

Promoting the Enabling Environment for Geothermal Development in the Andean Countries: Legal and Regulatory Frameworks: A Summary and Way Forward

The International Renewable Energy Agency (IRENA) is an intergovernmental organisation that supports countries in their transition to a sustainable energy future, and serves as the principal platform for international cooperation, a centre of excellence, and a repository of policy, technology, resource and financial knowledge on renewable energy (www.irena.org). The Country Support and Partnerships (CSP) division helps countries and regions accelerate the introduction of renewable energy and works with a variety of public and private stakeholders.

In 2013, IRENAs Geothermal Initiative in Andes was launched together with the Latin America Energy Organisation (OLADE) and the International Geothermal Association (IGA) as an initiative to support Andean countries, given the large geothermal potential in the region. As a result of the workshop held in Iceland on the 4-5th March 2013, three key areas of support were identified. These areas are legal frameworks to complement the existing regulatory geothermal norms to further develop enabling conditions for investments; access to finance and dissemination of innovative models to finance operations including geothermal reinsurance and risk mitigation funds amongst others; and capacity building.

With regards to capacity building, desk-based research and discussions with local experts about capacity needs is ongoing. A workshop on legal and regulatory frameworks was designed to share the experiences of the countries that have had a long standing experience in geothermal development. The workshop included five sessions with presentations from international and Andean country experts and practitioners. The meeting objectives were:

- To share the experiences and lessons learnt between countries advanced in geothermal development and Andean countries.
- To identify potential gaps and barriers in regulations for geothermal – short or long term.
- To discuss the way forward for the development of geothermal energy in the Andean countries.
- To identify synergies and areas for collaboration with IRENA and between/amongst member/signatory states.

The two day workshop brought together 57 regional and international stakeholders including representatives from government, regulatory bodies, private sector and academia from the five Andean countries- Bolivia, Chile, Colombia, Ecuador and Peru. In addition, geothermal policy, regulatory and legal experts from Grenada, Iceland, Japan, Kenya, Mexico, New Zealand and Nicaragua shared their valuable and long standing experiences. Representatives from IRENA, OLADE, IGA, Inter-American Development Bank (IDB), Japan International Cooperation Agency (JICA), and Japan Oil, Gas and Metals National Corporation (JOGMEC) also attended the event.

International experts from countries advanced (or advancing) in geothermal development such as Iceland, Japan, Kenya and New Zealand provided expert advice on the development of appropriate policies and regulations, including its implementation. For example, Iceland has been developing a Master Plan for protection and development of energy resources incorporating geothermal whereby power projects are identified and ranked as per the economics, minimum negative impact on the environment, and a positive impact on the society. In Kenya, a single buyer energy model exists but the government has provided appropriate support through policies, legislations, regulations, fiscal incentives and resource risk mitigation. Similarly, in Japan, the Government provides many incentives and frameworks for geothermal development and the country has deployed over 500MW of geothermal capacity. Due to the high risks involved during the exploration phase, the Government has introduced support schemes such as subsidy for public acceptance and geological survey, investment for exploration drilling, and loan guarantees for construction, equity capital, as well as feed-in tariff. In New Zealand, regional councils have the authority to manage natural resources, and almost 50% of electricity generation is in Waikato region, which has up to 70% geothermal resources. A resource management act came into force in 1991, and in the late 90's partial privatisation of energy companies were made possible, regulated by regional councils. Provision of permits are long term for developers (35 years) and with a large local Maori population, their interest to sustainably manage resources for future generations have been catered through various provisions such as consultation, protection of sacred sites, side agreements out of the formal process, permit processes enabling Maori input with rights to make submissions and appeal decisions.

In the Andean countries, geothermal development is at an early stage. The renewable energy industry in Chile, Peru and Colombia have private sector orientation while Bolivia and Ecuador are largely driven by the public sector. Chile is the most advanced in geothermal policy and regulation development in the region with a geothermal concession law enacted in 2000 and amended in 2012 and 2013. Exploration concessions are available for 2 years with the possibility to be extended up to 4 years in total. The production concessions are of indefinite duration, nevertheless there is a penalisation if there is no production for 7 consecutive years. Similarly, in Peru, there is a concession system for exploration of geothermal resources - currently there are 32 concessions for explorations. By law, developers should consult indigenous communities about the impacts of the project. In Colombia, geothermal development is reliant upon the government interest to diversify the energy matrix because of the highly cost competitive generation prices of hydropower in a liberal electricity market. A prefeasibility study for the first project exists but supporting regulations are needed. In the case of Bolivia and Ecuador, all resources belong to the state. In Bolivia, a 50MW geothermal power plant is planned to be operationalised by 2019. Ecuador has neither specific regulation for geothermal power, nor immediate plans to develop it.

Mexico and Nicaragua are active in developing the geothermal sector. In Nicaragua, the Ministry of Mines and Energy (MEM) grants licenses and concessions for exploration and exploitation of natural resources under Law No.443 (2002). Direct negotiation is established as the only channel for the granting of concessions for geothermal resources, with MEM authorised to invite bids from national and foreign investors. Concessions for exploration are granted in a 100-km² area for a period of three years, extendable for another two years; concessions for exploitation are for a 20-km² area, with the possibility of enlarging this by an additional 20 km², for a period of 25 years, extendable for another 10 years. In Mexico, a law for geothermal energy is being developed to be approved by the Congress. While resources belong to the State, it is expected that the private sector will benefit from some incentives. Currently, a concessional system granted by the National Water Commission exists, where companies have to comply with environmental standards to exploit resources.

During the two day workshop legislation, financing, and environmental concerns for geothermal development were discussed. For example, length of time for licensing including revoking processes and conditions for concessions were examined. The expert from Iceland noted that important conditions before granting concessions could be financial status and strict time limit. In the case of Kenya the concession would be revoked after two years of inactivity.

One of the major issue discussed during the workshop is the time required to process the Environmental Impact Assessments (EIA). The private sector in Peru had identified it as a major barrier. In Chile, projects over 3MW are required to undertake an environmental study that could take one year. Project developers are also obliged to consult communities impacted from geothermal exploitation projects. However, private sector experience has shown that it takes longer and environmental authorities can be rigid especially because geothermal development is at early stages. In Iceland, the EIA needs to be conducted first before a license is issued. This license has a timeframe window of 6 months to 2 years. The National Energy Authority provides guidance in the assessment process, and a query usually needs to be addressed within 3 months. Some countries have also devised compensatory approaches. In Nicaragua, once projects are operational, there is an environmental fund that is financed by the royalties of the project for compensations. In Iceland, there are regular compensation measures, and in Ecuador, 30% of net profit must go to environmental remediation and to finance local development projects in the nearest communities. Environmental regulations for national parks and protected zones is a major issue in some countries. In Iceland, natural parks are off-limits, and the Master Plan, reviewed every four years, has categorized different regions for geothermal sites – those that are for exploration, for use and those under a waiting list. In Kenya, only projects less than 3MW need a permit, not an environmental license; and for projects less than 1MW, no permit or license is required.

In financing, the Kenyan government supported a single buyer energy model while Chile's model considers only private sector financing as they are involved from generation to distribution. Fiscal incentives and resource risk mitigation was well addressed in Kenya, and public-private partnerships were developed. The Government also took the risk and instituted the Geothermal Development Company (GDC) for resource assessment and sale of steam to IPP's and the public power generator (KenGen). The Government has been in charge of exploratory phases including exploratory drilling. On the other hand, in Chile, private sector absorbs capital costs and are affected by high costs and delays, project areas in remote areas, environmental permit processes amongst others. It was suggested that capacities needed to be built, there needs to be more cooperation between developers and market access, and financing for risk mitigation is needed.

The Inter-American Development Bank (IDB) and development partners such as JICA, provide technical assistance. The KfW Entwicklungsbank in close cooperation with the IDB, Development Bank of Latin America (CAF), and the Central American Bank for Economic Integration (BCIE) is leading a coordinated effort of donors and financiers to establish a "Geothermal Development Facility for Latin America" in order to provide tailored assistance to the development of the geothermal sector in Latin America in general and the Andean countries specifically. This facility will consist of three pillars: a risk mitigation fund, an investment financing window providing concessional and non-concessional financing and a dedicated technical assistance facility to provide tailored, demand-based technical assistance to interested governments, regulatory agencies and project developers. The facility aims to achieve a coordinated approach to develop a clean, cheap, baseload-capable and low emissions technology on a regional scale, and a good opportunity for the Andean countries to take further steps in developing the geothermal sector.

During the workshop, the following key actions were determined by IRENA and the participants. There was general consensus that capacity building through trainings for current public and private sector staff on technical and environmental issues needs to be an ongoing effort. Some specific recommendations for way forward were:

- A workshop to discuss a geothermal framework for a regulation. In Ecuador, the IDB could support the country to develop a geothermal regulation. It was felt that although technical aspects may not be challenging, the legal complexities need to be understood better. Thus, potentially, IRENA can bring international experts to help make a regulation structure for Ecuador. The National Electricity Council (CONELEC) should develop a baseline document of what is necessary. In Bolivia, this assistance would also be required. It can be an observer in Ecuador. Bolivia is also interested to perform capacity building utilizing IRENAs process.
- Geothermal has other applications apart from electricity such as for farming, and recreation. Therefore, it is important to build enabling features in law and regulations for non-electric use of geothermal.
- Although renewable energy technologies does not have major environmental issues as compared to fossil fuels, environmental regulations do not differentiate among clean technologies and traditional energy technologies. IRENA should work also with environmental ministries to see if renewable energy can get preferential treatment. Other Ministries such as Mining and Environment are important and needs to be drawn into this process. IRENA could potentially form a consortium with World Bank, IDB and others to get environmental Ministries to rethink their EIA for renewable energy projects and not treat them the same as conventional energy projects (or mining). In Peru for example, assistance in drafting environmental regulations for geothermal was found to be important. The environmental processes, time lines, role of environmental authorities were all deemed as issues to be re-visited.
- Learning lessons on attracting private sector was also deemed important. How have countries such as Iceland, Japan and New Zealand constructed their law and motivated investments? What can be replicated? What clauses or elements are critical in their legal framework for attracting private sector and are replicable for other countries? Country visits by groups of public and private sector developers were deemed to be important to share experiences at a detailed level. For example, Chile public and private sector could benefit from Japan where regulations are well designed especially to attract private sector. Governments were also keen to identify mechanisms that prevented speculative companies in the licensing process.
- Similarly, experiences from countries with oil exploration and exploitation licensing may also be of interest, especially to make geothermal synchronous with them. Case studies can be researched wherein mining companies have worked well with communities for learning for geothermal. For countries such as Colombia with experience in oil sector, this base could be built up through geothermal specific training.
- Participants also felt that it was important to learn lessons from the region as there are many similarities. Central American countries such as Nicaragua and El Salvador had already experiences in geothermal development, and exchange of information and experiences could be fruitful.

A full list of participants is provided in the Annex. The following annex is a summary of the key points of discussions in the six sessions. All presentations made by the international, regional and Andean country experts are available in both English and Spanish.

ANNEX 1: SUMMARY OF KEY WORKSHOP THEMATIC DISCUSSIONS

Session 1 & 2: Introduction/ The development, challenges and impact of policy and regulations on geothermal development

1. Welcome remarks were made by Ministry of Energy and Mines of Peru and IRENA. A quick overview of geothermal potential in the region was provided by OLADE. Geothermal project development is at an early stage in the Andean region, and no country has reached the exploratory drilling phase. Technical capacities as well as specific regulatory frameworks are needed to be developed or/and enhanced in all countries. There is also a need to develop regulation for low enthalpy geothermal development. IRENA presented its geothermal initiative in the Andean countries, launched in partnership with OLADE and IGA in March 2013 in Reykjavik, Iceland. The initiative is supported by Iceland and other Member countries with a focus on three main areas – regulatory frameworks, access to financing and capacity building.
2. Experience from **Iceland** suggested that geothermal development needs to be developed within a long-term perspective of sustainable utilization of resources. Since 1997, Iceland has been developing a Master Plan for protection and development of energy resources incorporating both hydro and geothermal. Under this Master Plan, power projects are identified and ranked as per the economics with minimum negative impact on the environment, and a positive impact on the society. A new Act on a Master Plan for Protection and Development of Energy Resources was passed in Parliament in May 2011. The Plan is binding for all municipalities and is to be included in their general land use plans. Licenses are issued in accordance with the Act on the survey and utilization of ground resources. Under the Electricity Act passed by Parliament in 2003, a license issued by the National Energy Authority is required to construct and operate a power plant. However, such a license is not required for power plants with a rated capacity of less than 1 MW unless the electricity produced is fed into one of six distribution systems or directly onto the transmission grid. The legal framework itself is extensive and in constant development. Some of the legislation is recent while other provisions are long standing. Iceland has learned that effective policy making, the right financial incentives and official monitoring of geothermal development is crucial for supplying the society with renewable energy and sustaining a long-term lifespan of the resource.
3. In **Chile**, a specific regulatory framework for geothermal energy exists. Some of the legal provisions covered were – in 2000, geothermal concessions law No. 19.657; in 2012 Law 114 that exclude law 10657; and in 2013 – Law 20/2025. Requests for a concession has to comply with formal requisites. An exploration concession is for 2 years and can be extended for 2 more years. Production concession (exploitation) is of indefinite duration, and if not exploited by 7 years, one needs to pay an annual exponential patent according to the area of the concession. There is an obligation to inform the progress to the Ministry of Energy. Under a new regulation 114 of 2012, few provisions were added such as simplification of formal requisites, no need to prove the geothermal reservoir to get a production concession. In addition, as per Law 20.698, 14 October 2013, by 2025 Chile aims to have 20% of Non-Conventional Renewable Energy (NCRE).

4. In **Peru**, there is a concession system for exploration of geothermal resources - currently there are 32 concessions for explorations. The first phase is for survey, and the second is to drill, but an Environment Impact Assessment (EIA) is needed. Most companies are in phase 1 mainly because of the non-clarity of EIA process and lack of finance to drill. There is a previous consultation law, which obligates developers to ask indigenous communities about the impacts that a project would cause.
5. In **Bolivia and Ecuador**, all resources belong to the state. Bolivia plans to have a 50MW plant by 2019 and there is a need to develop capacities in-country. In Ecuador, there is no specific authority that can authorize the use of geothermal resources. The National Electricity Council (CONELEC) acts as the regulator of the electricity sector and is the concessional as well as environmental authority for electricity projects. A generic Feed in Tariff (FiT) was launched in early 2013 for all renewable energy.
6. In **Colombia**, hydropower is high on the country's energy matrix close to 70% (80% during rainy season). The market is open and liberal. They have a reliable remuneration cost, which gives preference to stronger and more reliable systems. Colombia wants to diversify the energy matrix, and there is a project in Congress to promote geothermal energy. The estimation of geothermal resource is currently in the middle of the country and south along the border with Ecuador. Although a prefeasibility study for the first project exists, there is a lack of environmental regulation, and they are trying to use oil & gas regulation. Exploration also needs environmental studies. ISAGEN (one of the great generation companies) plans a 50MW geothermal project by 2015 and they have started the environmental licensing with the Ministry.
7. The **key discussion points** were on:
 - **Licensing:** Given the experience of Iceland, it was suggested that a separation of licensing for exploitation and for production is needed. In Iceland, if the power plant is smaller than 1MW it does not need license, but as soon as it is connected to the grid, a license is needed. Licenses are also revoked if exploitation plans do not work as per planning.
Concessions: In Chile, the main environmental instrument needed for a concession is the EIA. However, one of the issues for the Ministry is filtering the real concession companies from speculative investments, and till date there is no generation from geothermal. In Ecuador, at least for PV, CONELEC has set a schedule in the concessional contact, which has a strong financial requirement. This slowly takes out speculators who do not have their financial numbers correct. In Iceland, concessions are provided for up to 65 years, but usually provisions are made for 30 years. However, conditions before granting the concession is important: financial, people, and most important a very strict time limit. In Kenya, a concession will be revoked after two years of inactivity.

In Mexico, there is a concessional system granted by the National Water Commission. The Congress will pass a series of reforms for the electricity and hydrocarbon sector. A law for geothermal energy is currently being developed and expected to be approved by the Congress. While resources belong to the Mexican state, they also want to create incentives for the private sector. An investment chronogram as well as regular progress reports are required.

- **Environmental Impact Assessments:** In Peru, one of the first barrier to the development of geothermal resources is the EIA. There are three tiers of EIA, with the first for exploration. In Iceland, the EIA needs to be conducted first before a license is issued. This license has a timeframe window of 6 months to 2 years. When a project is being developed, the Authority guides in the assessment process, and a query usually needs to be addressed within 3 months. The environmental Law 106 from 2000 is available in English.

In Mexico, Companies have to comply with Mexican Environmental Standards to exploit resources. In Chile, there are two categories of environmental licenses. Geothermal projects over 3MW need an environmental study that takes at least a year to complete. However, as per a private developer, the Ministry of Environment (responsible for EIA) works separately from the Ministry of Energy and approval may take approximately 2.5 years. As geothermal development is new, authorities are rigid although there have been recent improvements. As developers cannot locate exact sites of wells, it is often challenging to face the rigid regulatory authorities. Chile also has a well-defined and obligatory consultation process with communities impacted from geothermal exploitation projects.

In Nicaragua, once projects are operational there is an environmental fund that is financed by the royalties of the project for environmental compensations. In Iceland, there are regular compensations measures, and in Ecuador, 30% of net profit must go to environmental remediation and to finance local development projects in the nearest community/ies.

- **Protected areas:** Regulations for national parks and protected zones were also an issue for some countries. For example in Colombia, identified geothermal sites are in protected sites. In Iceland, natural parks are off-limits, and the Master Plan, reviewed every four years, has categorized different regions for geothermal sites – those that are for exploration, for use and for waiting. In Ecuador, CONELEC is the environmental authority for electricity projects but within the remit of the Ministry of Environment if projects are within a national park, and only if CONELEC says that the project is of high priority. On the other hand, Kenya has exploited geothermal resources for more than 30 years in a national park but within set boundaries.

Session 3 - Opening up investments for geothermal sector – key policies and regulations required

8. **Kenya:** Kenya with an effective geothermal capacity of 1500MW has a single buyer energy model. The Government provides support through policy, legislation, rules and regulations, fiscal incentives, and resources risk mitigation. Legislation starts with the Constitution. The main policies are:
- Sessional Paper No.4 on energy of 2004; Feed-in-Tariff Policy of March 2008
 - Two regulations for geothermal: Geothermal Resources Act No.12 of 1982 and Geothermal Resources Regulations, 1990.
 - There is a category of environmental licenses depending on the size of the project. Projects less than 3MW need a permit, not a license. For investments less than 1MW, no permit nor license is required.

There is weakness with concessions because there are many speculators. Public-private partnerships are being developed; and it was felt that fiscal Incentives are important and crucial for geothermal development. To mitigate the high upfront cost for geothermal, the government takes the risk and has also instituted the Geothermal Development Company (GDC) for resources assessment and sale of steam to independent power producers and the public power generator (KenGen). The Government has also been in charge of exploratory phases including exploratory drilling. All policies and regulations at www.erc.go.ke and www.kenyalaw.org

9. **Chile - Mighty River Power (MRP)** - A public-private (51% public) company from New Zealand. There are many geothermal power plants around the world and in North and Central America, but none in South America. Chile has a lot of potential, volcanoes surround it but there is not a single MW of production yet. In Chile, energy prices are high and will probably stay that way as market prices are rising. The shock will need to be absorbed by the consumers. Capital costs in Chile for geothermal should be around US\$7000 /kW. How do we bridge the gap? Classify externalities by physical, legal and market.
- Physical: resources, limited knowledge, and high exploration risk. No transmission lines, high cost and delays.
 - Legal: laws and regulations, environmental permitting
 - Market: rather high structural price level in the SIC. (Central interconnected system), strict conditions at tenders for regulated clients. Private clients need planning certainty.

In Chile, the sector is private from generation to distribution, and there is no support for expanding generation. Two actions are required: cooperation between developers and market access. Capacities needs to be built and financing for risk mitigation is needed.

10. **Inter-American Development Bank:** Overview of geothermal energy presented. In South America, there are many risks:
- Exploratory and construction risk
 - Insufficient knowledge and capacity about geothermal as a business.
 - Overcoming challenges on capacity building, long duration period for construction and financing

- Regulation and policy development- consistent with exploration and exploitation activities, technical peculiarities, anti-speculation rules etc.

The IDB has a risk fund for geothermal initiative with Chile and México.

11. **KfW Entwicklungsbank (presented by IRENA on behalf of KfW)** - KfW, in close cooperation with the Inter-American Development Bank (IDB), CAF Development Bank of Latin America, and The Central American Bank for Economic Integration (BCIE) is leading a coordinated effort of donors and financiers to establish a "Geothermal Development Facility for Latin America" in order to provide tailored assistance to the development of the geothermal sector in Latin America in general and the Andean countries specifically. The Facility will be based on the experiences gained by KfW with a similar facility - the Geothermal Risk Mitigation Facility (GRMF) - which is currently very successfully being implemented in East Africa. The Geothermal Development Facility for Latin America will consist of three pillars:

- A grant based Risk Mitigation Fund which will provide grants to public and private project developers to cover part of the exploratory risk
- Investment financing windows providing concessional and non-concessional financing to public and private project developers for investments in plant infrastructure
- A dedicated technical assistance facility to provide tailored, demand-based technical assistance to interested governments, regulatory agencies and project developers

Major grant contributions are foreseen to be provided by the German Federal Ministry of Economic Cooperation and Development, the European Union as well as IDB, CAF and BCIE, with further donors and financiers currently considering an engagement. KfW sees this as a coordinated approach to develop a clean, cheap, baseload-capable and low emissions technology on a regional scale, thereby generating considerable CO²-emissions savings, and improving access to electricity.

12. Some of the **key discussion points** made were on:

- **Drilling:** In Chile, MRP is drilling approximately 1400m deep. On high expense, it was mainly because of the barriers such as the location (high altitude), and the inexistence of oil & gas company experience to drill in-country. Thus, all experts and workers, as well as equipment are needed to be brought from outside. Chile has an open market so importing machinery is not the problem, but Chile is very far south, raising costs. In addition, drilling slim holes are expensive as equipment needed to be transported by helicopters. Instead of drilling two slim holes, it would be probably better to drill one complete one that provides much more information.
- **Risk avoidance:** Both Kenya and Chile started exploring sites in the 1970's but then Kenya has moved ahead and is generating geothermal energy. With a Public Private Partnership (PPP), Kenya's Government has moved ahead and also developed a national program to explore sites. Thus, the risk was sunk and developers were cost confident and knew that the resource was available. Kenya had the additional pressure of developing alternatives as the country did not have as much resources as in South America, and the oil crisis was also an important driver. In Chile, on the other hand, the private sector is expected to take all the major risks.

Session 4 - Collaborating for growth – Perspectives from Japan

13. Japan has developed a little more than 500MW of geothermal. About 80% of geothermal energy potential is located in natural areas. A Renewable Portfolio Standard started in 2003 but geothermal was excluded from the target Law. The Government has to support geothermal because of the high risks involved. Japan has designed a support scheme for each phase.

- Public acceptance: subsidy
- Geological survey: subsidy
- Exploration drilling: investment
- Construction stage: loan guarantee
- O&M: Feed in tariff

14. The Japan Oil, Gas and Metals Corporation (JOGMEC) uses the same technology for geothermal as from oil, gas and mining industry. While geothermal development is not allowed in some key areas, in others, slant drilling from outside of the park can be done. JOGMEC grants from 50% to 100% of the necessary funds for potential survey, and can also provide upto 50% of equity capital and upto 80% of loan for construction. JOGMEC's program covers:

- Grants subsidies for the development of thermal use of geothermal resources.
- Finance of equity capital
- Liability guarantees

Some of the issues to be solved in Japan for Geothermal expansion are:

- E&P business:
 - High risk
 - Long term projects
 - Investments
 - Power lines
- Volcanic sites
 - In national parks
 - Near hot spring resorts

15. In Peru, the Japan International Cooperation Agency (JICA) is providing co-operation in three ways: technical cooperation, loans, and non – refundable loans. For co-operation, there are equitable sustainable development, global issues and human security and inequality. For geothermal specific, there is:

- Technical cooperation: master plans, feasibility studies, EIA, etc.; and capacity building (engineering, administration)
- Financial cooperation: Engineering service loan E/S Loan, project loan for construction and consulting' and program or policy-based loan

JICA helped Costa Rica to build plan MIRAVALLS I (135 MMUSD) with a 55MW Toshiba turbine. The Agency also assisted Peru with their Master Plan and Prefeasibility studies.

Session 5 - The socio-environmental consideration and experiences in setting geothermal policy

16. Each phase of geothermal development has an impact on the community. Five key phases are: i) Scientific work (US\$ 2 to 4 million); ii) Exploration drilling (USD 20 to 80 million); iii) Appraisal drilling & feasibility- need to prove at least 30% of the project intended capacity; iv) Construction & development drilling; and v) Operation & make-up drilling. During the scientific fieldwork and exploration, local communities have expectations and can be impacted. While traditional responses to mitigating social impact of geothermal projects are common such as building community facilities, maintaining good relations and providing local employment; improved responses such as support for local businesses are also equally important.
17. Approaches such as the income generation from geothermal projects back to communities, royalties, share of government taxes, financing investment design are important particularly because geothermal project development is lengthy and takes about 5 to 7 years. Communities are frustrated if they do not see real benefits within time frames that mean something real to them. Successful stories are : www.tuaropaki.com/our-business/ and www.tuaropaki.com/our-story/our-history/ In New Zealand, greenhouses, vineyards, communications have been some of the benefits that Maori communities have received. In summary, social and environmental approach must be part of the overall plan of development.
18. In **New Zealand**, the central government has a hands-off policy for geothermal development and regional councils have the authority to manage natural resources. Sitting on two tectonic plates, New Zealand is on the ring of fire. About 50% of electricity generation is in Waikato region, which has upto 70% of geothermal resources. In the 60s and 70s, government investigated the development of geothermal, and in 1991 the Resource Management Act came into force. In the late 90's, partial privatization of energy companies were made possible, regulated by regional councils. Renewable energy is already 72% of the energy mix, with geothermal at 13.2%. In Waikato, there are 15 high temperature and 30 small systems. The single operator per geothermal system is better for developer and regulator. Permits are long term (35 years), and the regulator wants a long term management. The local Maori population has a culture of sustainable management of resources which means taking care of future generations. Their interests are catered for through:
- Relationship with natural resources must be recognized and provided for
 - Consultation
 - Permit processes enable Maori input with rights to make submissions and appeal decisions.
 - Protection of sacred sites
 - Side agreements outside of the formal process.

New Zealand's legal and policy frameworks for geothermal are now well established. There are only few adverse effects. But there are legacy effects that are still on mind of people.

19. In **Ecuador**, CONELEC is the regulator and the environmental authority for electricity generation projects. CONELEC provides environmental licensing at all stages of a generation project. Current regulation for renewable energy area:

- Parameters and requisites for renewable energy generators
- The regulation wants to make renewable energy attractive for investors.
- Based on a feed in tariff (FiT) system.
- There are prices and dispatch preferences for renewable energy.
- CONELEC took referential prices from international sources. For the first 15 years the investor gets preferential prices and preferential dispatch.

Ecuador has yet to define a geothermal specific regulation.

20. In **Peru**, environmental regulations exist for the electricity sector, including for environmental protection. Projects that promote social and economic development are more likely to be chosen. There are three categories of EIA. Community participation is done through workshops, public audiences, and information centres. Public consultation is done in the community's language within the direct zone of impact. For geothermal activities, with the preliminary inspection, the category of EIA study is determined. In protected zones, before the concession is granted to a project, the Directorate of Electricity has to coordinate with the national service of protected zones that the project has compatibility with the protected zone. Details are available in the presentation.

21. Some of the key **discussion points** made were on:

- On length of time to issue an environmental license, Peru's experience is not good especially with hydrocarbon projects usually taking upto 18 months, longer time span for projects within protected zones. For EIA, the usually approval time is 46 workdays, and the process should take no longer take than 6 months. At least 2 or 3 meetings with local communities have to be done at a minimum. However, participants had variant views and a large discussion took place around time needed for environmental licensing.
- In 2011, Peru issued a Geothermal Law, and a regulation in 2012. According to both, indigenous population involved in geothermal projects must be consulted. The Ministry of Culture has made visits to identify which populations would have problems with geothermal projects, but until now there has not been any town of population that would have to be consulted for developing geothermals.
- In Chile, there is no particular standard mitigation for communities', but there is a case-by-case analysis and the Servicio de evaluación ambiental (SEA) recommends the compensation that is to be made.
- In Nicaragua, when the project starts operations, 35% of the profit made by the company goes to the municipality where the project is in. There is also an environmental fund for mitigation.
- In Colombia, there is an EIA with state compensation for the community.
- In Mexico, payment for rights of investment are made to the communities. There is a percent of the investment that has to be given to the communities.
- How can neighbouring communities that are affected in an indirect way be compensated? Can there be reduction in tariffs for example? In New Zealand, compensation is not part of the law,

and there are no economic tools to pay communities. Land ownership is also separate from the right of resource exploitation. Thus, developers are not owner of the land. Developers therefore come up with creative ways to compensate the community often in co-ordination with each other; and the regulator stays out of it. In Indonesia, there is a corporate tax of 2 or 3% that goes back directly to the community.

- In Ecuador, in 2008, a new constitution was issued. Mandate No. 15 says that the Ecuadorian state is in charge of the investments in the electricity sector. Since then, Ecuador's government has been investing in the electricity sector. There is a big difference when the developer is state owned or private. During the construction phase there is an EIA that states all the environmental mitigation that CELEC (public generation company) must do. Ecuador uses a concept of integral development in the zone whereby infrastructure works are studied and prioritized in the whole zone: hospitals, schooling, roads, telecom, etc. All these works are added to the projects budget.
- Bolivia does not have regulation for Geothermal. There are 3 types of consulting: indigenous, community and legal. Bolivia has a state owned electricity sector. The electricity Law was created in Bolivia when the political trend was privatization, but now that law is obsolete because the political trend is now public utilities. There is big challenge for Bolivia to create regulation.

Session 6 – Building up capacities to strengthen geothermal policies and regulation in the Andean countries and beyond

22. The experience and way forward in **Nicaragua** was presented. The RE Law in Nicaragua includes geothermal energy. Companies may submit proposals according to requirements on technical capacity, financial capacity to the Ministry of Energy and Mines. A geothermal Master Plan exists (1999-2011) supported by UNDP and IDB. The purpose of the plan was to summarize and evaluate existent geothermal data, conduct specific studies and present an evaluation of the potential in Nicaragua. The Geothermal Energy Plan fits in the Human National Development Plan, and presents a map with the location of geothermal sites. There is a 2013 – 2027 energy expansion plan. The Ministry of Mines and Energy is the only institution that can undertake exploration processes. Private investors can participate in tendering. Concessions may be granted up until 100km². Concession duration time can be no longer than 3 years, but with a possible extension of 2 years. The exploitation concession can have 20km² and it can last for 25 years with an extension of 10 years. Depending on the outcome of exploitation.
23. Chile felt that it was important to learn lessons from the region as there are many similarities. In addition, Chile could also visit countries like Japan where regulations are well designed especially to attract private sector. The challenge for Chile is to find a way to reduce the financial risk for the private investor; to lower speculative projects that distort the market uncertainty.
24. In Colombia, there is a need to have regulation for the exploratory phases. Experiences of countries like Chile, Nicaragua, etc. can be looked at. Colombia has also much experience in oil sector that could be utilized as a base. Building capacities for these are important. The greatest barrier for the promotion of geothermal is the free market and competing prices offered by other generation

technologies, including renewables. The Law establishes that the least cost must be considered disregarding technology type. Under these circumstances, it is difficult for geothermal energy to compete or find investments.

25. In Peru, assistance in drafting environmental regulations for geothermal was found to be important. The environmental processes, time lines, role of environmental authorities were all deemed as issues to be re-visited. The time for the EIA elaboration and approval is too extensive and with no clear guidelines from the governmental side, since geothermal is relatively new.
26. For Ecuador/ Bolivia: As per expert advice, it was suggested if there is a generic renewable energy law, or electricity or mining law, then a regulation would be enough. Iceland for example, uses the Natural Resources Law as a basis. Ecuador does not currently have a generic natural resources law. It was felt that using the Water Law for geothermal might not be appropriate as they mainly protect water; moreover water law does not consider temperature of water. In Bolivia the water issue is very complicated. Geothermal fluid should not be considered as water.