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# Groundwork: Regulatory Guidelines for Making Canada a Geothermal Powerhouse

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## INTRODUCTION

Canada stands at a critical juncture in its energy transition. With vast untapped geothermal resources—particularly in western provinces and territories—Canada has the potential to become a global leader in clean, baseload geothermal power. However, the absence of consistent, comprehensive subsurface regulations across jurisdictions has hindered development. Only British Columbia, Alberta, and Nova Scotia currently have geothermal-specific regulations, and even these vary significantly. This fragmented landscape increases project risk, deters investment, and slows innovation.

The *Groundwork* report by the Cascade Institute addresses this regulatory gap by synthesizing international best practices and proposing model guidelines tailored to Canada's unique legal and geological context. It emphasizes the importance of harmonized regulations that are technology-agnostic, flexible, and aligned with Indigenous rights and governance.

## 1 CANADA'S GEOTHERMAL REGULATORY STATUS

Canada's geothermal regulatory framework is nascent and uneven. Only three provinces and territories have formal regulations for deep geothermal development—Alberta (Directive 089, 2022), British Columbia (Geothermal Resources Act, 2010), and Nova Scotia (Mineral Resources Regulations - Mineral Resources Act (Nova Scotia), 2018). Saskatchewan has permitted a project under temporary measures (Government of Saskatchewan, 2019), while others like Yukon (Government of the Yukon, 2023), Northwest Territories (Government of the Northwest Territories, 2018), and Quebec (Government of Quebec, 2022) are in early policy development stages. The remaining jurisdictions lack any geothermal-specific regulatory instruments (Figure 1).

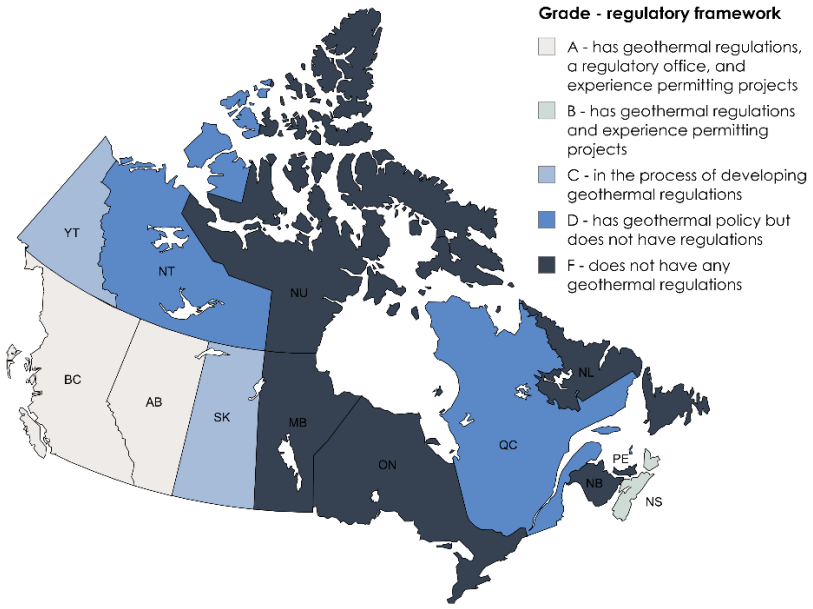



**Figure 1: The status of deep geothermal regulations in Canada. Grades are adapted from Young et al. (2019).**

Existing regulations often borrow from oil, gas, and mineral extraction frameworks. These frameworks are not fully suited to geothermal's unique characteristics—such as deeper wells, larger fluid volumes, and the

extraction of heat instead of hydrocarbons. This mismatch creates uncertainty for developers and complicates permitting processes.

Moreover, subsurface ownership varies across Canada. Provinces primarily own subsurface resources within their boundaries, while territories manage them under federal ownership. Indigenous land rights add further complexity, with overlapping federal, provincial, and Indigenous jurisdictions often complicating subsurface entitlements.

## 2 INTERNATIONAL INSIGHTS

To determine the global best practices for geothermal regulations, the authors analyzed the world's top 10 geothermal power producers (Figure 2). We reviewed geothermal definition, resource ownership, and tenure process for each jurisdiction to gather key learnings for Canada, summarized in Table 1. The *Groundwork* report provides a detailed analysis of each jurisdiction (Smejkal et al., 2025).

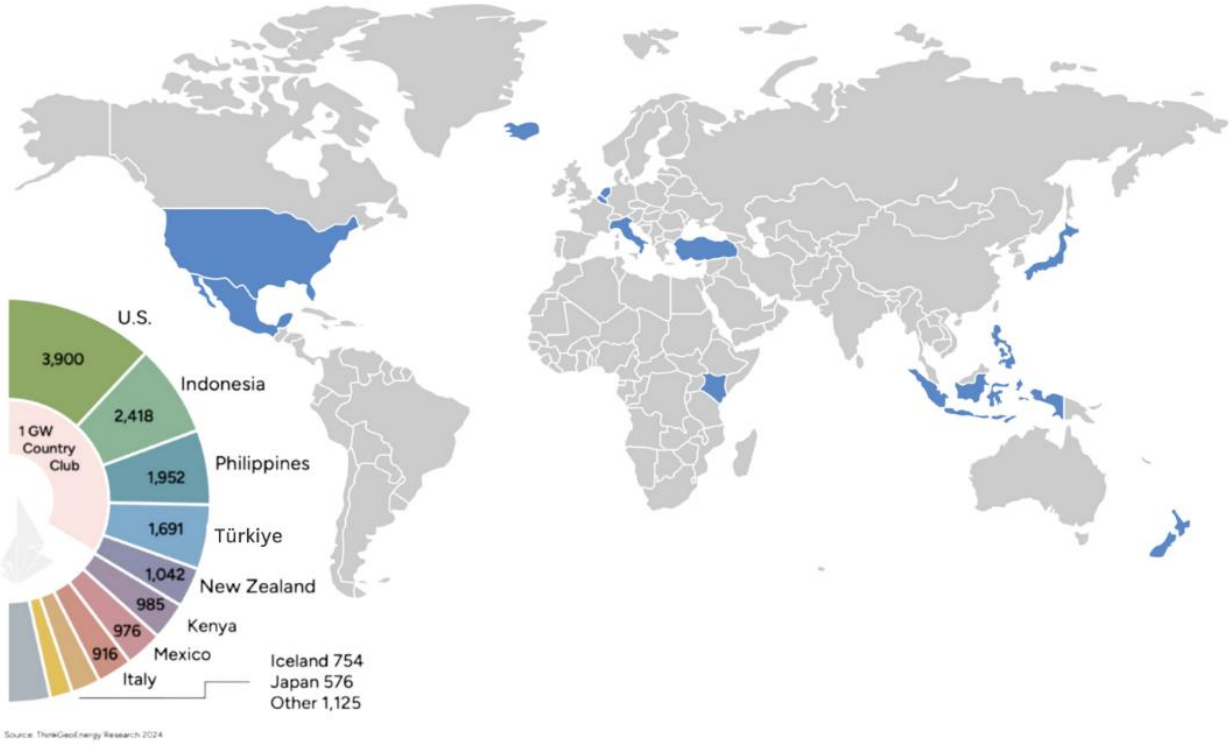



**Figure 2: The top 10 geothermal power producers globally (Cariaga, 2024) generate over 90% of the world's geothermal power.**

**Table 1: International insights on geothermal regulations.**

| Country | Key Learnings |
|---|---|
| **United States** | Template regulations can bring consistency across jurisdictions. |
| **Indonesia** | Automation and comprehensive post-operation regulations bring speed and certainty. |
| **Philippines** | Clear, technology-agnostic regulation speeds development. |
| **Türkiye** | Effective public communication reduces project opposition. |
| **New Zealand** | A thriving geothermal sector can honour treaties and Indigenous resource claims. |

| | |
|---|---|
| **Kenya** | Public funding can unlock private investment and create an industry. |
| **Mexico** | Mandated decision timelines drive project predictability. |
| **Italy** | Consistency in regulations across jurisdictions decreases scale-up risk. |
| **Iceland** | A dedicated regulatory body provides clarity and predictability. |
| **Japan** | Unclear regulations slow development and sow conflict between landowners. |

These case studies underscore the importance of clear definitions, streamlined permitting, tenure flexibility, and inclusive governance. Canada can adapt these lessons to create a regulatory environment that supports innovation, investment, and reconciliation.

## 3 MODEL GUIDELINES

Based on the international case studies mentioned above, the *Groundwork* report proposes the following model definitions and frameworks.

### 3.1 Resource Definition

***A geothermal resource is energy in the form of heat and/or pressure, below the base of groundwater protection, and includes all dissolved or entrained minerals that may be extracted from the medium used to transfer that energy. This energy can be used to generate heat and/or electricity.***

A broad, inclusive definition ensures compatibility with emerging technologies such as closed-loop systems and heat storage. It also facilitates co-production with critical minerals, hydrogen, and hydrocarbons, maximizing economic value from subsurface assets.

### 3.2 Ownership and Leasing

***Lease of rights to geothermal resources is granted by the Crown to the developer and includes the subsurface pore space (naturally occurring and human-made) over a given depth. Developers will apply to the Crown for the lease of subsurface pore space, and the lease of space will be awarded based on the merit of the application, following public notice and a period for additional applications.***

Transparent leasing processes, merit-based evaluations, and competitive bidding can prevent speculation and ensure equitable access. Prioritizing Indigenous and municipal rights aligns with reconciliation efforts and supports community-led energy development.

### 3.3 Tenure Model

We recommend a three-stage tenure system:

1. Development: five years, renewable.
2. Operations: 30 years, renewable in 10-year increments.
3. Decommissioning: two years, with site-specific renewal.

The proposed tenure structure balances the need for long-term operational certainty with safeguards against resource hoarding. Clear renewal criteria and staged development timelines promote accountability and reduce risk.

### 3.4 Additional Guidelines

While the definition, ownership, and tenure of geothermal resources are key to regulations, further components must also be included:

- Permitting timelines: Clear deadlines for regulatory decisions.
- Fee structures: Transparent and proportional to project scale.
- Liability management: Security deposits to prevent orphaned wells.

- Induced seismicity protocols: Traffic light systems and risk assessments.

Effective liability management is critical to preventing geothermal projects from leaving orphaned wells or causing lasting environmental damage. While regulations on well design and completion help reduce impacts, decommissioning rules must also address abandonment, remediation, and reclamation. To manage these risks, jurisdictions should require developers to provide security deposits or reclamation bonds proportionate to each project's size, complexity, and potential environmental impact. These financial instruments ensure that sufficient resources are available for proper site abandonment and reclamation, even if a developer becomes insolvent. In addition, protocols for managing induced seismicity—adapted from oil and gas regulations—should be mandated to assess and monitor seismic risks throughout the project lifecycle. These protocols, such as traffic light systems and fault proximity assessments, help safeguard public safety and reinforce regulatory confidence in geothermal development.

Together, these guidelines provide a clear, flexible framework for geothermal development, balancing investor certainty with environmental and social responsibility.

## 4 INDIGENOUS RIGHTS AND CO-GOVERNANCE

Indigenous rights to subsurface resources in Canada are complex and inconsistently defined. While reserves are Crown lands set aside for First Nations, many Indigenous nations assert broader claims based on treaties and traditional use. The Constitution Act (Constitution Act, 1982) affirms Indigenous rights, but provincial legislation often lacks mechanisms for co-governance or shared ownership.

As geothermal development expands, it must be guided by principles of co-governance; free, prior, and informed consent; and respect for treaty and inherent rights. These principles are enshrined in the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP), which affirms Indigenous Peoples' rights to their lands, territories, and resources, and their role as decision makers in matters affecting them (United Nations, 2007).

Regulatory frameworks should embed Indigenous leadership from the outset, not only through consultation but through shared project development. This includes prioritizing Indigenous-led projects, recognizing traditional knowledge in resource assessments, and ensuring benefit-sharing mechanisms. The Indigenous Geothermal Declaration, adopted in 2024, further calls on the geothermal sector to recognize Indigenous Peoples as rights holders and to commit to meaningful engagement, transparency, and inclusive development (Eagle-Bluestone, 2024).

To succeed, Canada's geothermal sector must ensure that Indigenous Peoples are not only consulted but empowered as equal partners.

## 5 CONCLUSIONS

Canada's geothermal potential is immense. Unlocking it demands a regulatory framework that is coordinated across jurisdictions, inclusive of Indigenous rights and community voices, and resilient to future technological and environmental shifts. The *Groundwork* report provides a comprehensive outline for such a framework, drawing on best practices from the world's leading geothermal producers and tailoring them to Canada's unique legal, geological, and governance landscape.

To operationalize this vision, the report outlines a series of actionable recommendations that Canadian provinces and territories can adopt or adapt:

1. **Define geothermal resources as energy—specifically heat and pressure—rather than limiting the definition to fluids.** This broader, technology-agnostic definition ensures that regulations remain relevant as geothermal technologies evolve.

2. **Ensure regulatory flexibility by remaining technology-agnostic.** This allows for the integration of innovations such as enhanced geothermal systems (EGS), closed-loop configurations, and subsurface heat storage, without requiring constant legislative updates.

3. **Streamline permitting processes by establishing predictable, time-bound approval pathways.** This reduces investor risk, accelerates project timelines, and makes Canada a more attractive destination for geothermal investment.

4. **Establish fair lease sizes and tenure structures that reflect local geology and geography.** This prevents monopolization of resources and ensures equitable access for a diverse range of developers.

5. **Set clear tenure timelines that balance the need for project flexibility with safeguards against speculative leasing.** Defined timelines help ensure that leased resources are actively developed and not held indefinitely without progress.

6. **Mandate early-stage public and particularly Indigenous engagement to build trust, reduce opposition, and foster co-governance.** Meaningful consultation and shared decision making are essential for aligning geothermal development with reconciliation and community priorities.

By implementing these recommendations through strategic coordination and policy development, Canadian jurisdictions can position themselves as global leaders in geothermal energy—delivering clean, secure, and equitable power while advancing climate goals and honouring Indigenous rights.

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