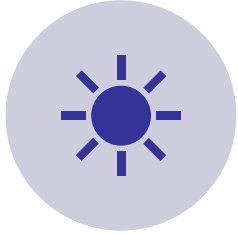


SECTION OF EARTH - TEMPERATURES
REACH 5000 DEGREES
CENTIGRADE AT THE CENTRE

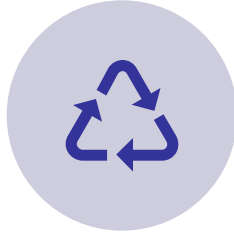


RAIN FALLS ON THE EARTH'S SURFACE AND
SEEPS DOWN TO THE HOT ROCKS BELOW.
THE WATER HEATS AND RETURNS TO THE
SURFACE

Advantages



CLEAN



RENEWABLE

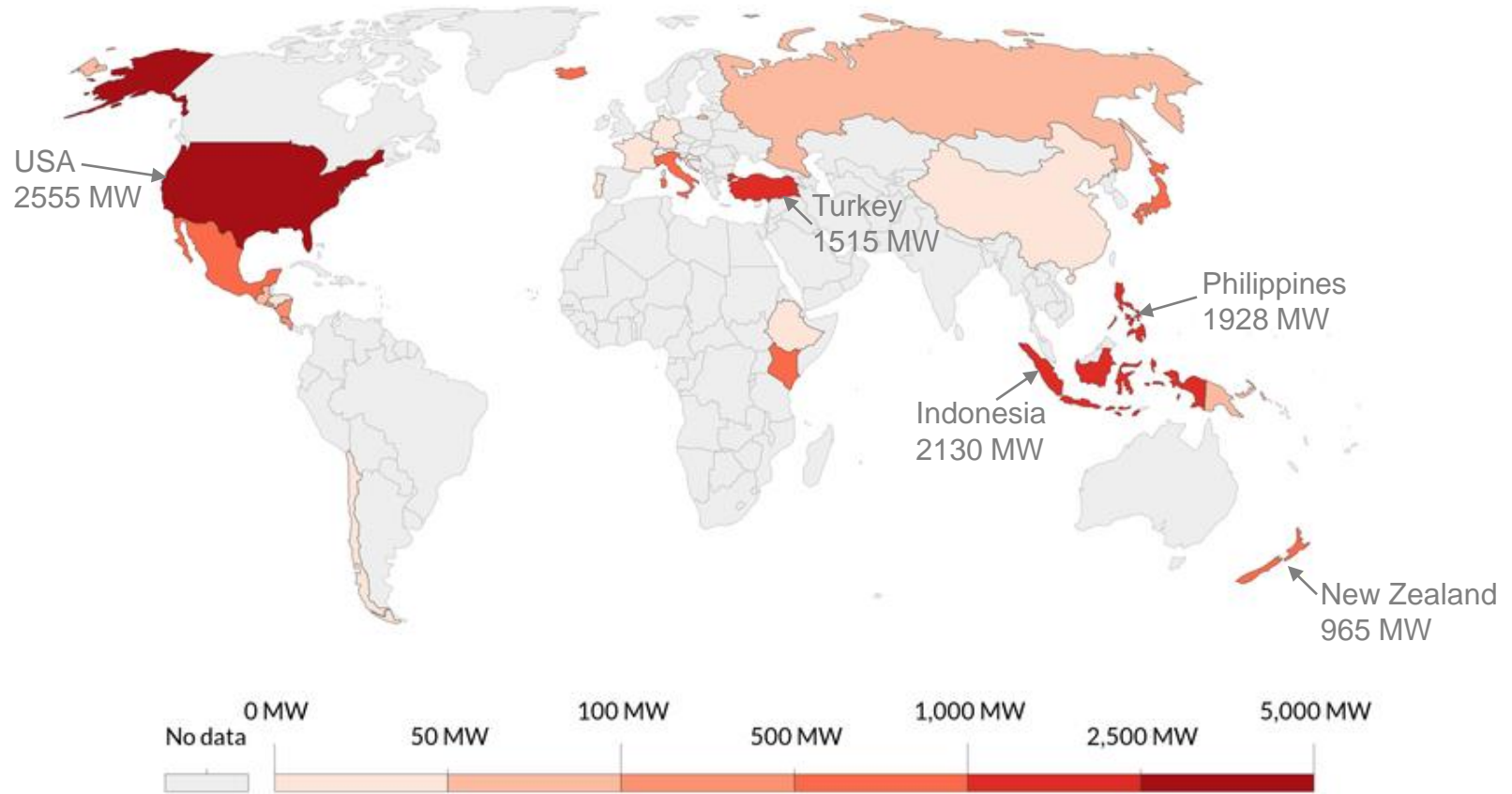


**WEATHER
INDEPENDENT**



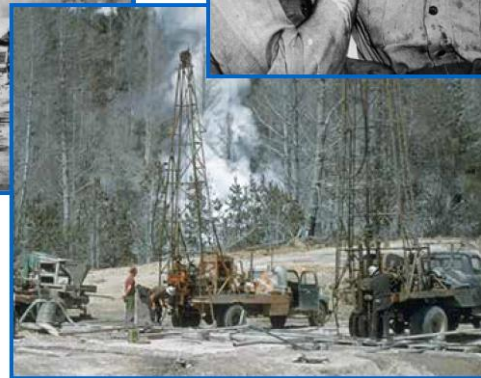
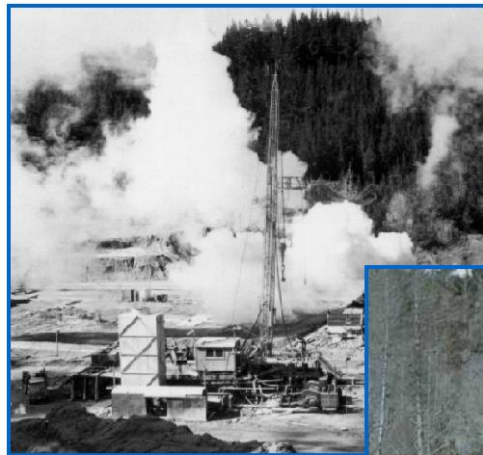
**CHEAP ONCE
INSTALLED**

Where in the world uses geothermal electricity?



Source: BP Statistical Review of Global Energy (2020)

New Zealand: Geothermal Pioneers



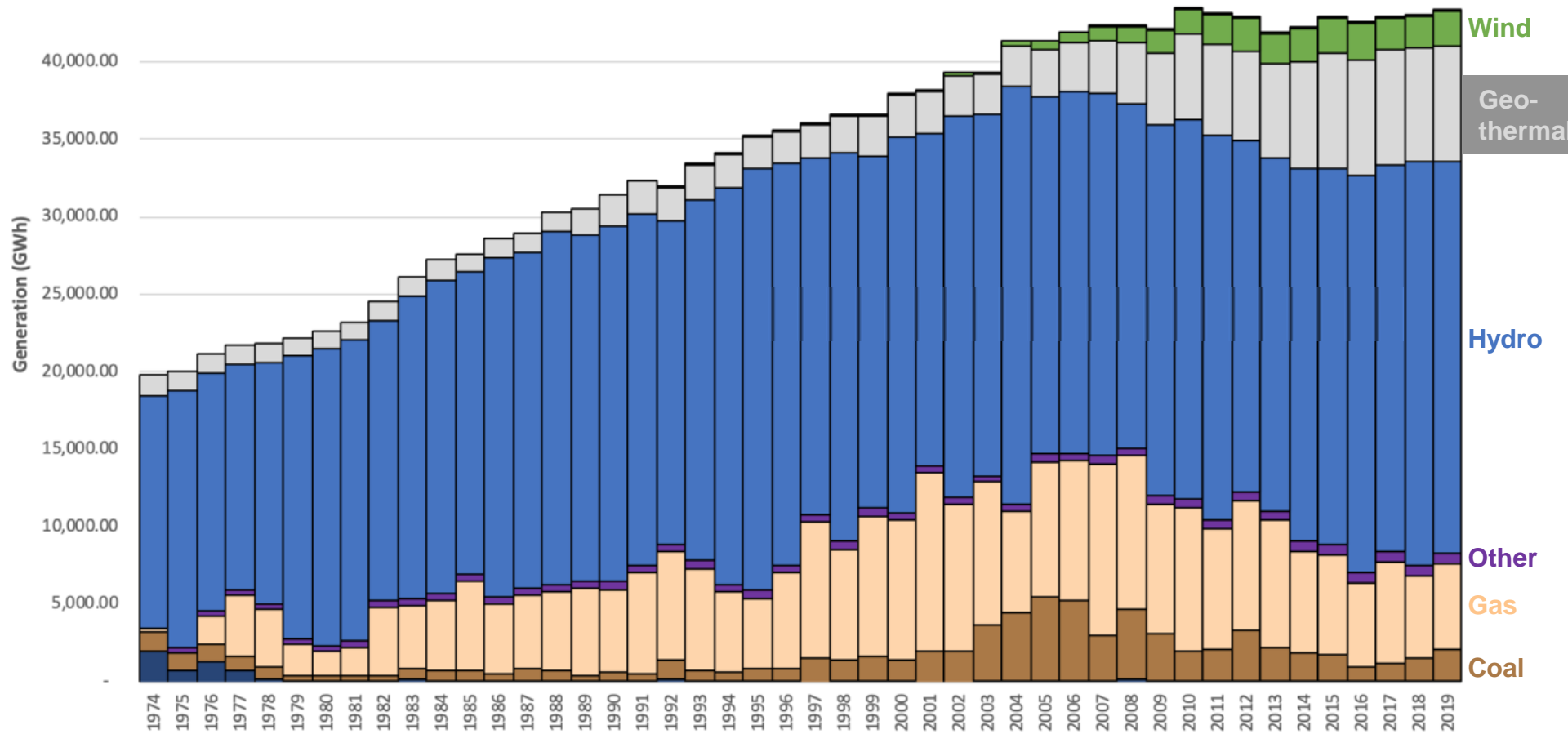
1958:
Wairakei power
station

1980:
129 areas
mapped

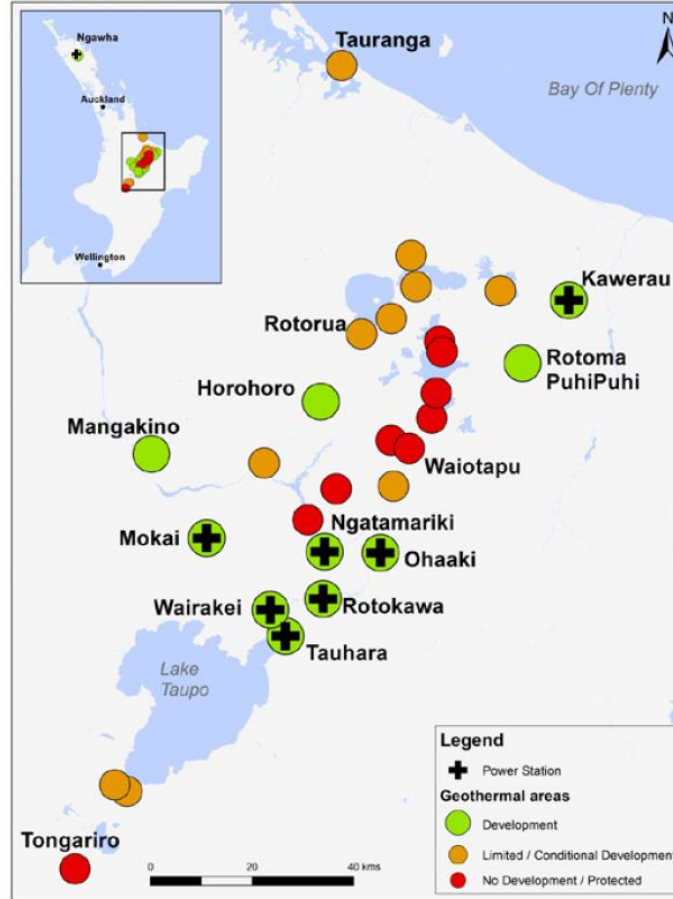
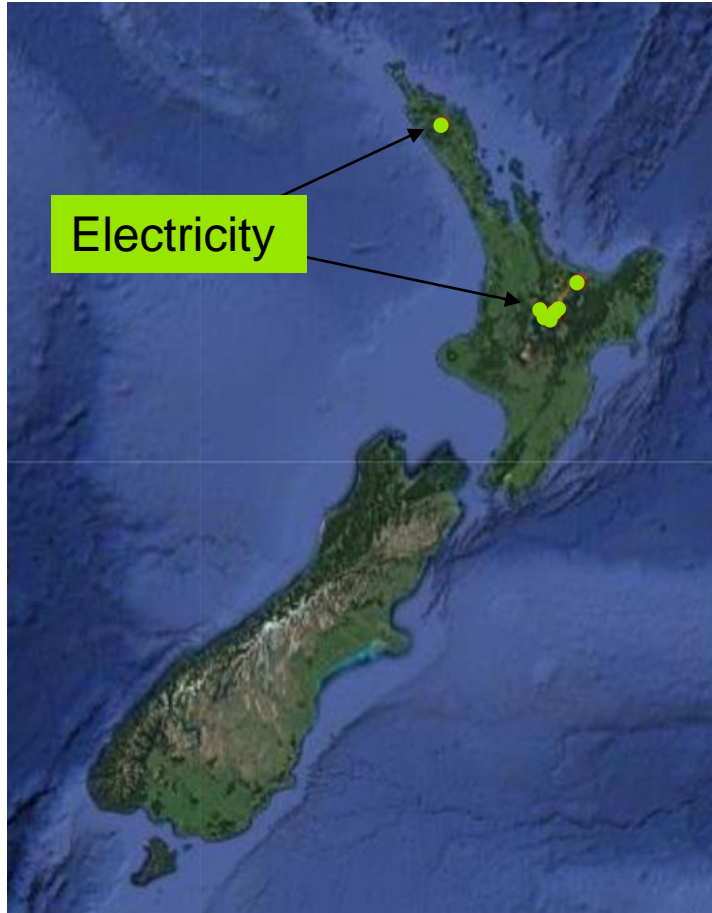
2007-2014:
electricity
doubled

2025:
90%
renewable

Geothermal electricity in NZ

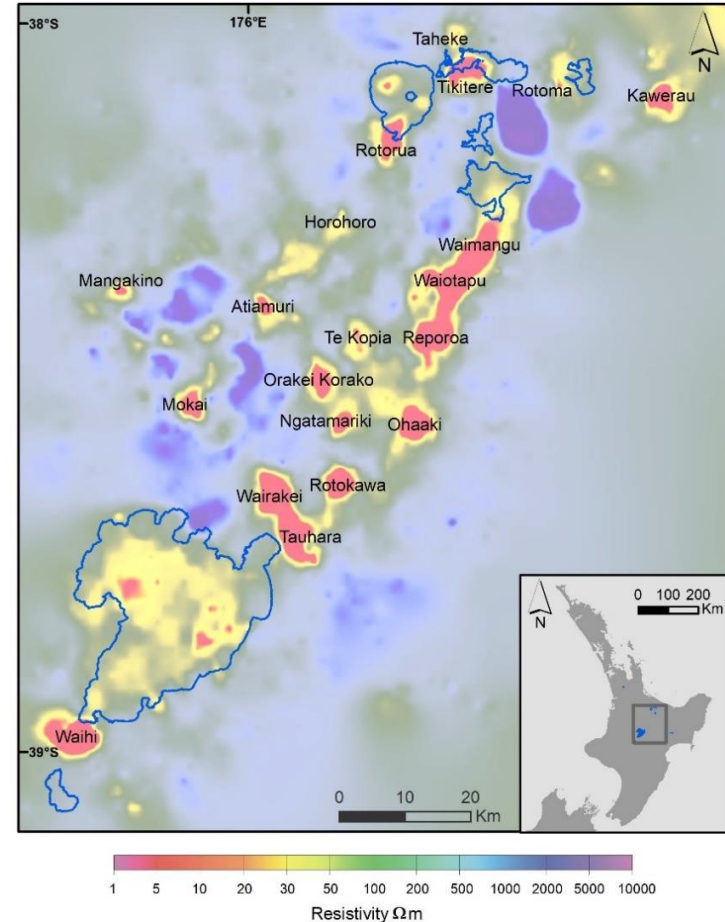


New Zealand's geothermal resources

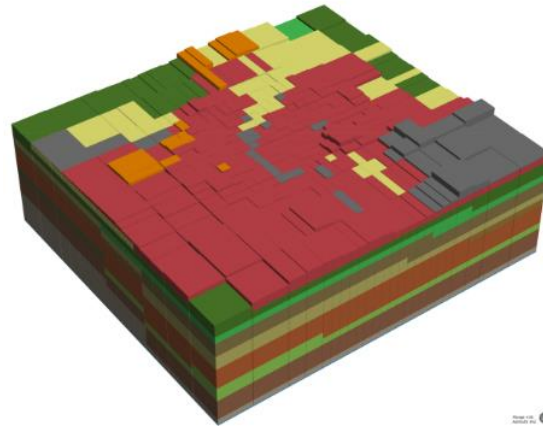
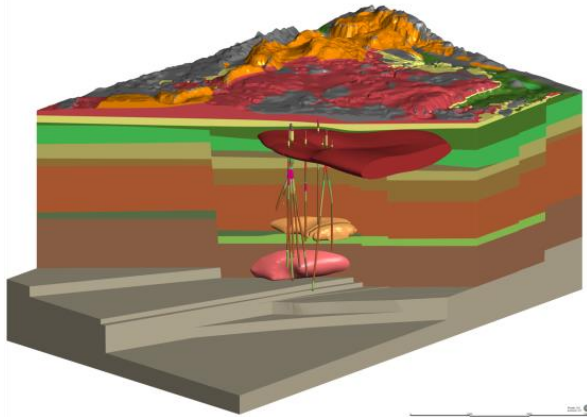


High-temperature geothermal systems

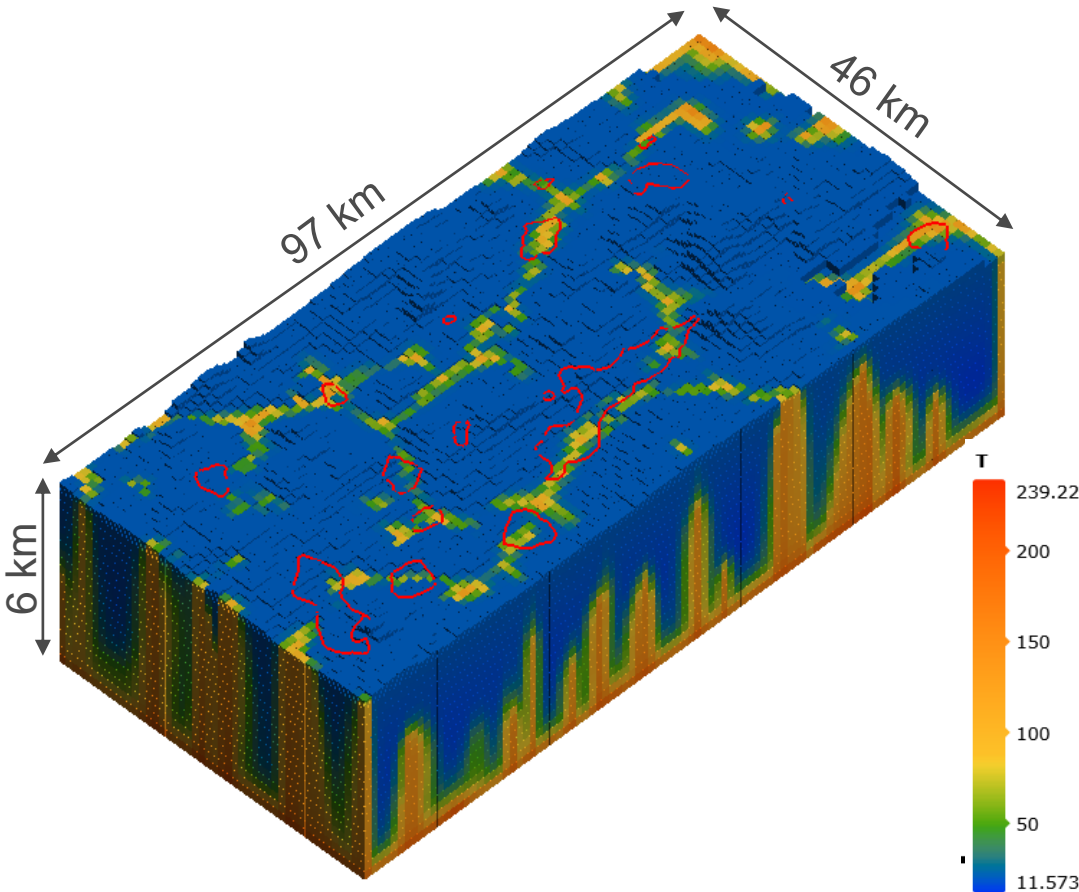
- Why are they there?
- Why don't they move?



What I do



Ground surface is a major influence



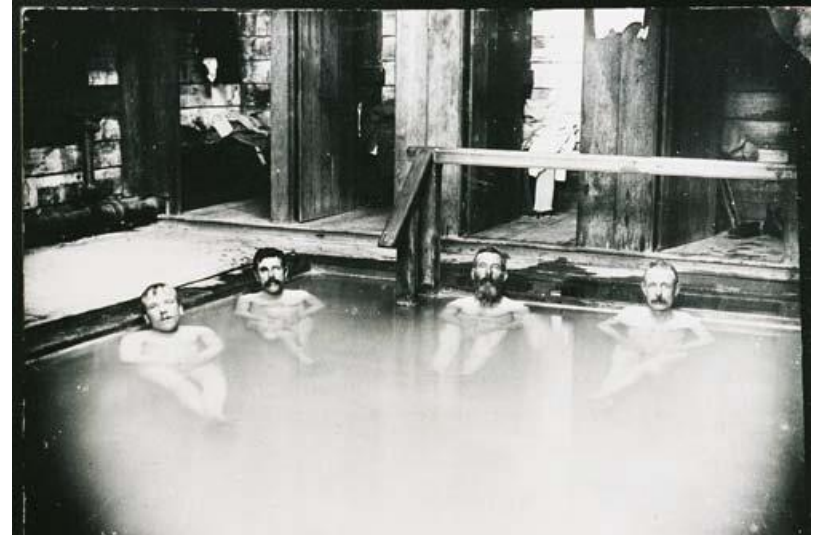
- Unlikely to move in future
- However can decline

Ways to reduce fossil fuel use

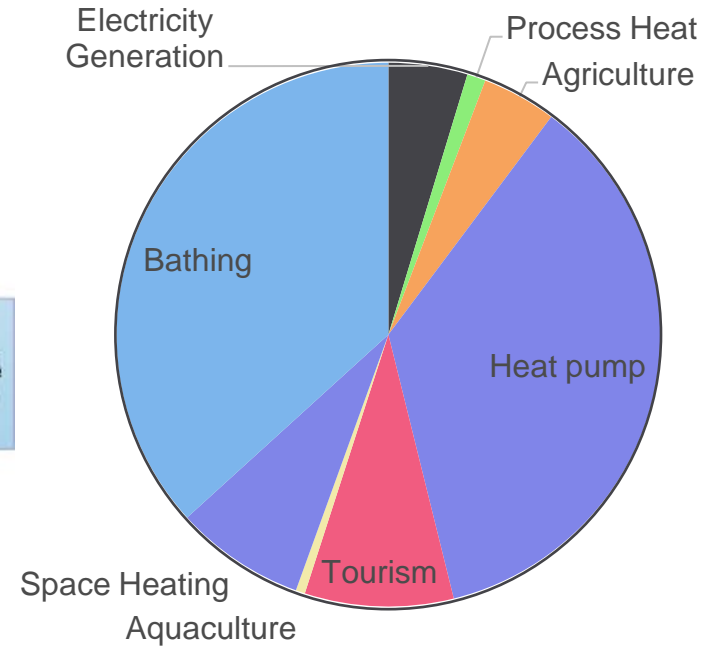
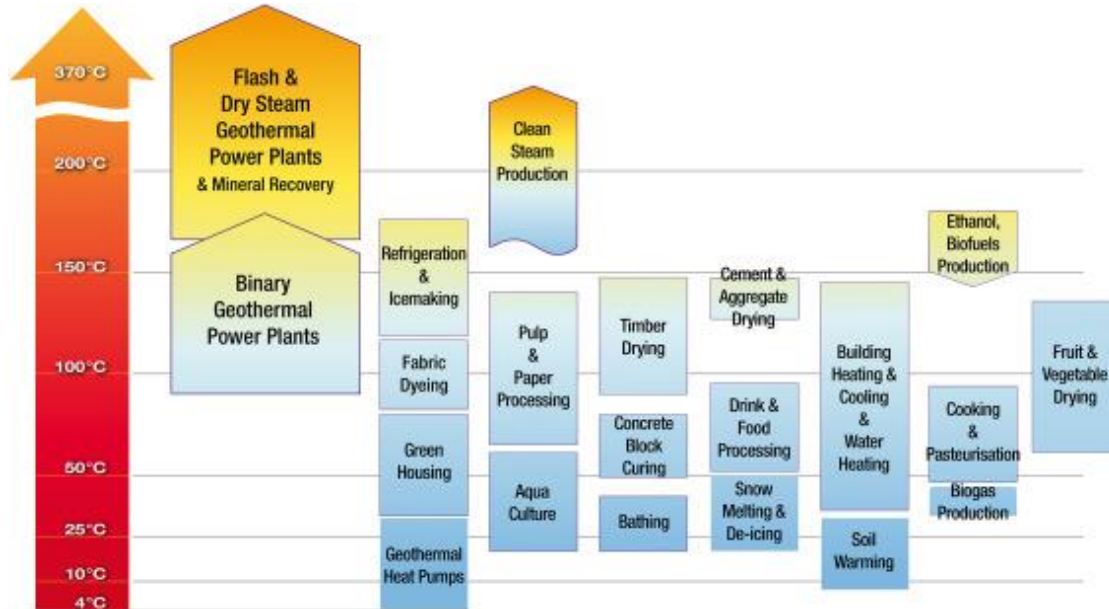
- Increase renewable electricity
- Reduce electricity use...



Carol Stewart,
'Geothermal energy',
Te Ara - the Encyclopedia
of New Zealand,
[http://www.TeAra.govt.nz/
en/geothermal-energy](http://www.TeAra.govt.nz/en/geothermal-energy)



Direct uses of heat



New Zealand's alternative geothermal resources

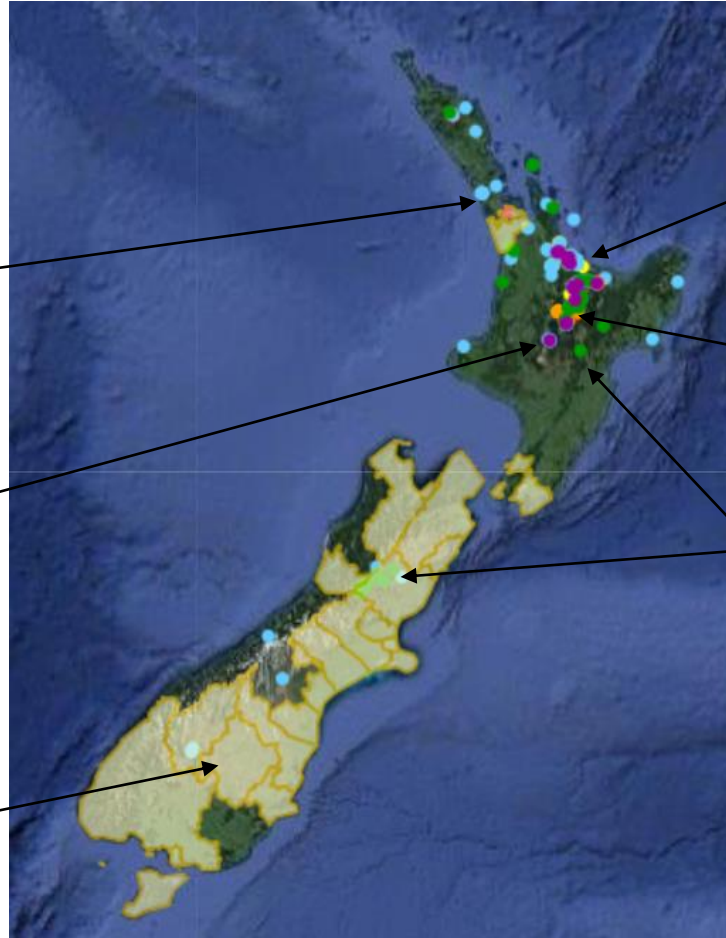


Bathing



Heating

Ground-source
heat pumps



Agriculture

Industrial

THE
ROGUE
BORE

GEOTHERMAL BREWERY

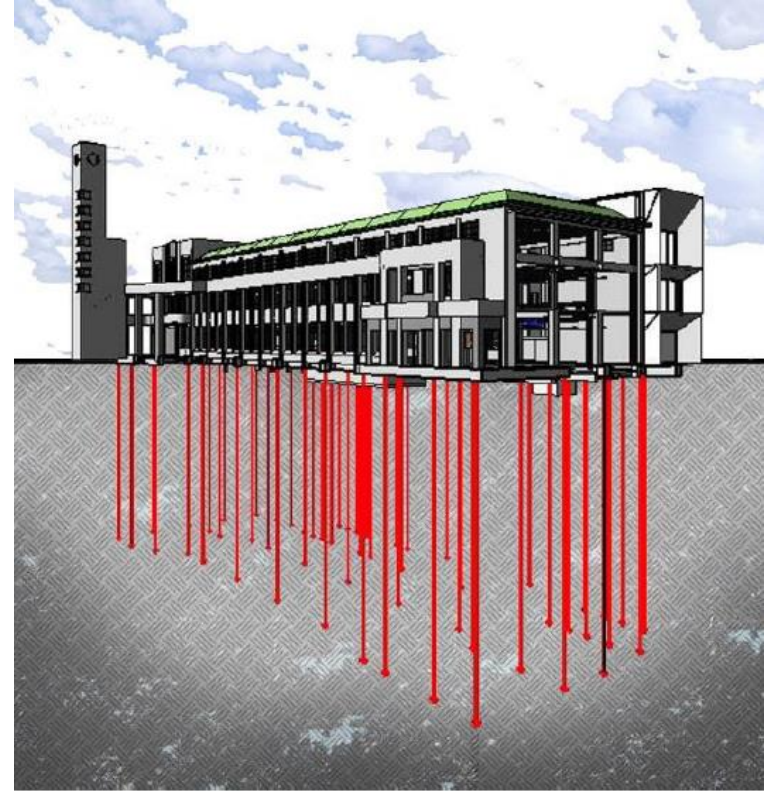


Tourism

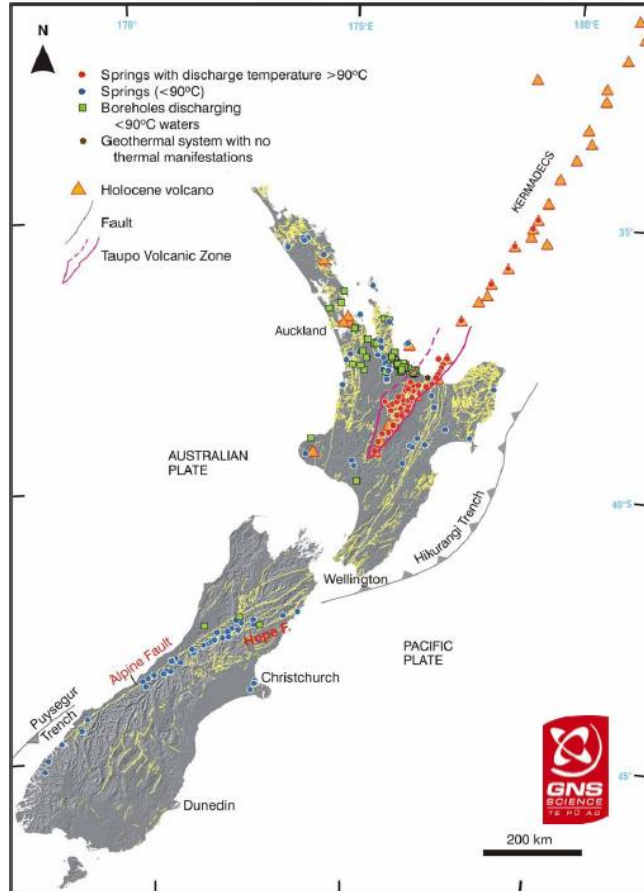


<https://data.gns.cri.nz/geothermal/wms.html>

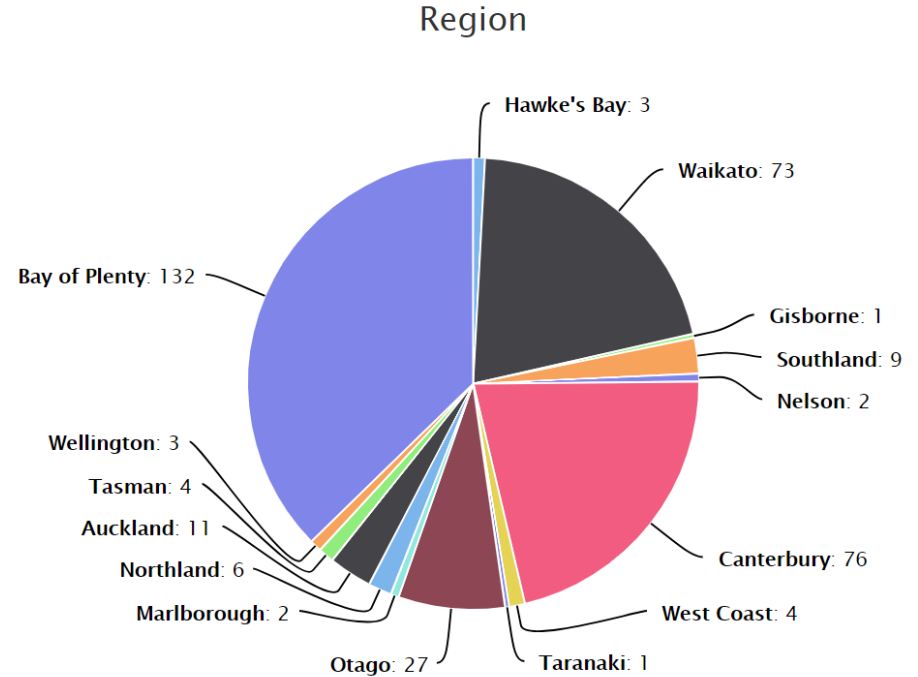
Where is this?



Different conditions for different heat uses

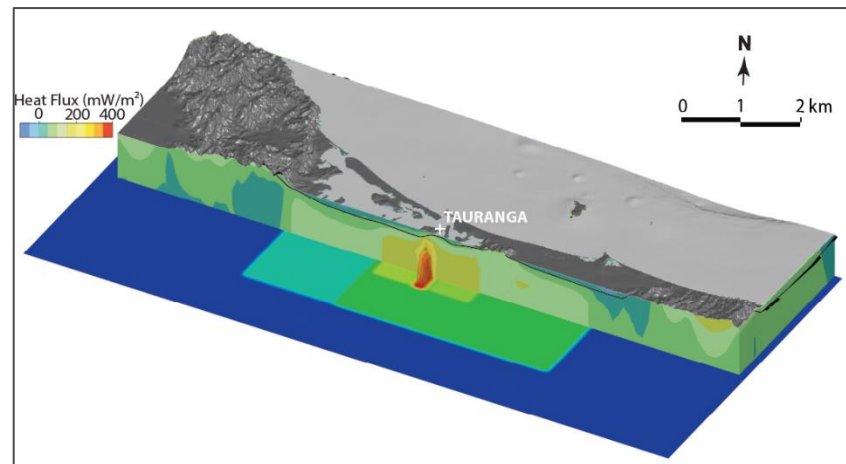
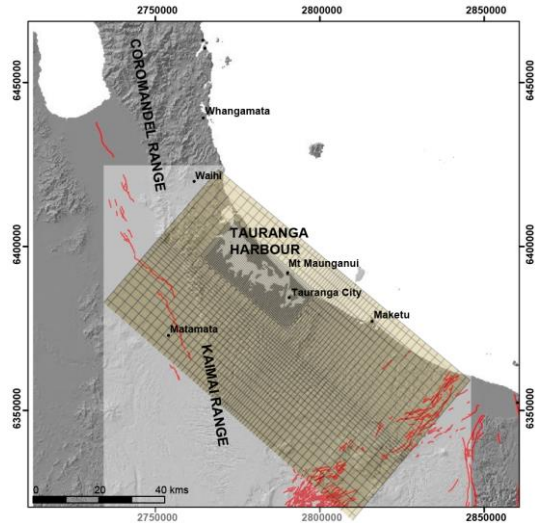
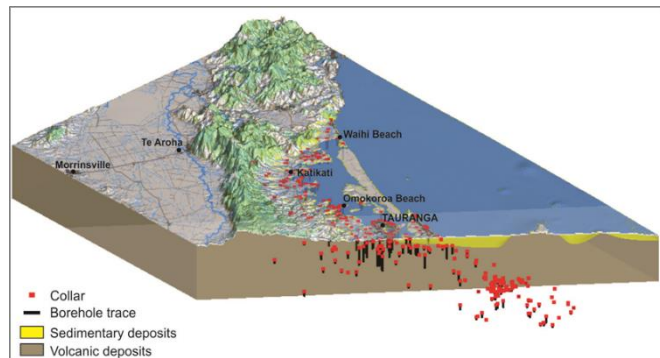


From: Reyes, A.G. and Christianson B.W. (2006) Mineral waters. In: Graham I. (ed) GSNZ Monograph. Faults from www.gns.cri.nz.



<https://data.gns.cri.nz/geothermal/charts.html>

Extracting warm water



Summary



- **Exciting area to work and do research**
- **Major clean energy contributor**
- **We could use more!**

Any questions?

