# Overview Geothermal Regulation and Licensing

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# Outline

1. Introduction
2. Ownerships, property rights, access
3. Electricity markets
4. Environmental licensing

# Tomorrow:

1. Community/indigenous participation
2. Investment and risk support policies

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# 1. Introduction

- **Wide subject area, introduce 'why', 'basics' & 'examples'**
- **More in background reader/discussion document**
- **4 cases: NZ, Philippines, Chile, Kenya**
- **6 dimensions**
- **Questions and discussions welcome**

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# 1. Why important?

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- Geothermal development complex, expensive and risky
- Geothermal has aspects of  other resource sectors (petroleum&mining), but also of (regulated) electricity sector/markets
- Geothermal is environmentally 'relatively benign' and many impacts already happen naturally, but need to be managed
- Geothermal projects often in remote, pristine regions (or highly populated)
- (Personal) dissatisfaction with existing publications generally not covering whole range and balance in geothermal regulation & policy

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# 1. Some countries as examples

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- **Countries with similarities (public-private development) and differences (e.g. experience, electricity markets, policies, etc)**

| | History & background |
|---|---|
| **New Zealand** | Since 1950s; 900 MWe installed; original state intiated development, now private developers; 3-5 GWe potential |
| **Chile** | Recent exploration wave, 2-4 projects 'approved'; none installed yet; complete private development; 3-16 GWe potential |
| **Philippines** | Since 1970s; 1900 MWe installed; previous state development; newly development under privatized framework (2008-); 3-4GWe potential |
| **Kenya** | Since 1970s; 500 MWe installed; mainly state&donor initiated development; recent drive for private development, but still major state involvement; 5-16 GWe+ potential |

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# 2. Resource ownership, property rights and access

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# 2. Main resource/property themes

- **Resource ownership & property rights**
- **Access policy (single vs multiple)**
- **Sustainability, renewability & (controlled) depletion**
- **Monitoring and reporting**
- **Royalties & taxes**

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# 2. Legal ownership & access

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- Most countries geothermal is public/national/regional resource (USA notable exception: land-owner; NZ mixed but effectively regional)
- Generally provides the basis for monitoring & control
- Resource/use access often defined in regulations similar to Oil/Gas:
  - Licences for exploration & production for defined periods
  - Exclusivity of resource use during period (or rules for multiple access)
  - Definitions of royalties/taxes/costs (or virtually '0')
  - Conditions (renewable/sustainability or in environmental legislation)
  - Conditions for rendering licences (and data – or not)
- Often a balance between attracting investors and 'keeping national control', 'keeping speculators out', etc

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# 2. Resource ownership (ctd)

- In some countries provisions for indigenous people/regions to co-decide and/or get share of royalties (e.g. Philippines)

- NZ organized quite differently, but with similar effects

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# 2. Physical access

- Even if resource ownership and access public
- Physical access often private: negotiate with landowners
  - For access to resource
  - For infrastructure (transmission, roads, etc)
- Jurisdictions differ in ability of (central) authority to 'force access' in the 'public interest'
- Resources sometimes in National/Conservation Parks/Reserves => other legislation & authorities involved => complex

# 2. ctd

- Sustainability & renewability are differently defined, via different legislation (NZ geothermal 'renewable' by law, but not exactly defined. In effect policy to categorize all systems in 'protected' vs 'development-with-controlled-depletion')
- Monitoring and reporting generally less well defined than in oil/gas (see tomorrow Resource Assessment)
- Most jurisdictions '0' or very little royalties for use of 'public' resource (Philippines 1.5% of net; NZ: 0)
- Generally normal company taxes (but incentives for renewables in many countries)

# 2. Country examples

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| | Ownership & access |
|---|---|
| **New Zealand** | No ownership', but Regional Authorities 'managers' of resource' via RMA-consents to use resource under sustainability conditions (30-35 years); access through private (indigenous) land-owners. No royalties. |
| **Chile** | State resource ownership; exploration and exploitation licensing rounds & contracts under Ministerio de Energia (perpetual licenses). Much private & indigenous land (state can force access). |
| **Philip-pines** | State resource ownership, but need for regional/ indigenous approval. New Renewable Energy Act (2008) defines exploration & geothermal service (=exploitation) contracts (25 yrs +15) under Department of Energy. Contracts also specify royalties. |
| **Kenya** | State resource, orginally state development; now also licences to private companies, but still public company dominance. Much land is state-owned. |

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# 3. Electricity market & policies

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# 3. Electricity price defines geothermal project feasibility

- Access to electricity market (incl linking resource to transmission grid)
- Open access or state or oligopoly company dominated
- Main electricity market price and length of contract
- Alternative/competing supply (hydro, fossils, etc)
- Electricity market/renewable support policies
- Indigenous resource policies

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# For comparison Chile-NZ-Philippines-Kenya looked at

- Geothermal resource & costs
- Demand scenarios
- Alternatives & prices
- Support policies

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# 3. Country examples

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| | Electricity Market & RE-policies |
|---|---|
| **New Zealand** | Open competetion between private & (part) state-owned generation companies. Very limited support from NZ Emissions Trading Scheme. Geothermal competitive 'on its own' |
| **Chile** | Open competition between privately owned generators. High power prices on imported fossil fuels & support from NCRE-policies, but geothermal higher cost in Andes & 'marginally competitive' |
| **Philip-pines** | Newly privatized electricity market. High power prices on imported fossil fuels.Various types of RE-support for geothermal (in RE-Act-2008). Same Act defines feed-in-tariffs. Seems competitive: new geothermal plants in pipeline. |
| **Kenya** | Privatizing generation market, but with high state involvement and single buyer. Feed-in-tariffs for geothermal and other RE. Question how competitive geothermal is. |

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# 4. Environmental licensing

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# 4. Main environmental effects

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Environmental impacts from geothermal lower (esp fossil fuels), still possible impacts:

- Habitat disturbance (animals, plants, wetlands)
- Noise and visual impacts (facilities, steam plumes)
- Cultural/historical resources impacts and impact on existing surface features
- Air emissions (construction equipment emissions, fugitive dust, hydrogen sulphide, carbon dioxide)
- Water use, hazardous materials & waste, wastewater discharges, and groundwater disturbance
- Land use impact (e.g. subsidence) and compatibility (e.g. recreation, farming)

# 4. Environmental Institutions

- Often many laws and institutions involved (resource, conservation, forestry, air & water authorities,
- Many countries attempt coordination via 1 authority/IEA (NZ, Chile)
- BUT in Philippines EDC has indicated it has to comply with 22 environmental and 17 forestry/watershed laws for its geothermal operations and for legal cover applied for 1,464 permits in 2011 (EDC, 2012)

# 4. Country examples

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| | Regulation of environmental impacts |
|---|---|
| **New Zealand** | Resource Management Act (1990) authorizes regional authorities through resource consents, incl effects on land use, water and air, indigenous biodiversity, etc. 1-stop-window. Regions guided by National Policy Statements |
| **Chile** | Environmental Assessment Agency responisible to coordinate impact assessment & approval of each project. Since 2012 separate SMA for monitoring (&fining) there-after. 1-stop-window. Generally provincial level. |
| **Philip-pines** | Department of Environment & Natural Resources coordinates but environmental laws spread over many agencies and Presidential Decrees |
| **Kenya** | NEMA coordinates application of many national and international environmental laws. Limited experience with geothermal. Used to get expertise from KenGen. |

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# 5. Community/indigenous participation

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# Community/indigenous participation

- Impact geothermal projects generally lower, but …
- In many countries geothermal resources are in remote regions with indigenous populations
- Many have a special cultural or spiritual connection with the geothermal (and other natural) resources
- Projects can have negative and positive impacts
- Community/indigenous participation sometimes arranged in EIA-process, or separate Indigenous Laws (Chile, Philippines) or International Laws/Guidelines (ILO, WB)
- Examples esp of geothermal projects in Philippines and NZ

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# New Zealand

- Indigenous Maori had special connection with Geothermal, water 'kaitiakitanga' (guardianship)
- Since Treaty of Waitangi not 'Crown Resources' (like petroleum & minerals)
- Resource Management Act (RMA-1991) puts responsibility for sustainable management with regional councils
- RMA recognizes these Maori values and special relationship
- Many geothermal resources in CNI are on land owned by Maori groups

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# Waikato Region

**(70% of NZ high temperature geothermal resources)**

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Waikato Regional Council geothermal policy (Brockelsby, 2013):

- Consultation with Maori required when developing policy
- Iwi (Maori) Management Plans must be taken account of when making policy
- The RMA-requirement to "recognise and provide for" Maori values, e.g. reflected by identification and protection of culturally significant geothermal surface features
- Permit processes enable Maori input with rights to make submissions and appeal decisions as 'affected parties'
- A Maori representative on the Peer Review Panel that regularly reviews impacts and conditions under an 'adaptive management' approach

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# Example Community Based Ranking on Long-term Intergenerational *Mauri* (health) of the Land and *Tangata Whenua* (indigenous people)

| | | Group 1 | Group 1 | Group 2 | Group 2 |
|---|---|---|---|---|---|
| | Indicator | 2010 | 2040 | 2010 | 2040 |
| Environmental | Surface Features | 0 | +1 | +1 | +2 |
| | Waste Water | 0 | 0 | 0 | 0 |
| | Subsidence | -1 | 0 | -1 | 0 |
| Economic | Cost/Benefit | +1 | +2 | +1 | +2 |
| | Cash Flow | +1 | +2 | +1 | +2 |
| | Employment | +1 | +1 | +1 | +1 |
| Cultural | Ancestral Connection | +1 | +1 | +1 | +1 |
| | Kaitiakitanga | +1 | +1 | +1 | +1 |
| | Returning Home | +1 | +1 | +1 | +1 |
| Social | Sustainability | +1 | +1 | +1 | +1 |
| | Community Resilience | +1 | +2 | +1 | +2 |
| | Aesthetic Environment | -1 | -1 | -1 | -1 |
| | **Results:** | **+0.5** | **+0.91** | **+0.58** | **+1** |

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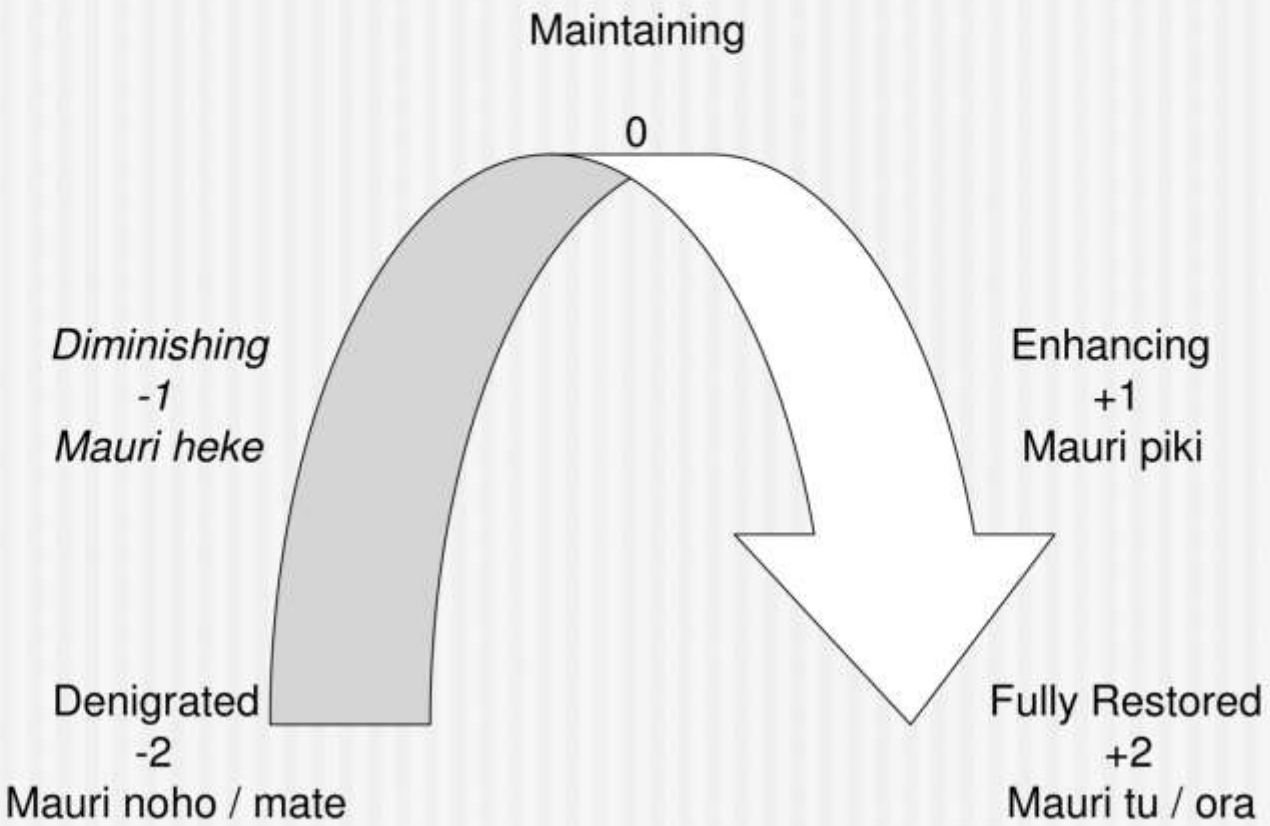
# The Mauri (universal health) assessment scale

## Sustainability Assessment in Absolute Terms




Source: Kepa Morgan

# Specific references


- Hikuroa, D.C.H., Morgan, T.K.K.B., Henare, M., Gravley, D.M. 2010. *Integrating indigenous values into geothermal development*. Geothermal Resources Council Transactions, v. 34, 51-54.
- Hikuroa, D. C., Morgan, T. K. K. B., Durie, M., Henare, M., & Robust, T. T. (2011). Integration of Indigenous Knowledge and Science. *International Journal of Science in Society, 2* (2), 105-114. URL: http://hdl.handle.net/2292/18215
- Hikuroa, D. C. H., Slade, A. T., & Gravley, D. M. (2011). Implementing Māori indigenous knowledge (mātauranga) in a scientific paradigm: Restoring the mauri to Te Kete Poutama. *MAI Review, 2011* (3), URL: http://hdl.handle.net/2292/18216
- Hikuroa, D. C., Morgan, T. K. K. B., Henare, M., & Gravley, D. M. (2010). Integrating Indigenous Values in Geothermal Development. In J. S. Te Rito, S. M. Healy (Eds.) *Proceedings of the 4th International Traditional Knowledge Conference, 2010,* 149-152. Auckland, New Zealand: Nga Pae o te Maramatanga.
- Hikuroa, D. C., Morgan, T. K. K. B., Gravley, D. M., & Henare, M. (21/11/2010). *A Kaitiaki approach to Resource Development*. Paper presented at GeoNZ2010, University of Auckland, New Zealand. 21 November - 24 November 2010. GeoNZ 2010 Abstract Volume. (pp. 1).

# 5. Country examples

| | Community/indigenous participation |
|---|---|
| **New Zealand** | High involvement of indigenous (Maori) people due to RMA-requirements, historic-cultural ties and land-ownership & co-investment |
| **Chile** | Several local and international indigenous laws. No geothermal projects yet, but 'talking to communities'. Much environmental and indigenous protest against energy projects of late, hence great sensitivity. |
| **Philip-pines** | Many geothermal fields in remote, indigenous regions. Much experience with developing geothermal projects in participation with indigenous communities. Geothermal royalties are shared with regions & indigenous groups |
| **Kenya** | Kenya abides by many national & international indigenous treaties. KenGen involved in many community projects with indigenous population of Olkaria (Masai) |

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# 6. Investment and risk support policies

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# 6. Investment/risk support policies

- Historically much state-involvement in most geothermal development (also NZ, Philippines, Kenya
- Presently: more private sector with 'enabling' government/donor policies
- Balance between supporting 'deserving', renewable, baseload, indigenous energy resource and environment/government investment, etc
- Many options, choices depend on national preferences and historic developments

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# Overview of countries studied

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- Kenya: heavy support through its government-owned Geothermal Development Company (GDC) doing much of the steam field exploration and resource proving, as well as feed-in-tariffs and the multilateral Geothermal Risk Mitigation Facility);
- Philippines: medium support through feed-in-tariffs, reduced taxes & royalties and government-led pre-exploration programmes
- Chile: limited support through NCRE and capacity building
- New Zealand: very limited support with its Emissions Trading Scheme and NPS on Renewable Generation and consenting support

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# 6. Types of support

- Capital (subsidy, grants, fiscal incentives)
- Risk capital / joint investment / soft loans
- Drilling insurance (Iceland, Germany)
- Support for geothermal/renewable electricity (subsidy, Feed-in-Tariff, RPS/NCRE obligations, carbon markets)
- Support for (or state-initiated) geophysical exploration studies
- Pooling of expertise and (drilling) equipment
- (softer): capacity building, geothermal outreach and promotion

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# 1. Geothermal Project Phases
## Activities, Investment & Risk

| | Cumulative time | 24 months | 60 months | | 50 yrs+ |
|---|---|---|---|---|---|
| | **Exploration** | | **Production Drilling & construction** | | **Operation** |
| **Main Activities** | Pre-feasibility | Slim-hole drilling | Feasibility studies | Construction | Plant operation & maintenance |
| | Geophysics & geochemistry | | Consents & production drilling | | Field Management: Make-up well drilling, reinjection |
| **Investment amount** | 100,000's | millions | 10 millions | 100 millions | Cash Flow after ca. 5 yrs, for 50 yrs+ |
| **Risk/Capital raising** | Risk/venture or government funds | | Transit/mixed | Bankable | Utility, sellable |
| **Institutional support options** | Surveys&data | Risk Mitigation Fund | Risk Mitigation Fund | Private sector financing | Joint Geothermal Operator training |
| | Expert advise pool | Expert advise pool | Stable regulatory system | Donor/Intern. Financial Insititution Support? | Expert Reviews & Reservoir Modelling of Geothermal System |
| | Training | Training | Business model development | | Productive/tourism uses of 'waste heat' |
| | Equipment pool | Equipment pool | Community/indige-nous engagement | | |

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# 6. Country examples

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| | Geothermal investment & risk policies |
|---|---|
| **New Zealand** | Previously heavy state involvement in exploration, resource de-risking and project development. Now all private, but most large geothermal fields have geophysics, well and other data available (brownfield) |
| **Chile** | In principle complete private development, but slow. State considering/investigating support in transmission and drilling risk. Government already investing significantly in research, education & capacity building |
| **Philip-pines** | Previously mainly state and donor development, recently completely privatized. Government support includes exploration studies, tax holidays, reduced import tariffs, etc |
| **Kenya** | Mainly state and donor development, despite privitization. Special state-owned exploration company (GDC). Also international donor funds started (KfW-GRMF) to support private sector exploration and drilling |

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