International Renewable Energy Agency

Geothermal Policy and Regulation

Cases from Chile, Kenya, New Zealand and the Philippines

November 2015

Geothermal Capacity Building in the Andes

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IGA

- [x] Legal and Regulatory Frameworks → **CB Workshop Nov 2013 Peru**
- [x] Technical – Environmental Licensing & Reservoir Modelling → **CB Workshop May 2014 Chile**
- [x] Finance and Risk Mitigation → **CB Workshop Sep 2015 Colombia**

Geothermal Policy and Regulation

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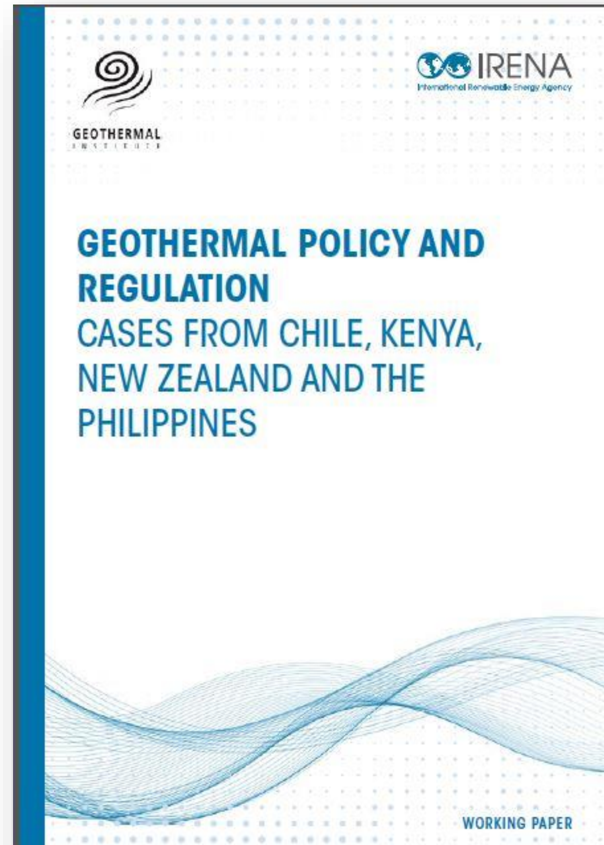
Review of policies and regulations from four countries in the main geothermal development regions with varying level of sector development



Geothermal regulation is complex

Geothermal Regulation

Ownership and access to the resource

Need for a clear framework or ‘contract’

Electricity market regulations

Policies and regulations to help support the financial viability of a geothermal project

Environmental regulations

Need to strike a balance between resource usage and (local) environmental impacts

Other dimensions

Community participation

- Involving and rewarding (indigenous) communities from the initial phases

Investment and risk support policies

- Policies to support the different phases of geothermal development
  - Specially for exploration drilling

Olkaria Geothermal Complex, Kenya

Chile

First country in South America to start the construction of a geothermal power plant

- Emerging market with recent exploration wave
- 3-16 GWe potential
- Few projects approved

Chile

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Ownership and Access

- State resource ownership

Electricity Market

- Open competition between private generators

Environmental Impacts

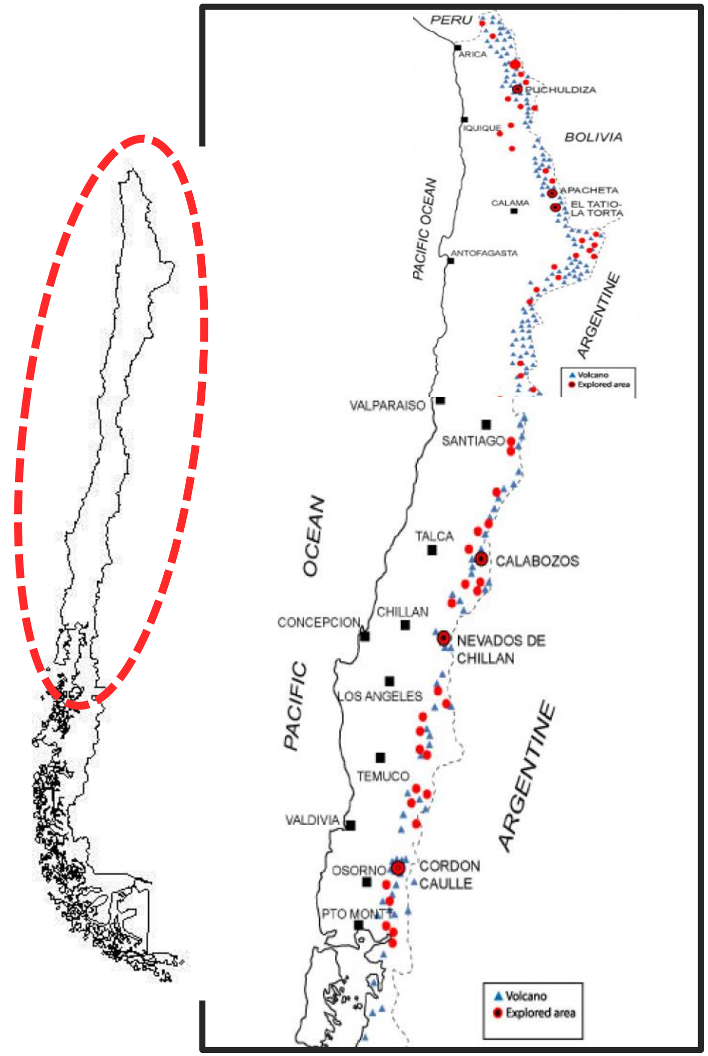
- Environmental Assessment Agency responsible for approval of each project

Community Participation

- Several local and international indigenous laws

Investment and Risk

- Complete private development



Volcanoes and geothermal explorations

Kenya

- Development since 70's
- 5-16 GW potential 500 MW installed
- Resources state-owned
- Recent drive for private development
- Still largely state (GDC) & <u>donor</u> driven

Kenya

Ownership and Access

- State resource ownership and license to private sector

Electricity Market

- Privitizing with high state involvement and single buyer

Environmental Impacts

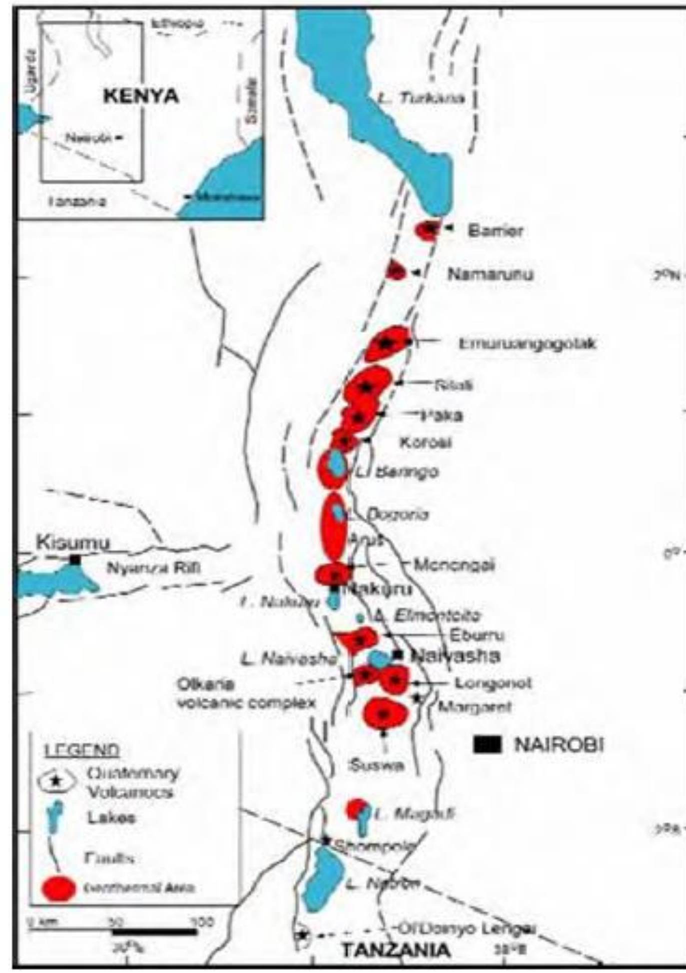
- NEMA + KENGEN experience

Community Participation

- KenGen involved in many community projects

Investment and Risk

- Mainly state and donor development



Source: Mulaha, 2013

Geothermal prospects in Kenya's Central Rift Valley

New Zealand

- Mature geothermal market since the 1950's.
  - Geothermal energy currently provides around 16% of electricity (900 MW installed)
  - Significant direct heat use for industries (paper, diary, agriculture) and tourist attractions.
- Estimated potential of around 3 to 5GW
- Resources private-owned
- Private & public developers
- Competitive market without state support

New Zealand

Ownership and Access

- Regional Authorities managers of resource

Electricity Market

- Open competition between public and private generators

Environmental Impacts

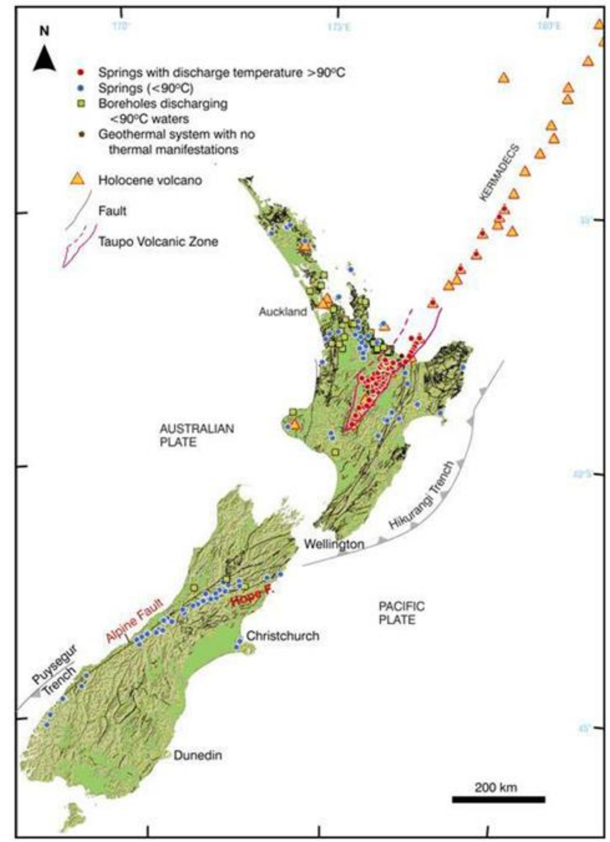
- Resource Management Act (1991)

Community Participation

- High involvement of indigenous (Maori) people

Investment and Risk

- All private project development



GNS-Reyes in MED, 2011

High- and low-temperature geothermal systems in NZ

Philippines

- Well-developed market
- 3-4 GW potential
  1.9 GW installed
- Resources state-owned
- Newly privatized power market; support schemes for geothermal (incl. FiT)
- Originally state driven; lately private sector

Philippines

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Ownership and Access

- State resource ownership with indigenous approval

Electricity Market

- Newly privatized electricity market

Environmental Impacts

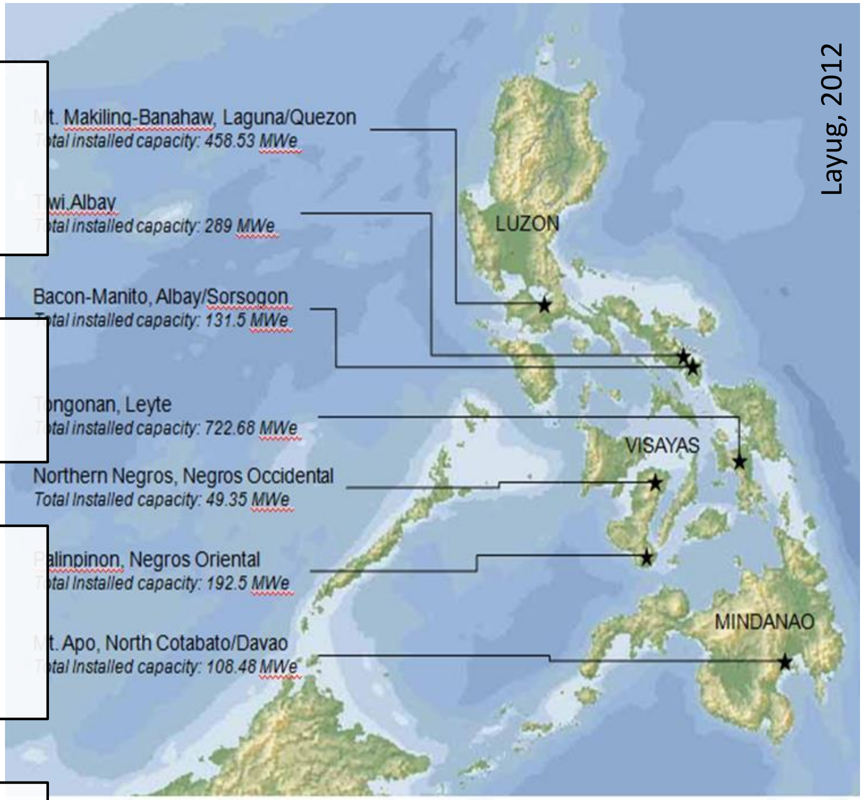
- Department of Environment & Natural Resources to coordinate

Community Participation

- Geothermal royalties are shared with regions and indigenous groups

Investment and Risk

- Recently completely privatized



Layug, 2012

Existing geothermal capacity in the Philippines

THANK YOU

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