

# Empowering Indigenous Epistemologies in Geothermal Development

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**Abstract**— Epistemologies are ways of knowing. Indigenous Peoples are aware that they do not perceive and experience the world in the same way as others. So it is important when empowering Indigenous epistemologies, such as that of the New Zealand Māori, to also be able to represent a scientific understanding within the same analysis. A geothermal development assessment tool has been developed by adapting the Mauri Model Decision Making Framework. Mauri is a metric that is capable of representing the change in life supporting capacity of things and collections of things. The Mauri Model is a method of grouping mauri indicators as dimension averages in order to allow holistic assessment and also to conduct sensitivity analyses for the effect of worldview bias.

R-shiny is the coding platform used for this Vision Mātauranga research which has created an expert decision support tool (DST) that combines a stakeholder assessment of worldview bias, with an impact assessment of mauri based indicators to determine the sustainability of proposed geothermal development. The initial intention was to develop guidelines for quantifying mātauranga Māori impacts related to geothermal resources. To do this three typical scenarios were considered:

1. A resource owner wishing to assess the potential for a new geothermal development;
2. Another party wishing to assess the environmental and cultural impacts of a proposed development;
3. An assessment that focuses on the holistic sustainability of the resource including its surface features.

Indicator sets and measurement thresholds were developed that are considered necessary considerations for each assessment context and these have been grouped to represent four mauri dimensions that mirror the four well-being criteria used for resource management in Aotearoa New Zealand.

Two case studies have been conducted to test the DST suitability for quantifying mātauranga Māori and other bio-physical factors related to a geothermal system. This involved estimating mauri0meter values for physical features such as temperature, flow rate, frequency and colour. And developing indicators to also quantify qualitative observations about the geothermal system made by Māori. A retrospective analysis has then been conducted to verify different understandings of the geothermal system. The case studies found that the expert DST is useful for geothermal development assessment, especially where hapū (indigenous sub-tribal grouping) are conflicted regarding the benefits and disadvantages of their’ and others’ geothermal developments.

These results have been supplemented with evaluations for the cumulative impacts of geothermal developments experienced by different parties using integration techniques applied to the time history curve of the expert DST worldview bias weighted plotted against mauri0meter score. Cumulative impacts represent the change in resilience or potential of geothermal systems, which directly assists with the holistic interpretation of change from an Indigenous Peoples’ perspective.

**Keywords**—Decision Support Tool, Holistic Geothermal Assessment, Indigenous Knowledge, Mauri Model Decision Making Framework.

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