Geothermal development in New Zealand

Managing environmental and social effects and effects on Maori

by

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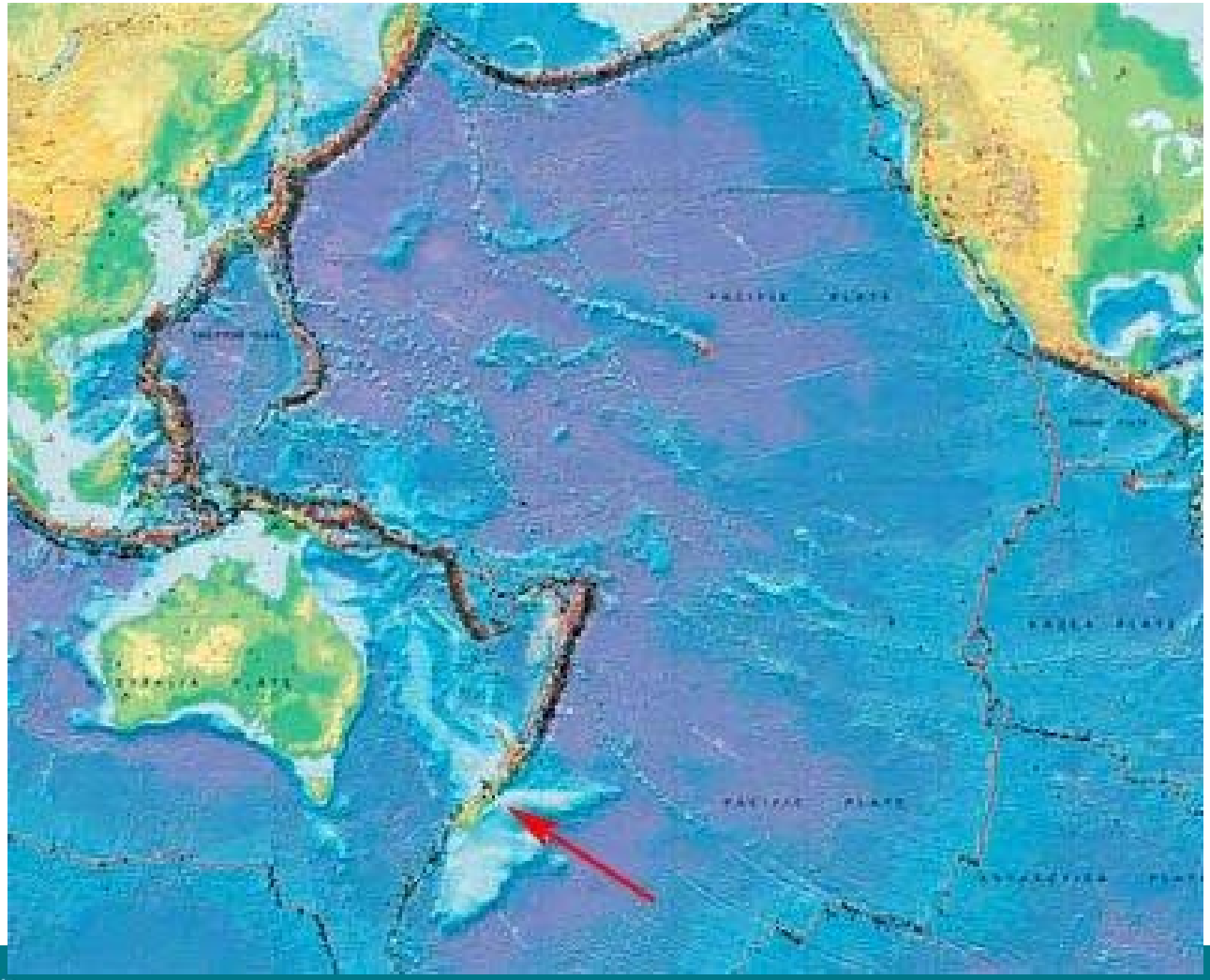
My presentation will address...

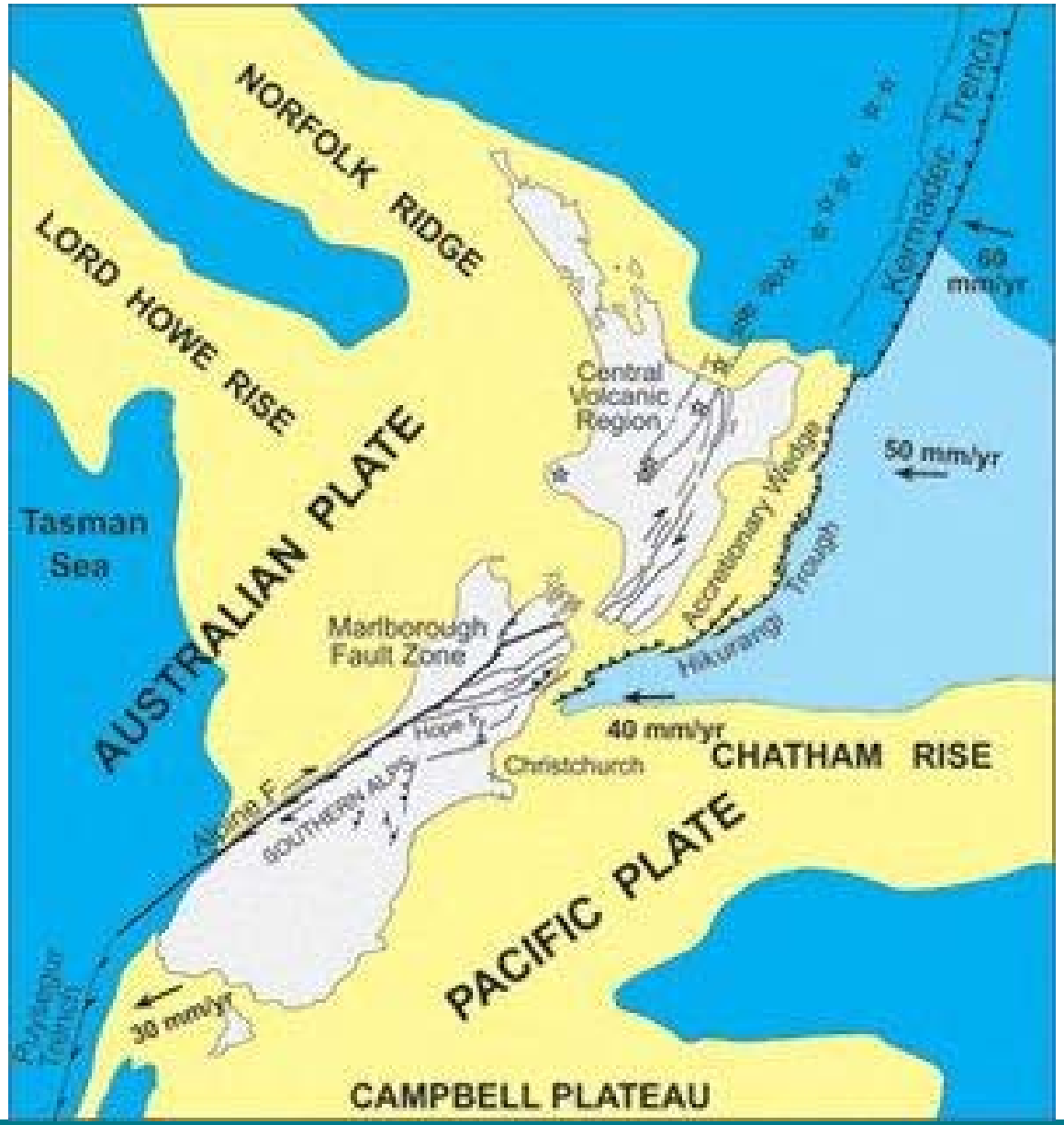
- Context:
  - Local government structure in NZ
  - Geothermal resources in the Waikato Region
  - Maori interests in geothermal management
- Legal framework
- Policy framework
- Adverse effects:
  - Management of environmental/social effects
  - Management of effects on Maori interests

NZ's position in the world



New Zealand straddles 2 tectonic plates.

Population 4.5m



Government in NZ

- Central government
  - ❖Responsible for making legislation
- Regional Councils
  - ❖predominantly address natural resource use issues – water, land, air, geothermal
  - ❖boundaries based on river catchments
- District / City councils
  - ❖service delivery / infrastructure focus
  - ❖land use
  - ❖boundaries based on political & social factors

Waikato at a glance

- Area 25,000 km2
- Population 412,000
- Up to 50% of New Zealand's electricity generation.
- 75% of New Zealand's geothermal systems

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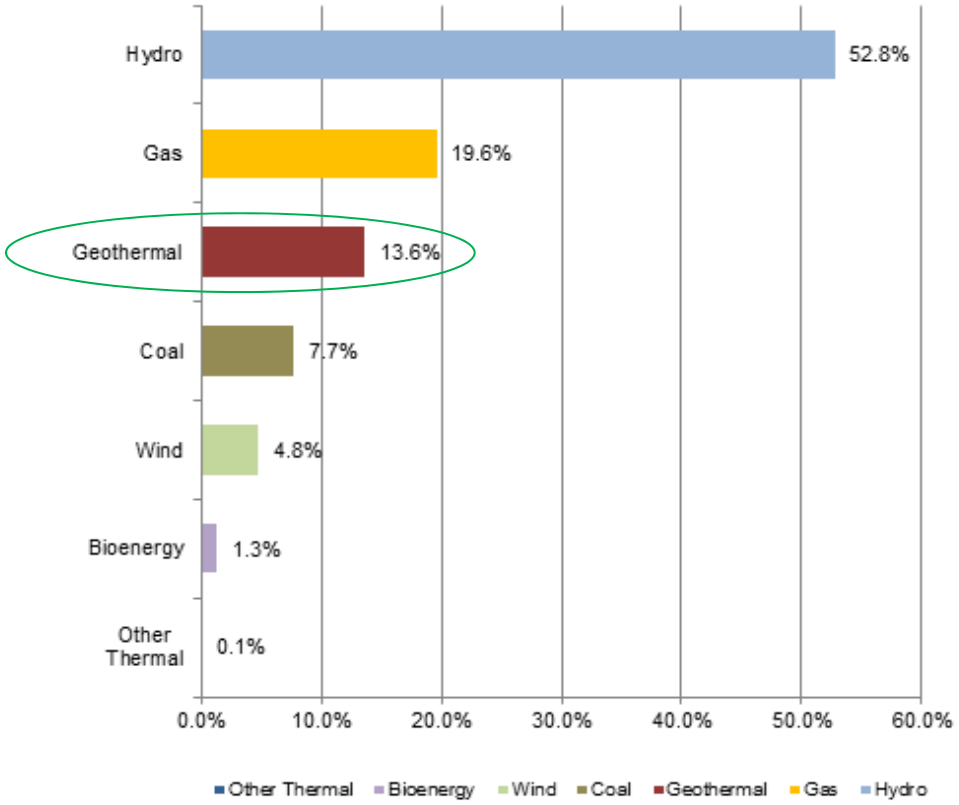
Geothermal Resource Management

- 1960/70s - Geothermal investigations by government
- 1991: Resource Management Act 1991 - Use and allocation
- Late 1990s – partial privatisation of energy companies
- Regulated by Regional Councils – 75% in Waikato Region
- National perspective:
  - Geothermal is defined in law as a renewable resource
  - Gov't target – 90% of NZ's electricity from renewable sources, by 2025 (currently about 72%) → currently busily encouraging geothermal, wind etc
  - 2011 National Policy Statement (under RMA) for Renewable Electricity Generation → promotes renewable energy projects

Geothermal energy makes an important contribution to New Zealand's energy supply

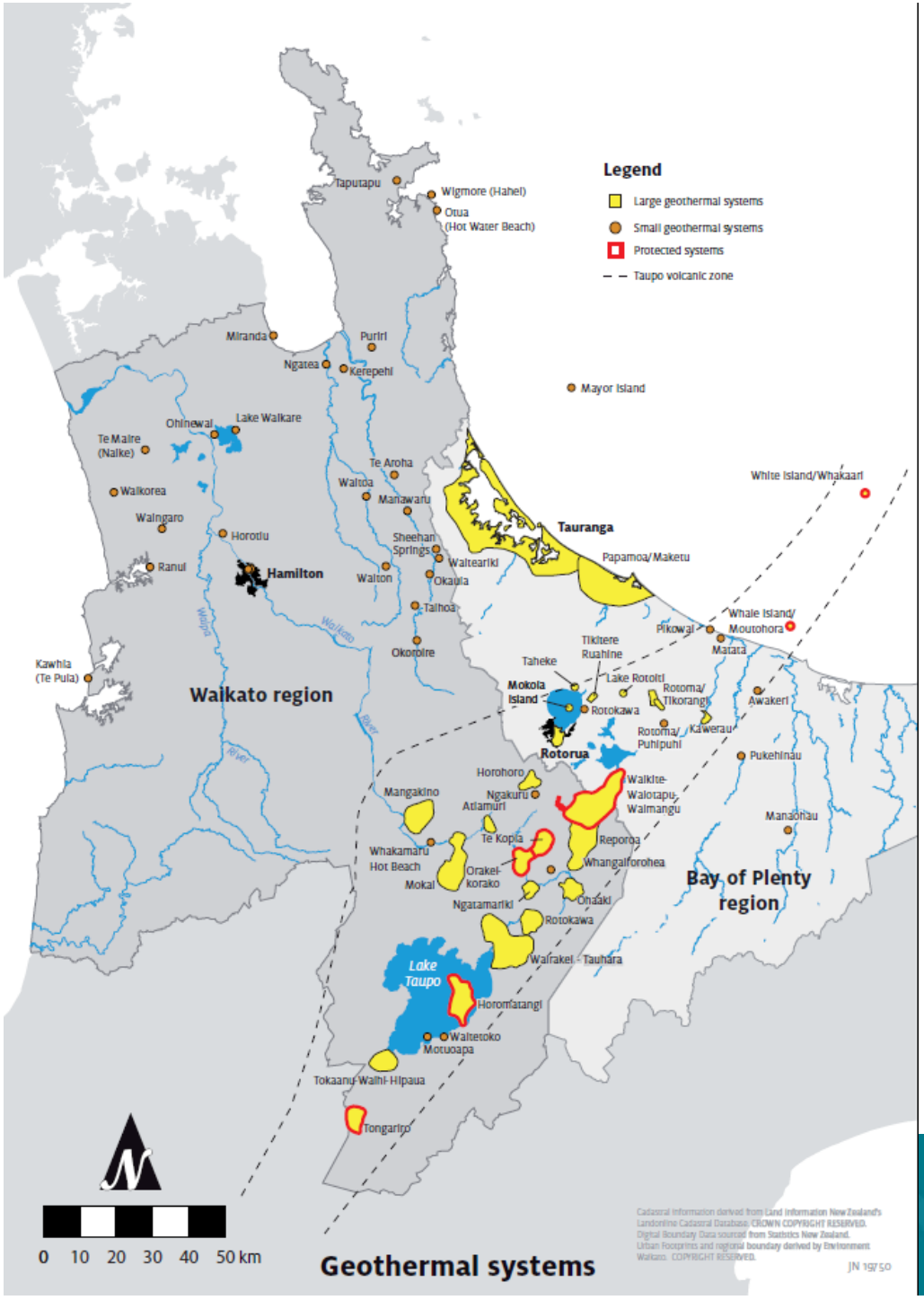
Electricity generation, GWh (2012)



Renewables
≈ 72%

Total
≈ 43,000 GWh

Source: MBIE (provisional data for 2012)



Geothermal resources in the Taupo Volcanic Zone

Managed by two Regional Councils

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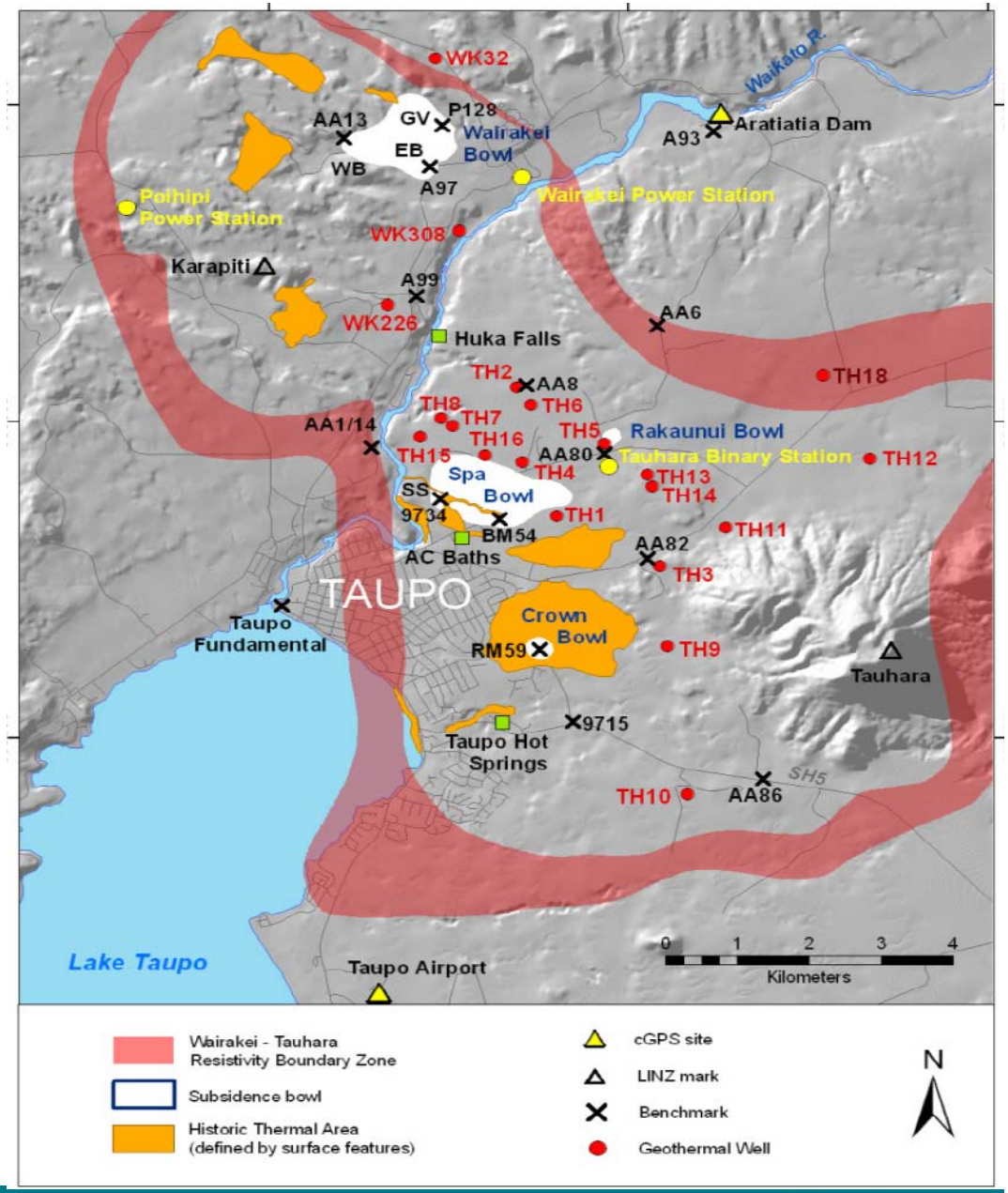
Waikato Geothermal Resource

- 15 High-temp systems, 30 small systems
- Important source of:
  - ✓ Domestic and process heat (prawns, milk processing, timber drying, honey, orchids, tomatoes, etc)
  - ✓ Electricity (610MW, 7 stations, approx 635MW planned.)
  - ✓ Tourism (2.5 million visits p.a.)
  - ✓ Cultural uses
  - ✓ Biodiversity
- 100s of surface features with scientific and landscape value

Illustrating one of the resource management challenges in NZ – ie. coincidence of urban and geothermal areas



Maori interests in geothermal resources

- Most geothermal resources are subject of ownership claims by local Maori (Waitangi Tribunal)
- Significant areas of land overlying geothermal systems are owned by Maori or were occupied by Maori in historical times
- Geothermal resources are regarded by Maori as a traditional “taonga” (treasure)

Legacy effects

eg Ohaaki pool:

1. original state
2. during field development
3. now artificially filled by bore water

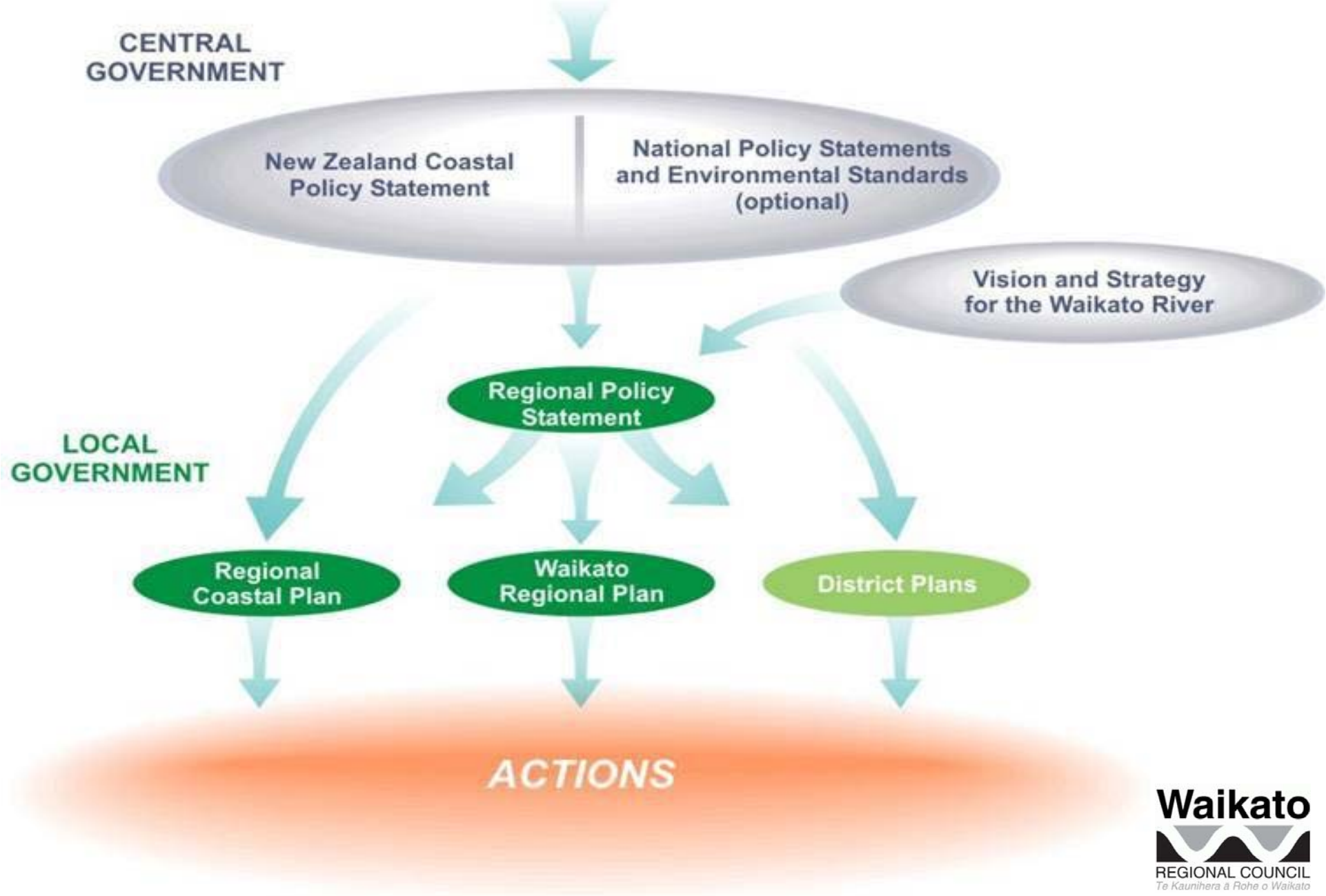
Resource Management Act 1991

The principal law governing use of resources in NZ

Purpose (s5)

- To promote sustainable management of natural & physical resources
- Sustainable management means - managing natural and physical resources so social, economic cultural well being and health and safety of people and communities provided for while
  - Sustaining potential of resources (excluding minerals) for the reasonably foreseeable needs of future generations
  - Safeguarding life-supporting capacity of environment / ecosystems
  - Avoiding, remedying, mitigating adverse environmental effects

Resource Management Act
1991



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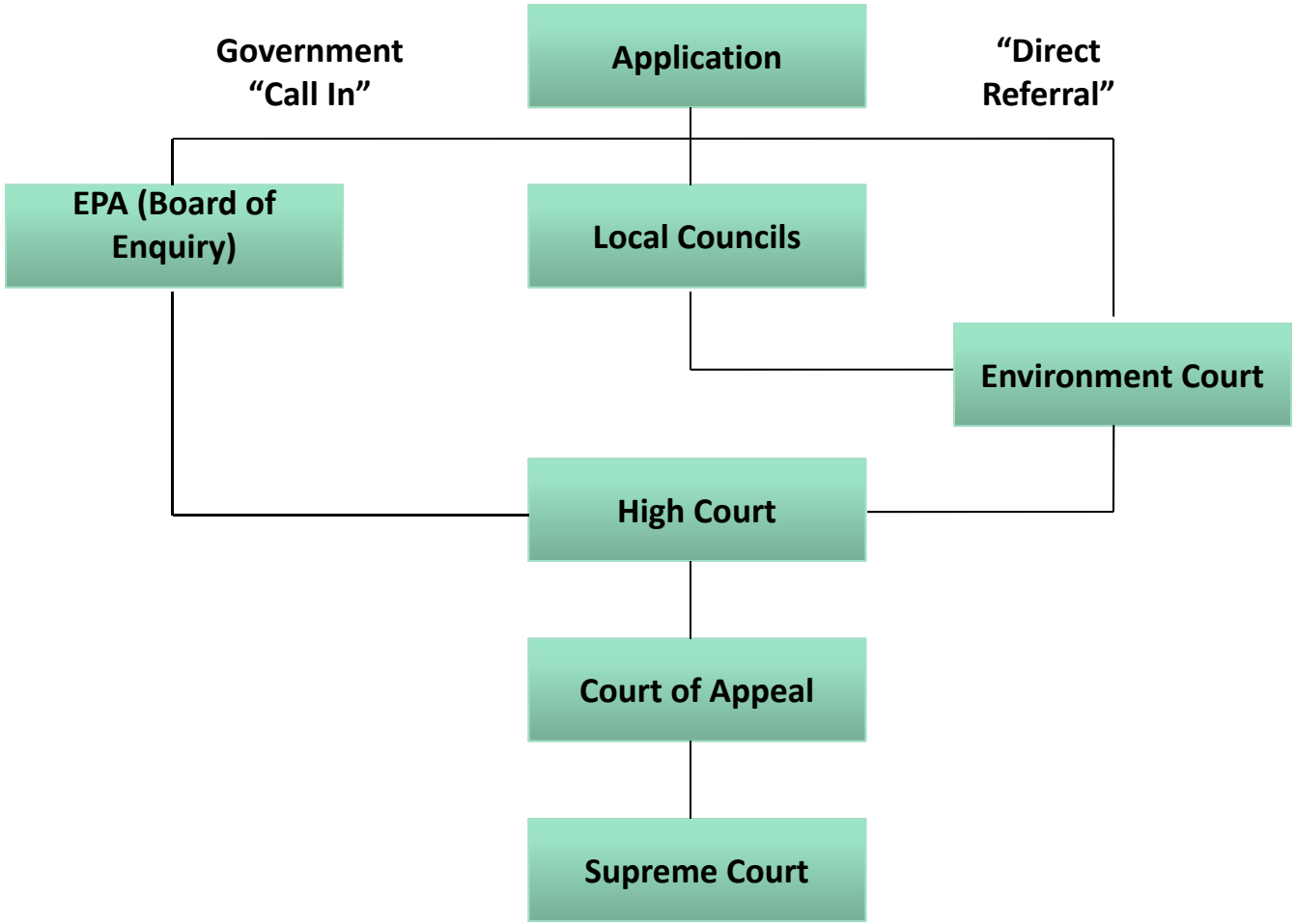
Resource Consents (Permits)

- Permit under the RMA to use resources - water, (including geothermal) land, air, coast, river beds
- Do not confer ownership
- Granted for a defined period (max 35 years) except land use (unlimited)
- Subject to terms and conditions of use including review of conditions
- Process of obtaining permit is open to public submissions where effects are more than minor

Permit processing pathways



Fundamental Policy Principles

"Sustainable management" through:

A. System classification

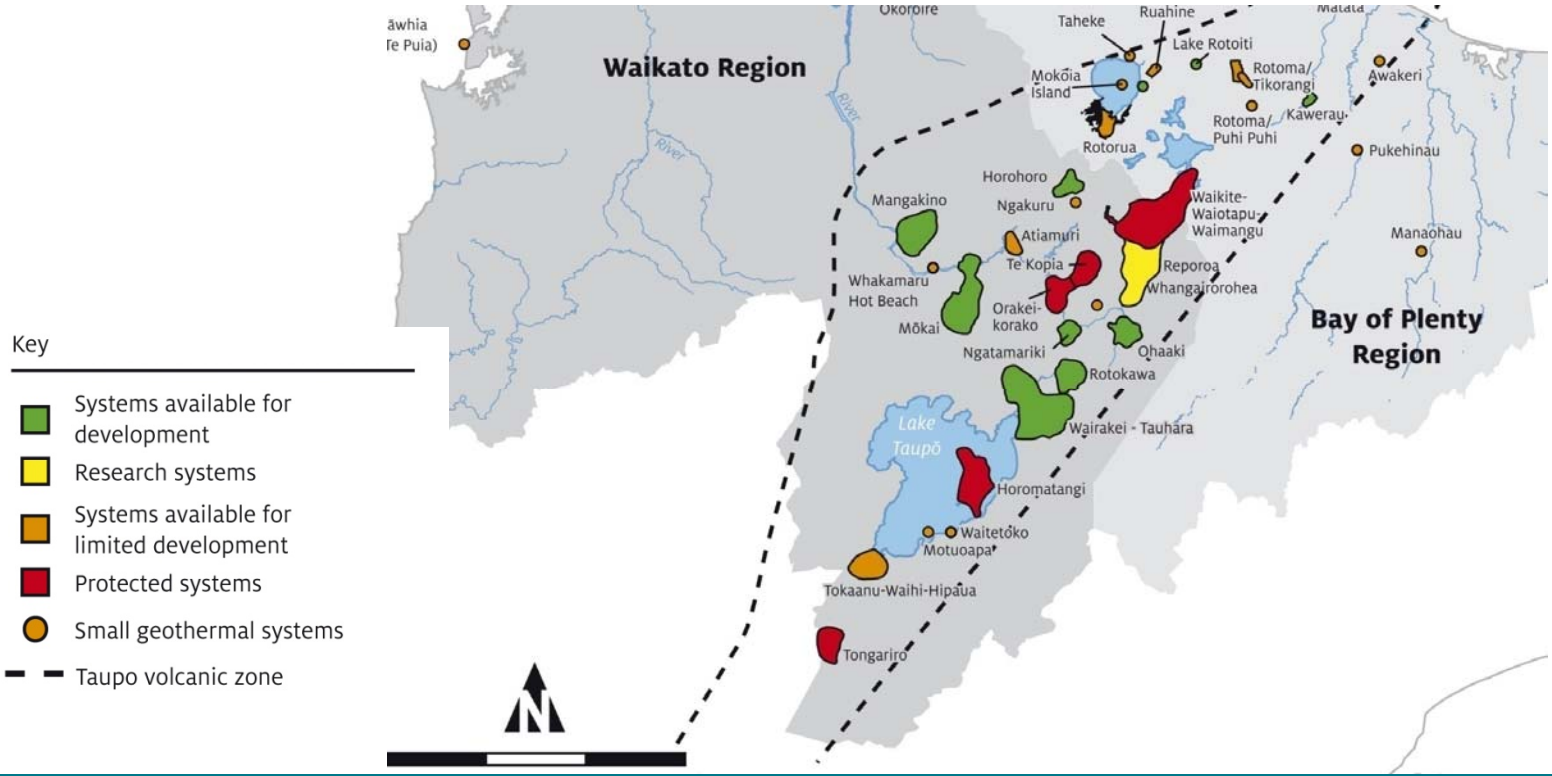
B. Development over time (current & future generations)

C. Encouraging efficiency

D. Ensuring protection of significant geothermal features

A - System Classification

Recognise "**geothermal system"** as primary management unit – classify systems for "development", "protection" etc



B - Development over time

- Energy in Development Systems to be available for use by current and future generations
- Controlled depletion
- Staged development for large projects
  - Disturb resource and study effects
  - Determine sustainable take
- Avoid excessive take/adverse effects

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C - Efficiency

- Encourage direct use of heat
- Encourage maximum use of taken fluid – eg "cascade" use
- Require re-injection of taken fluid – reduce adverse effects and enhance life of system
- Burden of adverse effects to fall on those who cause them ("polluter pays")

Tuaropaki Glasshouses
Direct use of Heat: Mokai

Miraka milk processing - Direct use of Heat: Mokai


Silica Terraces Cascade use of fluid : Wairakei
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Huka Prawn park:

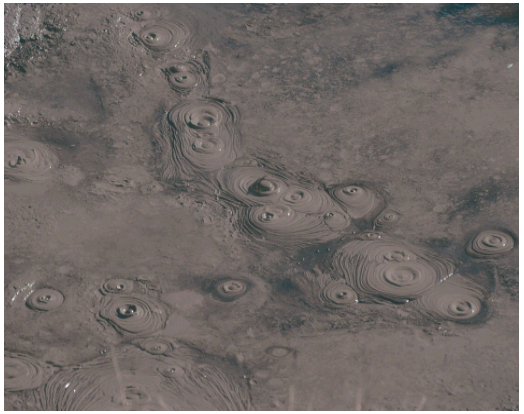
Cascade use of Heat : Wairakei

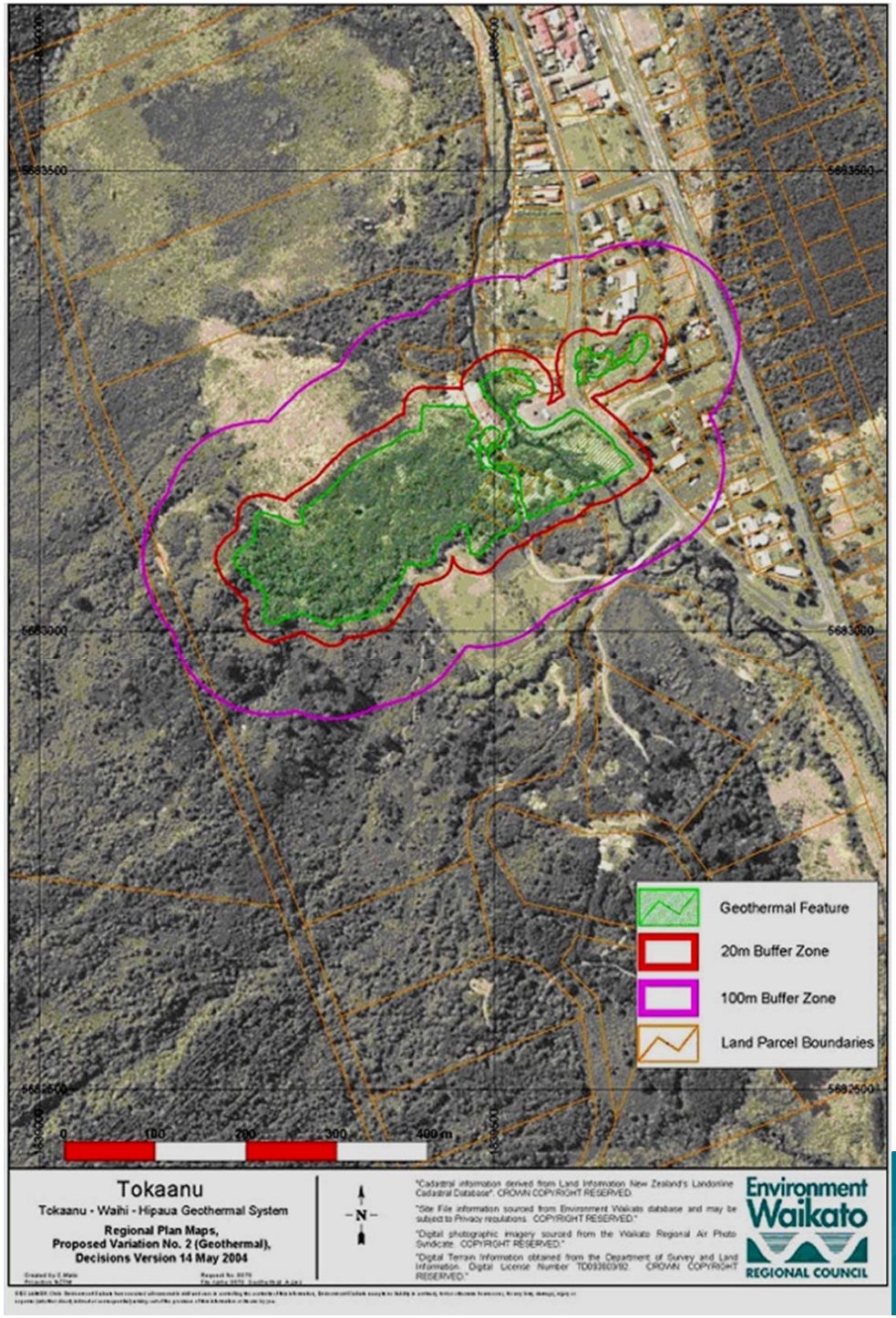
D - Protection of Features

- Significant geothermal features (SGF) identified and ranked for significance based on rarity, and vulnerability to extractive uses and land uses
- SGFs protected by rules in Plan - except in Development Systems

Geothermal Features and Habitats



SGF maps

- Mapped for Development and Limited Development Systems
- Rules specify setback distances:
  - groundwater take,100 m
  - land disturbances, 20 m

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Management of environmental and social effects – Key tools

- Peer review panel:
  - typically 3 technical experts and a Maori representative
  - provides independent, expert oversight
  - reports to Council but paid for by developer
- Monitoring, modelling and reporting
  - wide range of monitoring requirements (baseline and ongoing)
  - requirement to maintain model and run regular “scenario” forecasts (5, 10, 20 years)
  - information publicly available

Management of environmental and social effects – Key tools (cont)

- System Management Plan
  - draft Plan to be lodged with application
  - sets out production strategy, discharge strategy, identifies risks and means of addressing adverse effects
  - updated every 4 years or upon significant changes
  - Council approval
- Monetary bonds
  - example: $5m bond at Wairakei for subsidence mitigation

Management of environmental and social effects – Key tools (cont)

- "Adaptive management" built into permit conditions
  - example: management of subsidence at Wairakei-Tauhara through maintenance of minimum reservoir pressure
  - target pressure can be altered by Council if subsidence objectives not being met
- Damage claims processes – land subsidence, water supplies, etc (eg Wairakei-Tauhara)
  - obligation on developer to remedy or compensate
  - process administered by Council with PRP assistance
- Ability to review conditions

Lessons learnt

- Policy – it all starts here
  - good policy provides clear direction, certainty
  - good process → stakeholder buy-in
- Protection and development in the same system are incompatible

  → regional approach to sustainability
- Good information is vital – at permitting/ongoing
- Independent, expert oversight of information vital

Lessons learnt (cont)

- Staged approach ie
  - large enough to perturb the system and gather useful information (and to be commercially viable)
  - small enough to avoid undue environmental risk
- Single operator per geothermal system
  - avoids disputes about responsibility for adverse effects
  - avoids competitive behaviour in terms of system exploitation and management of information
  - easier to optimise development of system (eg siting of production and reinjection wells)

Lessons learnt (cont)

- Adaptive management essential
  - "learning by doing"
  - reflects the uncertainties inherent in geothermal developments
  - aligns with developer need for operational flexibility
- Long permit terms (35 years) encourage developer to take long-term view to sustainability

How are Maori interests catered for?

- RMA:
  - Principles (s6-8) recognise Maori values
    - ✓ Relationship with natural resources must be “recognised and provided for”
    - ✓ Must “have regard to” kaitiakitanga (gaurdianship)
    - ✓ Must take account of principles of the Treaty of Waitangi
  - Consultation with Maori required when developing policy
  - Iwi (Maori) Management Plans must be taken account of when making policy

How are Maori interests catered for? (cont)

- WRC geothermal policy – requirement to "recognise and provide for" Maori values
  eg. reflected by identification/protection of culturally significant features
- Permit processes enable Maori input with rights to make submissions and appeal decisions
- Some geothermal developments are joint ventures with local Maori (eg Rotokawa, Ngatamariki)
- Mokai Geothermal System developed by local Maori landowners

How are Maori interests catered for? (cont)

- Permits to develop generally include:
  - Maori representation on peer review panels
  - Establishment of Maori "reference groups" (purpose – information exchange)
  - Direct mitigation requirements – eg. remedial works, funding of Maori education, protection of sacred sites etc
- "Side agreements" (outside formal permit process) are common

Conclusions

- NZ's legal and policy frameworks for geothermal use are now well established
  - RMA requires sustainable management of geothermal resources
  - Policy and permits implement this at a regional level
- There is a sound legal/policy basis for the management of adverse effects
- Ongoing adverse environmental and social effects are relatively minor - although some significant legacy effects