



A CASE STUDY ON CHANGING NORMS
AND HYDROPOWER IN NEW ZEALAND

The Kaimai Hydropower Scheme

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Table of Contents

Introduction	2
Method	3
Theory	5
Kaimai Hydroelectric Power Scheme Overview.....	9
Hydroelectric Dam Development in New Zealand.....	11
The Kaimai Scheme. Approval and Development.....	12
<i>Conservation Act of 1987</i>	16
<i>Resource Management Act of 1991</i>	18
Māori Knowledge, Culture and History.....	21
National Climate Change Policy in New Zealand	25
The Kaimai Scheme and New Zealand Hydropower today.....	28
Current Consent Process in the Bay of Plenty	30
Taranaki Resource Consent Process and Lessons.....	34
Kaimai Scheme Benefits.....	39
Summary	42
A Crossroads/Discussion	44
Privatization or Public Investment in Infrastructure.....	47
Broader Application	52
Conclusion.....	53
Bibliography	57

Introduction

New Zealand, like many countries is in the midst of grappling with the ever more present threat of climate change. In the summer of 2022/23 record floods in Auckland and throughout the North Island as well as a record-breaking hurricane, which wreaked havoc on much of the east coast brought climate change into focus once more. These events underlined the growing public will to tackle both the causes and effects of climate change in New Zealand as well as the general support to protect the outdoors. For policymakers, the strategy is clear. New Zealand's economy should be electrified, and renewable energy generation expanded.

Blessed with access to many renewable energy sources, New Zealand already produces the vast majority of its electricity through renewables, mostly through hydroelectric power schemes. These hydroelectric schemes were largely built in the mid-20th century and now need to renew their water use licenses or consents. For many scheme managers this is the first time that they are applying for water use rights in the modern era. These schemes illustrate how resource management has changed within New Zealand over a relatively short period. Today there is an increased focus on ecological sustainability as well as on the cultural values of communities that are affecting water use decision-making.

In this project I will analyse the Hydroelectric Dam Scheme in the Kaimai Region of New Zealand in order to understand the informal and formal pressures shaping licensing and resource management decisions in New Zealand today and the implications that arise from these. The Kaimai Scheme was commissioned in 1972 and their current resourcing consent renewals will expire in 2026. Manawa Energy, which manages the Scheme are currently working to renew the permits, following new processes, as the regulatory environment has transformed over the last 50 years. The Kaimai Hydropower Scheme is interesting, because it highlights the changing world of resource governance in New Zealand in the context of discussions around how to transition to low carbon futures. Hydropower is invaluable to New Zealand's economy and quality of life both historically and

in the present. It also fits well into the plans to transition to net zero emissions for the country by 2050. Despite the continuing importance of hydropower to the region and New Zealand, the consensus among stakeholders is that the Kaimai Hydropower Scheme would not be possible to be build today.

To set the stage, I will begin with an analysis of how the Kaimai Hydropower Scheme was conceived and built, before turning to the significant changes in attitude New Zealand has undergone in the following years. I will place the project in its legislative, cultural, and social context. Finally, I will analyse why the projects' stakeholders and managers believe that despite the evident benefits of the scheme, it would not be possible to build such a project today, and the wider implications of their beliefs. In the end I will argue that the Kaimai Hydroelectric Scheme illustrates the changing norms regarding the use of natural resources that are currently impacting New Zealand's ability to effectively decarbonise their economy. Although this study is centred on New Zealand, I would further posit that many of the changing attitudes illustrated have wider applications around the world.

Method

This research project is focused on why an economically viable, low emission and ecologically low impact hydroelectric power scheme like the Kaimai Scheme would in all likelihood not be built today, in spite of a dire need to develop new renewable electricity sources in a timely manner. To appropriately answer this question there are many factors and dynamics that must be considered. First, I will introduce the theoretical framework of "energy cultures" which will guide my research. Then I will give a general overview of the Kaimai Scheme and look into the history and context of its initial development. This will be followed by an analysis of what has changed in New Zealand since the building of the Scheme, in particular how freshwater is managed today in contrast to 50 years ago. Through examining legislative developments and comparisons with other similar

schemes throughout the country, I will establish how the Kaimai Scheme fits within the regional and national context.

Throughout this project, I have developed relationships with key stakeholders, which assisted my understanding of the dynamics at play among these stakeholders. I held many informal, off the record discussions with them. In these discussions they elaborated on their unique base of knowledge and understanding which helped reveal important avenues of research for me look into. Topics that were discussed included their general attitudes towards hydropower and the Kaimai Scheme specifically as well how they felt about the modern regulatory framework surrounding the use of natural resources. An example of how these stakeholders helped support my research is the help I received from members of the Bay of Plenty Regional Council in finding relevant documents in the archives such as the original consenting documents and studies conducted on fish stock within the Scheme. As Manawa Energy is in the process of applying for new water use consents, they were unable to provide much in the way of specific data as these are confidential until they are ready to be submitted to the council. Nevertheless, they provided guidance and pointed me in the direction of their Hydroelectric Power Schemes in the Taranaki Region which have already applied for new consents and therefore the information is publicly available. They also provided useful information about the general operation and value of Scheme. Finally, by consulting Iwi I was able to compare the different perspectives about how the Kaimai Scheme has managed its resources and treated the Indigenous people affected by it. I greatly appreciate their openness and willingness to share insights off the record that guided my research.

Help from Manawa Energy, the Bay of Plenty Regional Council as well as local Iwi were critical for the completion of this project. These stakeholders were identified as key as all three must reach an agreement if the Kaimai Scheme is to continue to operate in the future. Manawa Energy must feel the Scheme is financially viable while the Regional Council must be satisfied all regulations are being followed and the local Iwi must be satisfied with the manner in which the water will be

used. While some interviewees wished to remain anonymous three agreed to be quoted. These are Evan Boyt who is an operations manager at Manawa Energy, Nicholas Koro which is the co-chair of the local Ngāti Hangarau Hapu and Marlene Bosch who is an expert with experience in planning and consent applications in the Bay of Plenty. After initial, off the record conversation, which enabled the stakeholders to be candid about their thoughts, I was able to follow up with more specific queries following my independent research. In this way I was able understand the stakeholders' motivations and concerns. These discussions were followed up by written communications, where the interviewees consented to being referenced in the text of this paper. Further I will be using direct sources such as consenting documents, legislation, press releases and public statements to demonstrate the evolution of norms and practices in New Zealand and the region. Seeing how the language and the focus of these documents shifts over time will provide invaluable insights into the changing norms and practices being researched. By interacting directly with key stakeholders and using first hand sources I believe a clear pattern within the region and New Zealand will become evident.

Another key pillar of this research is the guidance provided by the energy cultures theoretical framework.

Theory

The nature of changing norms and the interplay between these norms and the outcomes for decision making are complex. The theoretical framework that helped guide and contextualize this research is the energy cultures framework, whose authors noted that "The foremost aim in developing the framework was to enable different disciplines to work together using a common language and an integrating model (Stephenson, et al., 2015, p. 118)." In the book "Culture and Sustainability" the need for a framework when conducting this type of research is further elaborated. The author Janet Stephenson argues that Frameworks set out highly generalised

variables and indicate the relationships between them. “By depicting a complex field through certain universal qualities and dynamics, a framework can help researchers to formulate questions and thence identify the theories that are best suited to answering those questions (Stephenson, 2023, p. 71).” This framework has been applied to many different cultures, regions and problems and has proven invaluable. Examples include research done to understand shifting attitudes towards energy conservation in rural Romania (Klaniecki, Duse, Lutz, Leventon, & Abson, 2020) and examining the dynamics surrounding installing solar home systems in developing countries (Khan, 2020). These examples show how versatile this framework is and how it can be applied to a regional scope such as in this project. As this research project will draw from different disciplines and concepts, such a framework is a helpful integrator.

The energy cultures framework looks to understand how cultural beliefs and norms effect decisions and choices specifically in regard to energy use and sustainability. It aims to understand how these beliefs and norms impact sustainable decision making by building a conceptual shape with which to visualize and examine the dynamics surrounding culture and sustainability.

The framework focuses on the interplay between culture, norms, practices, and external influences as can be seen in the diagram below.

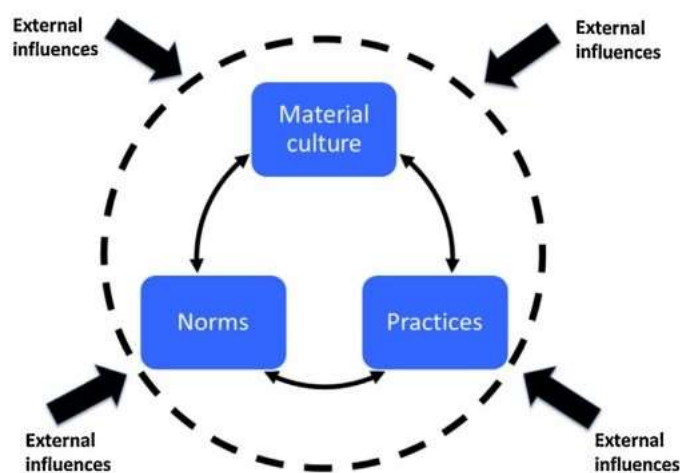


Fig. 1. The energy cultures framework.

Figure 1: (Stephenson, et al., 2015, p. 118)

The centre of the diagram represents the “cultural ensemble” and is comprised of norms, practices, and materiality. These terms are somewhat broad and ambiguous, and we will need to clarify what each term represents broadly and more specifically for this thesis. In more recent iterations of the framework the term norms has been changed to “motivators” and describes the characteristics that influence actions and choices. This includes but is not limited to norms, beliefs, knowledge, and language. Practices simply refers to the actions and things people do. This can be daily habits or unusual activities. Material culture encompasses all things that people have, make, and acquire under the interpretation that the decision to use, make or accumulate these items is influenced by other cultural factors such as the ones mentioned above. The double arrows allude to the fact that these core elements are not clearly delineated and are extremely interconnected and research using this framework focuses on how this interconnectivity affects sustainability outcomes (Stephenson, 2023, pp. 78-78).

The dotted line surrounding the framework represents factors that are important but are outside the influence of those involved in the process being examined. These can be positive, negative or neutral towards the outcome but importantly they all unable to be directly influenced by the cultural ensemble being examined.

A key point of discussion is the scale of application of the framework. As the Stephenson notes it is important that “we purposefully limit the scope of the aspects of culture that form our core focus” (Stephenson, 2023, p. 85) . When she first built this framework she pointed out that this framework is versatile as “It works at different scales, being applicable to understanding a single household, or a community (such as Waitati), or an industrial sector, or conceivably at a national level” (Stephenson, et al., 2010, p. 6128). Finally, the outcomes are defined as “social, economic, environmental or other sustainability-related consequences of actors enacting their cultural ensembles.” (Stephenson, 2023, p. 89)

With all of this in let us apply this framework to the stakeholders this research project will focus on. The scope of this project is on regional level decision making processes as the regional government has final say when it comes to water use rights. The stakeholders that make up the cultural ensemble in this instance are Manawa Energy, the power company that operates the Kaimai Scheme, the Bay of Plenty Regional Council, who are responsible for enforcing environmental regulations as well as granting consents and the local Iwi (Māori community) who have a strong cultural stake in the Kaimai Scheme. All actors operate with a current reality that is informed by their historical contexts, whether colonialism, carbon emissions reduction, profit or ecological sustainability.

In terms of norms, I will be examining New Zealand laws and regulations and how these have changed over time as well as Māori customs, traditions, and cultural knowledge. Notably these two belief systems have become increasingly interconnected over time. In order to understand and assess changing norms I will be using laws and regulations over time as a tool of analysis. While these laws and regulations are not the same as norms, they are an indirect indicator and over the time frame of this research they are the logical choice to use as a basis. As for practices I will look into how resources are managed and how decisions are made. Specifically, how decisions are made about water use and access as well as how power generators manage resources that they already have access to. Finally, the central material culture being examined is the existing hydropower infrastructure and potentially how it might exist into the future.

Returning to the framework, I will also incorporate very significant outside influences that are beyond the direct agency of these stakeholders, including national policies, international climate change directives, the history of colonisation and the subjugation of the indigenous Māori population as well as New Zealand's history of public industries' privatization.

The aim is to understand how and why hydropower projects are no longer considered viable, in spite of their vital importance to the country and the informal and formal pressures shaping

resource management decisions. There are many dynamics at play that lead to this unexpected outcome. Finally, I will propose how the dynamics within the cultural ensemble could be shifted in order to change this outcome going forward.

Kaimai Hydroelectric Power Scheme Overview

The Kaimai Scheme is a cascade hydroelectric power scheme located within the catchment of the Wairoa River in the Bay of Plenty Region of New Zealand. There are three main stations and dams that are filled by a series of diversions from rivers and streams in the catchment area. The three dams were not built simultaneously with the scheme first being approved in 1970 and the Ruahihi station being the last to be completed in 1981. The following diagram is an excellent overview of the scheme.

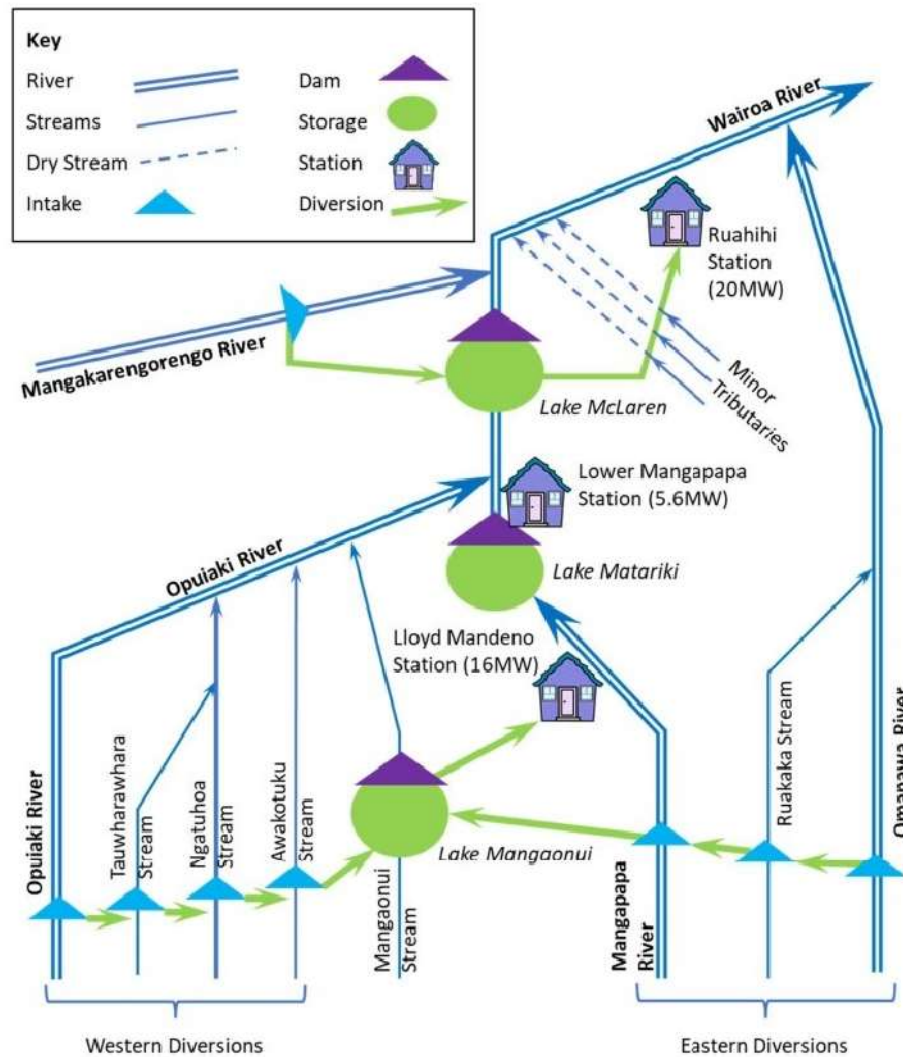


Figure 2: Overview of the Scheme (Lilley, 2022, p. 5)

The scheme is usually used for intraday storage to match peak demand for the city of Tauranga, New Zealand's fifth largest city. Over the year it provides 169 GWh, around a quarter of the power used in the city of Tauranga annually. While not the most important source of electricity it is a vital part of electrical capacity in the region. In a discussion with one of the daily operations team leaders it was revealed that the Scheme mainly utilizes groundwater, meaning short term fluctuations in rainfall do not have a significant effect on the capacity of the scheme and as such there is only a 5% variance in year over year power, making it an extremely reliable as a peak demand source of electricity (Boyt, 2023). Although the scheme was originally built with

government money, Manawa Energy is a private company which runs the scheme as well as many other hydroelectric power schemes in New Zealand. The Bay of Plenty Regional Council is the government entity in charge of managing, monitoring and approving the resources used by this scheme.

Additionally, Lake McClaren has also become a popular recreational area, due to do the damming of the rivers creating a lake used for swimming and the development of a surrounding park. Manawa Energy also has scheduled water releases so that the Wairoa River can be used by recreational kayakers and rafters once a week in the summer. There is also recreational fishing that takes place in the rivers, streams and lakes.

Hydroelectric Dam Development in New Zealand

To further put this Scheme into perspective it is necessary to understand the broader context of hydropower development in the country. The Kaimai Hydroelectric Power Scheme was greenlit at the peak of hydropower development in New Zealand. It was also a time where there were serious concerns about a lack of energy security and the potential for an economic crash caused by this. As can be seen in the following graph, the 1970s were when hydropower development in New Zealand peaked.

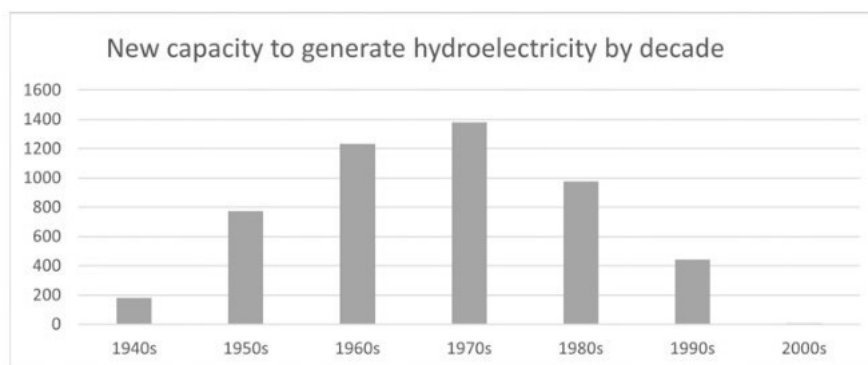


Figure 3: (Smith, 2022, p. 76)

In this period the primary concerns for New Zealanders were the lack of electric power and the fear of power rationing throughout the country as well as economic stagnation. As such there was broad public support for these projects to be completed swiftly. However, starting in the 1960s a growing movement of environmentalism started to change attitudes towards these projects and invite more scrutiny. The value of preserving nature became a large focus of public debate and came to a head when it was proposed to raise the water levels of Lake Manapouri on the South Island to generate power for industrial production. This would have flooded a significant area of a national park and would have had broad impacts on the local ecology. Since then, many different laws have come into effect that illustrate how these attitudes have changed. It is significant to note that as these attitudes became more mainstream hydropower projects have dropped to the point where in the 21st century there have been no notable increases in hydropower capacity in New Zealand. It is important to observe that the lack of development is not due to a lack of available resources. In fact, there still exist extensive sites that could be used to generate significant amounts of power. (Smith, 2022) To understand these changing norms towards protecting the environment more clearly, I will discuss the legislative and regulatory developments that emerged to reflect this change in attitudes.

However first I will go through how the Kaimai scheme was developed before looking deeper into the changing social and legislative world in which its managers are seeking to renew their consents.

The Kaimai Scheme. Approval and Development

The history of hydropower projects in the Kaimai area dates back to the 1920's, however this particular scheme was not commissioned until the 1970s. The regional council, which is now responsible for these types of consents, did not exist. At that time the body responsible was the Bay of Plenty Water Commission. In 1970 they granted the right to dam the river and the use of water under the authority granted to them by the *Electricity Act (1968)* as well as the *Water and Soil*

Conservation Act (1967). As a hydropower scheme, the *Electricity Act* defers to the *Water and Soil Conservation Act* and therefore the *Water and Soil Conservation Act* will be examined in some detail.

The *Water and Soil Conservation Act* aims to:

“promote a national policy in respect of natural water, and to make better provision for the conservation, allocation, use, and quality of natural water, and for promoting soil conservation and preventing damage by flood and erosion, and for promoting and controlling multiple uses of natural water and the drainage of land, and for ensuring that adequate account is taken of the needs of primary and secondary industry, water supplies of local authorities, fisheries, wildlife habitats, and all recreational uses of natural water (Parliamentary Counsel Office, 1967, p. 2).”

As we can see, while ecology is mentioned, along with the needs of industry and flood protection, among others, there is no discernible weighting of relative merits. Notably there is no definition of conservation, and the priorities are vague. The Act states that the boards that decide on water use must be made up of members from various departments including agriculture and internal affairs and gives them broad guidelines. For dams specifically, it mentions the requirement “To control the damming, diversion, taking, and use of natural water, and the discharge of anything into any natural water, so far as any such acts may affect the quality and availability of natural water for other purposes (Parliamentary Counsel Office, 1967, p. 13).” What this means concretely is left to the interpretation of those board members. The most specific reference in the Act is the following declaration of its aims:

“To take into account the present and future needs of primary and secondary industry, water supplies of local authorities, and all forms of recreation, and to have due regard to scenic and natural features and to fisheries and wildlife habitats when planning and advising on the allocation of natural water (Parliamentary Counsel Office, 1967, p. 15). “

What exactly constitutes “due consideration” is not elaborated on, however there does seem to be a clear hierarchy. The primary concern is to ensure that the needs of industries will be met and that other concerns such as protecting the scenery and wildlife are secondary.

In the approval of the resource consent for the Kaimai Scheme the Tauranga Water Commission refers specifically to section 21(3) of the *Water and Soil Act*. This section states that consideration must be made, and officials consulted if the river flows through national parks or affects any mining operations, but again there are no specifics about what these considerations should be, and it also demonstrated their focus on protecting the needs of industry.

With all this in mind it is interesting to examine the document where the Board gives approval to dam the river and for the use of water. This document, from the Bay of Plenty Regional Councils Archive, is shown below.

10.11

BAY OF PLENTY CATCHMENT COMMISSION
AND REGIONAL WATER BOARD

RIGHT IN RESPECT OF NATURAL WATER

Pursuant to Section 21 (3) of the Water and Soil Conservation Act 1967, the Bay of Plenty Catchment Commission, in its capacity as Regional Water Board for the Bay of Plenty Catchment Area, by a decision dated 3rd March 1970 hereby grants to,

Tauranga Joint Generation Committee
of TAURANGA

the following right in respect of natural water.

The right to dam, divert, take and use water from the Maungapapa River for hydro-electric generation at Lot 1 D.P.S 10437 of Allot 436 Blk V Otanewainuku S.D. Tauranga County.

Subject to the following conditions:

- (1) The dam shall be designed and the construction supervised by a Registered Engineer.
- (2) The maximum rate at which water shall be diverted from the river at the dam site and discharged into the river at the powerhouse site, shall not exceed 450 cusecs.
- (3) If the right granted is not exercised within five years from the date of issue, it be rendered liable to cancellation.
- (4) The Committee shall be entitled to assign the right granted subject to the conditions herein contained, to any transferee subject to prior notice of any such assignment being given to the Commission.
- (5) The right granted shall be without prejudice to any right which any person might have to recover compensation on account of any damage suffered as a result of the doing of any act or thing authorised hereby.
- (6) The right granted may be reviewed and varied by the Commission on reasonable notice being given to the Committee and the Committee being given opportunity to be heard if the Commission decides that failing such variation the rights or interests of lawful users of water pursuant to Section 21 (1) of the Water and Soil Conservation Act 1967 or notified lawful users of water pursuant to Section 21 (2) of the said Act would be materially prejudiced.
- (7) The right hereby authorised is granted under the Water and Soil Conservation Act 1967 and does not constitute an authority under any other Act, Regulation or By-Law.
- (8) The right granted shall be also subject to the consent being obtained of the Ministry of Electricity under the Electricity Act 1963 and to any conditions contained in any such consent granted.

Dated at Whakatane this 23th day of August 1970.

For and on behalf of the Bay of
Plenty Catchment Commission


J.D. CABLING
Secretary.

NO.11

Figure 4: Initial approval for the Kaimai Scheme (Bay of Plenty Catchment Commission, 1970)

As we can see the only conditions that they are required to meet are that the dam be designed and constructed under the supervision of a qualified engineer, as well as a maximum amount of water that can be diverted. Notably no considerations for biodiversity, conservation or cultural considerations are mentioned. While it is impossible to say that the Bay of Plenty Catchment Commissions completely ignored these issues when considering the approval of this dam it is fair to say it was not the primary concern, given the lack of mention in the approval document. This sentiment was echoed by all current stakeholders when discussed.

In 1978 the Kaimai Scheme was granted an extension of the resource consents that run until 2026 under the same conditions. While there had already been a big shift in how the public views and values resource use in New Zealand the legislation had not yet changed. In the following years, this situation would change significantly. In summary the Kaimai Scheme was first built at a time when there was significant public pressure to grow the electricity capacity in New Zealand and there was also minimal oversight about the use of water. As such the scheme was granted the rights to use water with little in the way of conditions beyond maximum amounts of water that can be taken. In the following we will examine some of the notable legislative changes that have come into effect in the years that followed.

Conservation Act of 1987

The first major piece of legislation to show the shift in New Zealand's values is the *Conservation Act (1987)*, almost 10 years after the Kaimai Scheme was granted its current permissions for water use. In the years leading up to the passing of this act there was a growing dissatisfaction with how resources were being managed. Examples of these include the secretive

plan to raise the water levels in Lake Manapouri to generate power for an aluminum plant, the clearing of old growth forests to make space for exotic pine plantations as well as plans to mine on public land (Towns, Daugherty, Broome, Timmins, & Clout, 2019, p. 248). The Department of Conservation was established through this act to manage New Zealand's natural and historic resources. This department consolidated several agencies such as the forest service, wildlife service and the departments of land and survey. This spread of responsibilities did not facilitate effective management and in fact often doomed these institutions to failure. These institutions had contradictory policies and there was little recourse when one agency would make decisions that did not fit the mandate of another one. For example, there were instances when forests would be destroyed after they had been surveyed to protect rare birds. (Towns, Daugherty, Broome, Timmins, & Clout, 2019) The consolidation of all these departments represented a commitment and public will to tackle conservation issues more effectively in a way that it was impossible to do before.

The wording of the Act underlines the new focus on conservation that had not existed previously. In this Act they define conservation as “the preservation and protection of natural and historic resources for the purpose of maintaining their intrinsic values, providing for their appreciation and recreational enjoyment by the public, and safeguarding the options of future generations (Parliamentary Counsel Office, 1987).” The acknowledgement of the intrinsic value of natural resources for appreciation and recreation shows the high priority that they had become. In the previous *Water and Soil Act* the values were mostly based on references to resources' usefulness for primary and secondary industries. Another notable point is the reference to the needs of future generations which was not mentioned in any previous legislation. Further the Act included “systems of interacting living organisms, and their environment” in their definition of natural resources. An acknowledgment that within an ecosystem a small change can have large effects on the ecosystem as a whole and therefore great care must be taken when giving permission to alter the environment. The phrasing along with the formation of the Department of Conservation shows how important the values of protecting biodiversity and natural resources had become in New Zealand. Unsurprisingly

the progress towards achieving these goals did not end there and continued with the *Resource Management Act* a few short years later in 1991.

Resource Management Act of 1991

The *Resource Management Act* was enacted relatively shortly after the *Conservation Act* and further entrenched the commitments to protect biodiversity and conservation within New Zealand. This Act, which effects the consenting process of the Kaimai Scheme directly, was the next step in the progress made towards enshrining biodiversity and conservation commitments in natural resource management decisions. To this day the Act remains in effect and provides the legal basis for any decisions made in terms of the use of natural resources. The diagram below highlights the different focuses of the *Conservation Act* as well as the *Resource Management Act*. It also demonstrates how this act still defers final decision-making to the local governments but provides much stronger directives to guide these decisions.

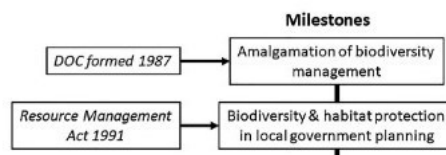


Figure 5: Legislative Milestones from the formation of the Department of Conservation and the Resource Management Act (Towns, Daugherty, Broome, Timmins, & Clout, 2019)

The *Resource Management Act* adds another dimension to managing natural resources as we can see in their definition of environment as including:

(a) *ecosystems and their constituent parts, including people and communities; and*

(b) all natural and physical resources; and

(c) amenity values; and

(d) the social, economic, aesthetic, and cultural conditions which affect the matters stated in paragraphs (a) to (c) or which are affected by those matters (Parliamentary Counsel Office, 1991)”

By explicitly adding cultural, aesthetic, and social consideration to the equation new factors must be considered in any future resource consents. Further it emphasizes the point that resources have value beyond their direct benefits to primary and secondary industries. It also clarifies what should be focused on when making decisions to protect the environment, by explicitly spelling out what is included. This is in stark contrast to any- previous legislation such as the *Water and Soil Conservation Act* where there were no definitions of key terms. By explicitly defining what is included in the environment and what is meant by conservation it ensures that local bodies that are responsible for making decisions across the country will be in line with regulations in other districts, as less is left up for interpretation.

The Act goes on in its opening statement to spell out the express purpose for its enactment.

“1) The purpose of this Act is to promote the sustainable management of natural and physical resources.

(2) In this Act, sustainable management means managing the use, development, and protection of natural and physical resources in a way, or at a rate, which enables people and communities to provide for their social, economic, and cultural well-being and for their health and safety while—

(a) sustaining the potential of natural and physical resources (excluding minerals) to meet the reasonably foreseeable needs of future generations; and

(b) safeguarding the life-supporting capacity of air, water, soil, and ecosystems; and

(c) avoiding, remedying, or mitigating any adverse effects of activities on the environment.

(Parliamentary Counsel Office, 1991)”

Again, the explicit way in which concepts like cultural wellbeing, future generations’ needs and the importance of ecosystems to support life illustrates the aspects that Zealanders had felt were neglected in the past and need to be explicitly protected, as the protections had proven to be inadequate. This highlights the shift in norms within the cultural ensemble and greatly effects all stakeholders.

With this Act in combination with the *Conservation Act*, there are now significant steps that have been taken to specifically ensure that to reduce, mitigate or eliminate any harm to the environment. Long-lasting cultural factors and the long-term effects of any action must be considered. For example, had these laws been in place, the Kaimai Scheme would have had significantly more responsibility to explore and address any potential harm that would arise from building these dams. In particular they would have needed to research how native plant and fish life would have been affected and determine the views and any concerns of the local Māori population. The regional council and the Māori representatives would have had to agree that the dams built were in the interests of the community, would not appreciably affect the ability of the water to flow through the rivers and tributaries in the Kaimai Scheme and that the dams would not destroy any of the water system’s cultural and community uses in the present and for future generations. Again, this is not to say that these considerations were not taken into account in the past, but there is no documentation on the process and no accountability in the case that it was not. Today the *Resource Management Act* ensures that these processes cannot and will not be overlooked.

It is also important to point out that the concept of intergenerational equity is now enshrined in law. New Zealand was one of the first countries to include such language in legislation and New Zealanders are proud of this fact. (Towns, Daugherty, Broome, Timmins, & Clout, 2019) It also adds provisions that Māori representatives must be consulted before making decisions about the use of natural resources.

As discussed in the theory section, laws are one way to show how people think and these shifts in legislation show how important these issues have become to the people of New Zealand. In addition, these changes will have massive impacts on how Hydro Schemes are operated and new infrastructure is built in New Zealand

Māori Knowledge, Culture and History

In both the *Resource Management Act* and *Conservation Act* there is a clear effort to account for Māori traditions and beliefs. Both acts refer to the rights and privileges granted to Māori in the treaty of Waitangi as well as other more specific inclusionary language. In previous legislation references or acknowledgement of Māori rights are notable in their absence.

The Māori are the Indigenous people of New Zealand. When the British colonized New Zealand the Māori suffered in the way many Indigenous populations have all over the world in the hands of settlers. The relationship between the British settlers and the Māori population has a rocky history, which is reflected in the legal framework of New Zealand. In 1840 a representative of the British Crown and 500 chiefs signed the Treaty of Waitangi. This Treaty is still in effect to this day though there has been much debate, both peaceful and violent about the exact nature of the agreement it contains. The European understanding was that the Treaty cemented British sovereignty while the Māori were able to keep their traditional forests and fisheries, among other guarantees. They also received all the rights and privileges of any other British subjects. The Māori

translation is reported to have not properly conveyed the European understanding of the Treaty, leading to countless conflicts. In the end European cultural, political and legal norms dominated leaving negatively affecting many Māori. (Orange, 1987).

Economic as well as well as cultural marginalization, racism and forced migration were among the injustices Māori faced. The British colonizers also enforced their way of life in New Zealand including instituting a legal system which enshrined land as property (Moewaka Barnes & McCreanor, 2019). As can be seen in the application for water consent use for the Kaimai Scheme when it was first considered the land is acknowledged as Crown Land and Māori cultural or concerns or established knowledge of the land was not considered. Even as late as the 1980s the federal minister of local government opposed acknowledging the treaty in any local government issues. However, when the *Resource Management Act* was passed, it required local governments to recognise Māori cultural considerations in decisions regarding natural resources (Orange, 1987, p. 224). Nevertheless, the treaty is still in effect and in the modern era efforts have been made to avoid the mistakes of the past and have a positive and collaborative relationship with Māori stakeholders. The Bay of Plenty Regional Council has outlined how the treaty affects decisions today.

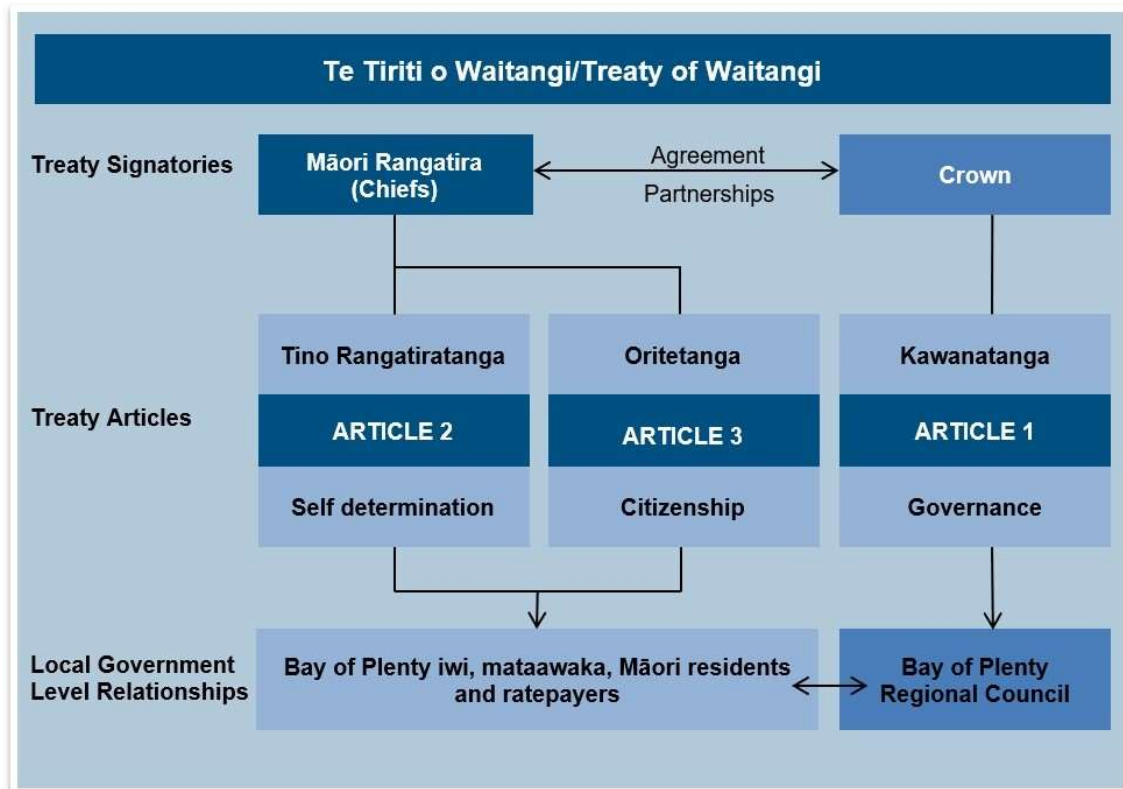


Figure 6: The influence of Treaty of Waitangi (Bay of Plenty Regional Council, 2023)

As discussed previously *the Resource Management Act* is quite specific and in its requirements for consultations with Māori. It lays out that the local governing bodies must have on record the contacts of the Iwi authorities in the region as well as records of any planning documents made by these authorities. As the Māori are not a monolith and are made of hundreds of different tribes spread throughout New Zealand with some areas of overlap this explicit process is immensely important. A clear process of explicitly defining the rights and responsibilities ensures there is no confusion and removes grey areas that could lead to key stakeholders being overlooked or purposefully ignored. More critically it enshrines a system of checks and balances as well as giving recourse and accountability tools to groups that previously did not have these. At least not to this degree.

This connection and requirement of local government decisions to collaborate and seek guidance from Māori stakeholders has only become more entrenched since then. In 2014 the

national policy on freshwater management, which is an update to the *Resource Management Act*, includes the Māori knowledge of “Te Mana o te Wai” which loosely translates of the vital importance of water. Te Mana o te Wai includes a hierarchy of commitments that must be adhered to. The first being the health and wellbeing of the water. The second being the health needs of the people and the third being the ability for people to be able ensure their social economic and cultural well-being. Further the following six principles must be adhered to (Ministry for Primary Industries , 2020, p. 2).

The six principles

Mana whakahaere: the power, authority, and obligations of tangata whenua to make decisions that maintain, protect, and sustain the health and well-being of, and their relationship with, freshwater

Kaitiakitanga: the obligation of tangata whenua to preserve, restore, enhance, and sustainably use freshwater for the benefit of present and future generations

Manaakitanga: the process by which tangata whenua show respect, generosity, and care for freshwater and for others

Governance: the responsibility of those with authority for making decisions about freshwater to do so in a way that prioritises the health and well-being of freshwater now and into the future

Stewardship: the obligation of all New Zealanders to manage freshwater in a way that ensures it sustains present and future generations

Care and respect: the responsibility of all New Zealanders to care for freshwater in providing for the health of the nation

Figure 7 Tangata Whenua translates to “the people of the land”.

The continued acknowledgment of Māori knowledge and beliefs shows the growing commitment to accept the Māori as stewards of their lands. The fact that the Māori knowledge and traditions are not just referred to but actively included in legislation underlines their inclusion.

There is another important Māori cultural belief that affects the Kaimai Scheme. Many Māori believe that rivers are living beings. As a result of Māori pressure the Whanganui River was legally declared as a person in order to grant it protections within the New Zealand legal framework

(Perry, 2022). This again shows the growing commitment to respect indigenous beliefs and customs, however it raises some problem for the Kaimai Scheme as it mixes water from different rivers is in opposition to the river's personhood.

Finally, it is important to note some of the specific grievances local Iwi have with the Kaimai Scheme. Nicholas Koro is one of the co-chairs of the Ngāti Hangarau Hapu Trust which represents one of the Iwi groups in region and has collaborated with Manawa Energy in the past and is familiar with the Kaimai Scheme. In regard to the Kaimai Scheme he mentioned specifically that because of the water diversions some of the streams and rivers have gone dry, meaning that waterfalls, which are an important part of Māori culture can no longer be witnessed in the present. This issue is critical, and Nicholas stated that having waterflows restored to these waterfalls in some capacity, even if just for a couple of days a year is critical for Iwi approval of renewing the resource consents. He noted that that Manawa Energy did not seem opposed to this demand at this stage (Koro, 2023). It is notable that the Kaimai Scheme does have scheduled releases for recreational rafting but not for this important cultural aspect and further highlights how Māori concerns were not a part of the original development process. Mr. Koro also mentioned that a lot of land surrounding the scheme is owned by Manawa energy but is not a part of the scheme in any way. This land was confiscated by the British in the 1860's and sold to private owners for next to nothing. There is hope that some of this land could be returned to the original owners (Koro, 2023).

Critically it should be noted that the relationship between Manawa Energy and the local Iwi today is positive. This is reflected in the change of name from Trustpower to Manawa Energy in 2022. The name Manawa was gifted by the Iwi. Mana is the energy or life force of the universe and the gift and acceptance of such a name demonstrates the respectful relationship on both sides.

National Climate Change Policy in New Zealand

The Kaimai Hydropower Scheme must also be situated within New Zealand's climate and emission reduction goals. In 2011 the New Zealand Government released a national policy statement for renewable energy generation as an extension of the *Resource Management Act* to clarify and support new renewable energy projects then in development. The national policy statement was important as there was and still is a need to accelerate the development of new renewable energy sources (Ministry for the Environment , 2011). New Zealand has committed to the global effort to limit global warming to a maximum of 1.5 degrees above preindustrial levels and as a part of this goal is aiming to achieve net zero emissions by 2050. Obviously, there are many parts of this plan, and it involves all facets of society from making houses less energy intensive to heat and cool as well as cutting the energy use and electrifying industry. No plan for net zero emissions can succeed without an energy grid equipped to supply power for New Zealand in a sustainable way. In 2022 the government released its first emissions reduction plan, and the following image is an excerpt outlining the vision for its energy systems for 2050.



Contribution to our long-term vision

By 2050, our energy system is highly renewable, sustainable and efficient, and supports a low-emissions and high-wage economy. Energy is accessible and affordable and supports the wellbeing of all New Zealanders. Energy supply is secure, reliable and resilient, including in the face of global shocks.

Figure 8: Renewable energy vision for New Zealand (New Zealand Government , 2022, p. 58)

New Zealand is fortunate to have easier access to renewable energy than many other countries and the power grid is already significantly covered by renewable energy sources. The following chart from the Ministry of Business, Innovation and Employment clearly demonstrates this

point.

Ministry of Business, Innovation & Employment									
Annual electricity generation and consumption									
Calendar year	2014	2015	2016	2017	2018	2019	2020	2021	2022
Net Generation (GWh) ^{1,2}	42,651	43,333	42,919	43,311	43,419	43,815	43,174	43,270	43,503
Hydro	24,075	24,285	25,676	24,924	25,992	25,343	24,024	23,992	26,001
Geothermal	7,195	7,749	7,738	7,779	7,729	7,793	7,834	7,968	8,060
Biogas	228	244	265	264	262	267	271	265	257
Wood	522	519	496	485	463	472	460	483	458
Wind	2,189	2,340	2,317	2,070	2,047	2,233	2,282	2,616	2,837
Solar ³	19	36	56	76	100	127	159	205	276
Oil	3	1	3	6	11	4	13	26	5
Coal	1,831	1,753	979	1,133	1,479	2,118	2,159	3,020	1,254
Gas	6,542	6,357	5,338	6,527	5,287	5,412	5,932	4,650	4,310
Waste Heat ⁴	47	49	51	46	49	45	40	43	45
Renewable Share (%)	80.2%	81.2%	85.2%	82.2%	84.3%	82.7%	81.1%	82.1%	87.1%

Figure 9: New Zealand Energy Sources 2014-2022 (Ministry for Business, Innovation and Employment, 2022)

In 2022 renewables accounted for 87.1% of all power generation, with Hydro being by far the largest single source, generating almost twice as much power as the second largest source which was geothermal. The Kaimai Scheme accounts for around 3% of New Zealand's annual hydropower generation. Nevertheless, there is still room for improvement when it comes to renewable energy generation in New Zealand. As the government notes in their emissions reduction plan, there needs to be an acceleration of new renewable energy development among other factors.

To transition our electricity system to 2050, we need to:

- ▶ accelerate development of new renewable electricity generation across the economy
- ▶ ensure the electricity system and market can support high levels of renewables
- ▶ support development and efficient use of transmission and distribution infrastructure to further electrify the economy.

Figure 10: Energy Transition Goals (New Zealand Government, 2022, p. 213)

Of course, there are factors to consider beyond simply transitioning to renewables. Other factors such as reliability and energy diversity must be considered. While hydro power works well for New Zealand, plans must be put in place for abnormally dry year(s). Further the shift to renewables has created some problems. Transpower, the company which manages the national grid, is

anticipating some load management difficulties and has stated that it might be necessary to turn off appliances at peak times over the winter of 2023. (Sadler, 2023)

In summary the federal government of New Zealand is committed to growing renewable energy generation of all types in and further electrifying the economy. This commitment has been further demonstrated by the decision to spend 140 million New Zealand dollars to convert the largest single emitter in the country to shift from coal-based steel smelting to electrical. (McClure, 2023) ty. This increased electrification will have to be supplied through an increase in renewables that can be brought onboard quickly and are reliable and represent an external factor which significantly effects the regional governments decisions surrounding the Kaimai Scheme

The Kaimai Scheme fits very well within the long-term energy goals of New Zealand, as its citizens strives to achieve net zero emissions by 2050. The Scheme is reliable, even in dry years, as well as renewable, which makes it invaluable within New Zealand's overall energy context.

The Kaimai Scheme and New Zealand Hydropower today

The significant shift in legislation, mirroring the changing perception of water use and the evolving public values, which I have outlined above, have affected the operation of the Kaimai Scheme. On the one hand the Scheme has not been officially affected: the water use provisions have not been meaningfully altered since its inception. Minor changes to conditions have occurred, but these have been the result of surveying errors or a misunderstanding of groundwater levels and have not had notable impact on the operation or water levels in the catchment area (Boyt, 2023). On the other hand, the changing norms have not gone unnoticed by Manawa energy and steps have been taken to address some of the issues, that are now clearly recognized and that were overlooked during the original approval process.

One example is the impact on the region's fish populations. After the Scheme was built, in 1976 fish passes had to be constructed in order to protect the fisheries. In 1992, in response to the

passing of *the Resource Management Act*, a study of the fisheries that were impacted by the damming of the rivers was conducted. In short it was found that “The development of the area for hydro-electric power generation has resulted in the: 1. loss of habitat 2. formation of new habitat 3. formation of barriers to upstream and downstream migration 4. formation of access pathways between catchments. (Donovan, 1992, p. 4)”. Notably though the report shows that the effects on indigenous species was minimal as the naturally-occurring waterfalls on these rivers already represent significant natural barriers. As they stated, “In the case of the Kaimai Hydropower scheme available data indicates that such passes are not required on the existing hydro dams primarily because significant natural barriers to upstream migration are present throughout most of the tributaries.” (Donovan, 1992, p. 6)

While in this instance there is a relatively minimal impact on fish migration throughout New Zealand ecology, fish populations and other environmental impacts are a large focus for hydropower companies and further illustrate how changing values and regulatory norms affects their practices within the cultural ensemble. This point is also evident in the strong emphasis on public relations campaigns showing they are protecting fish and other wildlife. As part of their community webpage, Manawa Energy touts several programs that they fund aimed at ecological protection, including a conservation project to protect indigenous birds and a wilderness trail around some of their other Hydropower schemes. (Manawa Energy , 2023)

This approach to highlighting conservation efforts is found all over the country. Meridian Energy, which manages around 50% of all of the hydropower schemes in the country, similarly touts several bird protection schemes, as well as river restoration, Indigenous collaboration and habitat protection schemes. (Meridian Energy, 2023) The fact these companies are expending considerable resources to be seen as managing resources responsibly demonstrates the importance of these relatively new environmental concerns to New Zealanders and illustrates how material culture and practices are influenced by norm shifts as highlighted in the energy cultures framework.

It is fair to say that the changing norms as reflected by the significant legislative developments have had major impacts in the material culture represented by the existing hydropower infrastructure. Furthermore, the fact there are no new hydropower developments planned by Manawa demonstrates that these changes have also impacted any future plans for new hydropower infrastructure. As mentioned earlier there are plenty of potential sites for new hydropower developments throughout the country and Manawa has considerable expertise in this area. Instead, almost all of the new renewable energy developments planned by Manawa Energy and other major power companies for the near future are in solar and wind energy.

Current Consent Process in the Bay of Plenty

This changing landscape is further underlined by the consenting process laid out in the public information of the Bay of Plenty Regional Council. In great detail the many steps necessary to gain consent for use of natural resources are shown. On their website you can find this extensive diagram explaining the process. The contrast with the original permissions and procedures is stark.



Figure 11: The Consent Process (Bay of Plenty Regional Council, 2023)

It is important to note that Māori concerns must now be addressed explicitly. While not all resource consents require this, any use of water requires an assessment of the potential cultural effects. The Resource Management Act is deferred to, as the regional council explains on its website, noting that the terms used and definitions are taken directly from the legislation, although there is still some room for interpretation. Further proof that water resources are now highly valued is the fact that for all water use a cultural assessment must be done regardless of the planned project. What goes into that is elaborated in pamphlet provided by the regional council, as can be seen below.

What should an Assessment of Cultural Effects contain?

At the very least, an Assessment of Cultural Effects should contain:

- Information on the relevant Māori cultural values, interests and associations with an area and/or natural resource e.g. river or stream.
- The potential effects of the proposed activity on those values and interests.
- Methods to avoid, remedy or mitigate cultural effects, including suggested consent conditions.

An Assessment of Cultural Effects should be developed with the relevant Iwi or Hapu Authority. In some instances, this may involve more than one iwi or hapu authority.

Figure 12: Assessment of Cultural Effects Pamphlet (Bay of Plenty Regional Council , 2023)

Iwi or Hapu refers to the tribes or people. There are many different Iwi spread throughout the Bay of Plenty and in many cases, there are overlaps, therefore multiple groups must be consulted. These groups are nationally recognized and there is a database of current contacts and organizations that must be maintained as part of compliance with the Resource Management Act.

Here we can see how the commitment to including Māori stakeholders as well as assessing the potential risks to for the indigenous plant and marine life, which are the focus of the recent legislative changes in New Zealand are concretely put into practice. In response to the *Resource Management Act* many Iwi have released resource management plans to clarify their positions and beliefs for anyone planning to use resources in their area in advance of any potential projects. The Ngāti Hapu Iwi released such a plan and as their ancestral grounds include the Wairoa River it is of direct relevance to examine their values for the Kaimai Scheme. While generally the demands for sustainable use, water protection and other similar needs align with stated aims of the Regional Council, it is important to note that there is also a distrust of any development projects, in part due

to past mismanagement. This quotation from their resource management plan elaborated on this point:

“Interviewees said that while much of Wairoa is degraded through bad environmental management from pre-RMA (resource management act) times, the degradation is not beyond restoration and coupled with better planning for the undeveloped areas there still remained the opportunity for Wairoa to achieve true sustainable development. Consistently, however, people expressed distrust in local authorities and their willingness to protect the relationship Ngati Kahu whanau have with the environment, especially with the River. Ngati Kahu believe that councils need to better balance the cultural, economical, environmental and social well-beings in respect of any planning. (Te Runanga o Ngati Kahu, 2011, p. 48)”

Mistrust is yet another obstacle, as all stakeholders must believe the others are acting in good faith in order to achieve outcomes that suit everyone implicated. On the other hand, it should be noted that in their management plan they do state that broadly their goals and aims align with the regional council when it comes to emissions and matters of climate change.

In speaking with a consents and planning expert in the Bay of Plenty, Marlene Bosch, this balance of managing environmental impacts and cultural values was reiterated. She noted that a large focus is on environmental impact and that national legislation is used as a tool to guide the process. Further she stated that that any consents regarding water takes are particularly complicated as there are inevitably many stakeholders who are potentially directly affected. This contributes to making these type of consent applications difficult and expensive to undertake in relation to other types of resource consents. Ms. Bosch also highlights how these considerations, in particular concerning indigenous rights, were not in place when the scheme was first built stating “When these schemes were first built there was little or no consideration of the cultural effects, which has since changed and there is greater direction to give effect to the Treaty of Waitangi and to

work with Māori as partners, especially when an activity will adversely affect their cultural values (Bosch, 2023).”

In short, the process for getting consents is transparent and takes into account many stakeholders and ensures their concerns are accounted for. Nevertheless, not all stakeholders are convinced of the process, due to a long history of water use and other rights being granted with less care and less concern. It remains to be seen if this perception will change in the long term. While the process is transparent, the outcomes remain nebulous, especially in regard to water consents, as there are now a myriad of considerations that must be made and stakeholders that must be satisfied. This means any project will have to seriously consider whether it is worth the time and money required to get the consents needed. For project proponents therefore the clear process does not produce predictable results. Therefore, at the moment all stakeholders remain to be convinced that the process can serve their and the community’s interests.

How this works in practice can be seen by examining the example of the re consenting process in Taranaki.

Taranaki Resource Consent Process and Lessons

In the Taranaki region of New Zealand there is another Scheme run by Manawa Energy that has key similarities. The Motukawa and Mangorei power Schemes have been running for over 90 years, in other words also built, before the *Resource Management Act*. Unlike the Kaimai scheme, Manawa energy applied for re consenting in 2020, which allows us to draw on their experience to understand the re consenting in this new legal and social environment. While the Taranaki and Bay of Plenty Regional Councils are separate entities, they fall under the same laws and regulations, which will allow us to use their experience to gain valuable insights. The extensive documentation from their re consenting process illustrates the vast differences in resource management that New

Zealand has undergone. Their experience highlights many of the potential issues that I outlined with respect to the Kaimai Scheme. Furthermore their experience demonstrates that the challenges facing the Kaimai Scheme are not unique to the Bay of Plenty but have far reaching implications.

To begin, an important legal clarification of precedent was brought forward in a memorandum sent to the consenting officer. They stated that.

“Case law confirms that consents granted by a regional council should not be considered as part of the existing environment when those activities are being reconsented. Regional consents are granted for a finite term, and it cannot be assumed they will be renewed when reconsenting. The leading case is the decision of the High Court in Ngāti Rangi Trust, regarding applications to replace existing consents for the Raetihi Hydro-Electric Power Scheme. (Doesburg & Dickson, 2022, p. 1)”

This point is extremely relevant as it noted that in law existing dams, tunnels and other diversion built cannot be grandfathered into the new legislative conditions but instead must be assessed anew on their own merits. This legal matter however is not completely settled, and Manawa Energy has contested this opinion. A second opinion was solicited, which broadly agreed with the original memorandum, but also argued that

“To the extent the Wynn Williams memo proposes or implies an existing environment being a return to a “pre-scheme” or “naturalised”/“pristine” environment, we disagree with this. Approaching the existing environment on such a basis is not required by the case law and would lead to unrealistic and unworkable outcomes, especially for infrastructure/structures of this nature. In the context of the Proposal, including the fact that the Motukawa HEPS has been in operation for 90 years (including the creation of Lake Ratapiko), it is simply not feasible, realistic or indeed helpful to usefully postulate a pre-scheme environment, and attempts to do so are fraught because it would rely on many assumptions and unknowns. To do so would also be contrary to a real-world analysis.” (Chancery Green , 2022)”

Further they stated that “The ‘legacy’ effects of the Scheme resulting from its 90 years of operation are relevant to the existing environment.” (Chancery Green , 2022) This would imply that to some degree, it would be easier for a structure to be allowed to remain than it would be to be built in the first place. More simply put, a structure that would not be allowed to be built under today’s regulations could still be allowed to remain in place and continue to be used. Though clearly this matter has not been definitively settled and a final verdict has yet to be reached.

The extent of the application process is striking. Along with the necessary forms, the energy company has also submitted seven assessment reports concerning hydrology, sediment, environmental effects and other issues. Each of these assessments is extremely detailed and is over 100 pages. Additionally, they submitted a 130-page executive summary outlining the steps that they have taken to satisfy modern regulations. This contrasts extremely with the level of documentation and the financial and human resources required for applications at the time that these projects were built and demonstrates again how much resource use regulations have changed and how changing norms have affected practices within the cultural ensemble.

Reading through the application the implications of the new regulations are revealed in more detail. For example, to manage the impact of aquatic ecology, they suggest measures such as “Additional flow releases in summer in order to maintain the health of the Manganui River” as well as “Enhancement of the existing trap and transfer programme to include wider parts of the Scheme that have the potential to impact on fish migration.” (Trustpower, 2021, p. 4) While these are relatively minor changes it nevertheless shows that there were oversights when first building this Scheme that must now be addressed.

With respect to inclusion of the Māori, we can see how the new rules are implemented. In their application they stated “Trustpower have been engaging with iwi and hapu that are mana whenua or have an interest in the Motukawa HEPS since 2018, in order to establish an understanding of the cultural and historical associations of iwi and hapu with the Scheme (and the

waterbodies it interacts with).” (Trustpower, 2021, p. 48) For at Scheme that has been in operation for over 90 years, it may seem surprising that it has taken this long to collaborate with the local Iwi authorities. On the one hand this demonstrates that the regulations are taken seriously, and that steps are being taken to address local concerns. On the other hand, it shows that without these regulations it seem unlikely this collaboration would happen. Although this consultation and inclusion process is a new hurdle, this is an example of how the process and culture has changed significantly: Today it would seem surprising or unthinkable to not consult and include local Iwi authorities.

Another interesting contrast with the era of construction of these projects is the exponential increase in conditions. As noted earlier, the original document allowing for the use of water for the Kaimai Scheme consisted of a single page with eight conditions, only two of which applied to specifics of the Dam. These conditions were that the dam must be built under the supervision of an engineer and the maximum amount of water that can be diverted to the river. The other conditions simply cited legal formalities, such as the legislation that gave them the authority to allow the building of the dam and the legal notice periods etc.. As part of their consent application Manawa Energy submitted proposed consent conditions that they had drawn up for the Motukawa Scheme: It is an 11-page document with around 70 conditions and sub conditions. These are not the final conditions, which have not yet been determined. But would seems unlikely that the power company applying for consent would propose more conditions than necessary and I would presume that this is the low end of expected conditions for use of water and operation of the scheme. Studying the conditions in detail, we can see the effect of the new regulations and new demands from the regional council. There are conditions under different river and lake levels and other conditions for very specific circumstances such as flood or drought conditions. There are conditions for ensuring that fish will not be affected and in-depth instructions on how to ensure that fish are able to migrate and spawn. There are also specifications on which Iwi to consult on which matters and how to inform the Iwi of any notable potential incidents within the scheme. (Trustpower, 2020) These

conditions illustrate the substantial shift in mindset to attempting to reduce or even eliminate any negative unforeseen consequences of these projects.

The extensive documentation is also evidence of the transformation of the power company and its management. They have needed to change their asset management to meet the demanding requirements of modern New Zealand environmental regulations.

The Taranaki consenting process demonstrated that an old built piece of infrastructure is in the end not treated the same as a new project, to the extent that it is a part of the existing environment. It also shows that the process of giving permission to use freshwater is intensive and requires extensive amounts of documentation, research, and work to be completed, in other words financial and human resources. Further it highlights the many steps required to comply with the regulatory framework. Assessments of the affects on water, the soil, native plants and animals, farmers, indigenous concerns and more all need to be researched and addressed in the planning process.

In the end the application was a success and demonstrated that steps can be taken to retrofit a scheme to meet modern requirements. From ensuring that vegetation on the riverside will be watered even in the event that water levels drop to ensuring that fish are able to adequately pass through the dams and weirs. However, the process would also imply that many steps that can be taken to protect natural resources will not be taken without the implementation of specific regulations, laws and oversight.

These old hydropower schemes are a valuable part of New Zealand's electricity infrastructure in spite of the, in some ways, reckless and inconsiderate ways in which they were originally built. Finally, it is important to note that there are differences between the Kaimai Scheme and those discussed in the Taranaki region. These differences include that some of the water used in the Taranaki scheme is also used downstream as a source of drinking water and that the rivers and

dams have to handle floods in a way that is not required for the Kaimai Scheme. Nonetheless the process transformation applies equally to the Kaimai Scheme.

Kaimai Scheme Benefits

If the Kaimai Scheme did not exist, its electricity would have to come from another source.

What is gained by the operation of the Scheme?

“Electricity generation from the combustion of coal, oil, and gas provides baseload, backup and peaker electricity supply.” (Ministry of Business, Innovation & Employment, 2023) An aspect that has not been discussed in depth is how valuable the Kaimai Scheme is because it provides electricity that would otherwise likely be generated from fossil fuel combustion. Solar and wind has grown significantly in recent years in New Zealand, however an issue with these electricity sources is that they can be intermittent and at peak times or if there is an unexpected demand these sources can be ill equipped to meet demand. It is also fair to conclude that if these hydro schemes did not exist at least a significant amount of electricity would instead be generated through fossil fuels as currently “When a ‘dry year’ occurs, and existing hydropower catchments do not receive enough rainfall, backup is currently provided by fossil fuel generation.” (IEA, 2023)

In 2021 this was laid bare as the conditions were such that coal power plant use peaked burning massive amounts of short-term coal. While alternatives are being researched, they will not be operational for several years at the earliest. (Bond, 2021)

In the following chart from the Ministry of Business, Innovation and Employment, we can see that coal and natural gas make up the overwhelming majority of fossil fuel electricity generation in New Zealand. It also shows the large variance in emissions from fossil fuels. These are mostly due to fluctuations in the availability of renewables in particular as a result of low water levels in reservoirs.

 Ministry of Business, Innovation & Employment									
Electricity generation emissions									
<i>Kilotonnes carbon dioxide equivalent (kt CO₂-e)</i>									
Calendar year quarters									
	Mar 21	Jun 21	Sep 21	Dec 21	Mar 22	Jun 22	Sep 22	Dec 22	
Emissions from electricity generation¹	1,498.07	1,864.33	1,079.48	520.90	1,016.13	1,173.50	654.44	374.70	
Natural gas	480.61	569.59	607.46	379.89	584.08	658.87	488.74	239.28	
Coal	860.81	1,148.63	338.97	9.30	303.40	379.63	27.46	8.98	
Diesel	4.90	13.25	2.75	0.36	2.00	0.57	0.94	1.13	
Fuel oil	-	-	-	-	-	-	-	-	
Geothermal ²	151.72	132.83	130.28	131.33	126.63	134.40	137.28	125.27	
Biogas	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	

Figure 13: (Ministry for Business, Innovation & Employment, 2023)

While it certainly is possible to make up for the lost hydro generation with other renewables, either on their own or in aggregate, it is fair to say that the fallback in New Zealand for replacing hydro electricity generation is currently and was in the past done through fossil fuels. This point makes clear the of the Kaimai Scheme not being in operation or not having been built.

The Kaimai Scheme generates 169 GWh of electricity annually. If in fact this was replaced by coal this would have a significant impact on overall emissions in New Zealand as well incurring damages and negative externalities such as pollution. It is impossible to determine exactly how much CO₂ would be emitted in this case however it is possible to get an idea of the scale of potential emissions.

The United States Energy Information Administration, an independent branch of the United States government, founded in 1977 to provide data to lawmakers as well as the public with accurate information about energy systems in the country and abroad, has compiled information on the emissions for each fuel type. (U.S. Energy Information Administration, 2023) Using this information, we can calculate approximately how much CO₂ would be emitted if the output level of the Kaimai Scheme was instead covered by natural gas or coal. For natural gas they calculate that 52.91 Kilos of CO₂ are generated for every one million BTUs of energy generated. By converting from BTU to GWh it would follow that to generate 169 GWh of electricity, 30 477.64 tons of CO₂ would be

emitted. In New Zealand 80% of coal is lignite, therefore we will be using it as the basis of our calculations. According to the Energy Information Administration, 98.18 Kilos of CO₂ would be generated. Using the same method as above, 56 601.85 tons of CO₂ would be generated if lignite coal was used to replace the Kaimai Scheme. (U.S. Energy Information Administration, 2022)

These numbers are, of course, an approximation, but they allow us to see the importance of the Kaimai Scheme. The numbers from the Energy Information Administration are calculated from averages based on energy production in the United States. Since it is impossible to know for certain how the energy from the Kaimai Scheme would have been generated instead and considering the fact modern fossil fuel power stations are more efficient than those built at the time that the Kaimai Scheme was constructed, it is not possible to exactly calculate how many tons of CO₂ emitted and have been saved by the Scheme. This approximation serves to highlight the value of a reliable Hydro Scheme that has very little variance in energy production and what would need to be done to replace it in a way that replaces not just the capacity but its consistency.

The value of emitting a tonne of CO₂ is also difficult to quantify as there are countless negative externalities that come with emissions. These include the air pollution, the emissions of greenhouse gases as well as other negative impacts.

The total value of emissions is difficult to quantify but one way is through emissions trading programs. In New Zealand a trading program was introduced which works by making every firm buy NZUs which stands for New Zealand emissions units. Each NZU represents one tonne of CO₂ emissions, and these are traded among companies or sold at auction by the New Zealand government. Companies must buy enough NZU to cover their emissions. This is an attempt to have free market dynamics more accurately capture the cost of emissions as well as encourage companies to lower emissions. (Ministry for the Environment, 2023) While this is not a perfect measure, it is an adequate method to approximate the monetary value of emissions. As the New Zealand government sets a minimum cost as well for the NZU auction it illustrates how the government values each tonne

of CO₂ emitted. In December 2022, the most recent auction for which there is public data, you could buy an NZU for \$79NZD. (Ministry for the Environment , 2022) At this cost the emissions to produce 169 GwH would cost approximately \$4.4 million New Zealand dollars per year if done with coal power or approximately \$2.4 million New Zealand dollars per year through natural gas. Another way to put this is the Kaimai Scheme currently saves between \$2.4 million and \$4.4 million New Zealand dollars annually worth of emissions according to the New Zealand carbon market. This represent another significant influence on the cultural ensemble being researched.

Summary

The Kaimai Hydroelectric Power Scheme was built to meet the growing electricity needs of New Zealand at a time of limited oversight and regulation. As a result, there is little documentation of the processes that went into giving the initial consents. Nevertheless, by modern standards it was done in a reckless way with little thought given to long term effects on indigenous plants and fish, as well as ignoring the concerns of the local Iwi and the potential long-term effects of building such a dam for the landscape. We can see how the old material culture clashes with new norms and practices in key ways as modern norms, reflected by the changing laws, such as fish protection and considering Māori cultural needs were not adequately addressed under the old paradigm.

Nonetheless the Kaimai Scheme remains a valuable piece of infrastructure for the Bay of Plenty and New Zealand. It is a consistent and reliable source of electricity for the region and is in fact one of the most dependable Hydro Schemes in New Zealand. While the process should not be prejudged, it would be a shock if the Scheme is not granted new consents, even though the regulatory framework has shifted so drastically. The national government has put directives to local councils to ensure national targets are met and this includes maintaining current renewable electricity infrastructure. As the national policy statement for renewable electricity generation states

“ Even minor reductions in the generation output of existing renewable electricity generation activities can cumulatively have significant adverse effects on national, regional and local renewable electricity generation output.” (Ministry for the Environment , 2011, p. 5)

Looking to recent examples, it is also to be expected that there will be significant alterations to conditions of water use and perhaps some additions to the Scheme will be necessary in order to satisfy all stakeholders, including allowing waterfalls to be accessible to local Iwi again and increasing the protections for fish. With the clearly stated intention of the government to support renewable energy generation, it would seem highly likely that the Kaimai Scheme has a long future.

The significant shift in laws reflects the changing norms and priorities of New Zealanders, which have in turned altered natural resource and hydropower scheme management. Today all hydropower operators in New Zealand highlight the steps that they have taken to protect local ecology and to respect indigenous cultures and practices regarding water use. As the energy cultures framework illustrates changing norms have greatly influenced the material culture and actions taken by New Zealanders, however this is an interactive process. On one hand, the value of the existing infrastructure, in spite of not complying fully with modern norms, has its effects on current practices in the cultural ensemble. In addition, if climate change was not a concern and emissions were not a factor it is likely that the Bay of Plenty Regional Council would not grant the resource consent as the scheme has negative effects on indigenous access to cultural areas as well as some, if potentially small, impacts in indigenous fish species. However, emissions are a great concern to the Government of New Zealand and therefore a peak supply provider such as the Kaimai Scheme cannot be removed without greatly compromising the national emissions goals. Further if ecological and cultural concerns were not a factor, it is likely that hydropower in New Zealand would be even more widespread and there would be no need for any fossil fuel electricity production. This shows how interconnected all of these aspects are within the cultural ensemble. It seems the most likely outcome in the near future will be that the Kaimai Scheme will continue to be allowed to operate

with some alterations of conditions such as allowing minimum flows through some of the rivers to respect the cultural practices of the indigenous population.

Nonetheless, it is was somewhat shocking to find that all the stakeholders with whom I met agreed that it would be extremely unlikely for a scheme like the Kaimai Scheme to be built today.

A Crossroads/Discussion

Over the years New Zealanders have grown more conscious of their environmental impacts. Protecting indigenous culture, plants and animals, promoting sustainable water use and a larger focus on renewable energy all seem broadly compatible with how the Kaimai Scheme operates.

When meeting with stakeholders, however, there was a universal consensus that if the Kaimai Scheme was not in place today it would not be built. Specifically, the question posed was “if the Kaimai Scheme did not exist would it be able to be built today or would someone attempt to build it today?”. While the reasoning wasn’t always the same it was agreed that it would not a project that would be undertaken in today’s New Zealand. Some believe this is due to the increase in costs due to the added regulatory hurdles while others believe some specific regulations make it unlikely it would get permits. Even if it did get consents, it is believed that there would be court cases following up the consent process and lead to further costs and delays as appeals would have to be heard and it could take years before these would be exhausted. (Bosch, 2023)

The consents and planning expert Marlene Bosch noted all of the issues that I have outlined and how they would make it difficult for new hydro projects to be developed. Marlene explained that the National Freshwater Policy has a massive impact on freshwater use rights. It states that the health of the body of water is prioritized over the needs of humans, in this case that need being power. She also notes the national directives to increase sustainable energy generation and points

out that there is currently new legislation in the works that aims to streamline the process for wind and solar power, however, there currently is no such plan to do this for hydropower (Bosch, 2023).

It was then unsurprising when she pointed out that there have been no new hydro projects applied for in the region or in the rest of country in the recent past. Finally, she did note that it is in fact possible to gain consents in today's regulatory framework. As she explained, there is a hierarchy of effects. If there is no way to avoid negative effects, then there must be steps taken to mitigate them and finally if they cannot be mitigated adequately the effects must be offset or compensated for. Though she did argue that a hydro project would likely only be proposed if all other alternatives have been exhausted first (Bosch, 2023).

As Manawa Energy is currently in the process of applying for consents, they were unable to comment on any specifics regarding this process however their lack of investment in hydro schemes in spite of their expertise in the field demonstrates that they do not see hydro schemes as feasible investments at this time.

Nicholas Koro also reiterated that broadly there were no objections to the Schemes existence and that it is absolutely possible for the Kaimai Scheme to exist in a way that satisfies the cultural needs of local Iwi. (Koro, 2023)

We are in a time where new renewable energy is needed and quickly. In many ways this mirrors the demand for new electricity that led to the initial peak of new hydro developments in New Zealand in the mid-20th century. Because of this it might be reasonable to expect that a similar scheme would be an obvious project to complete quickly. Instead, experts and stakeholders were of the opinion that a similar project would not even be considered as there are too many hurdles or potential pitfalls. As discussed earlier there are plenty of areas in New Zealand available for Hydropower schemes and yet in recent years there has been no notable development. It would seem that in the years where the most effort and concern has been put into protecting the environment, ecosystems, culture and biodiversity a project such as the Kaimai Scheme would be a

welcome addition to the electricity generation landscape if it did not exist already. Especially considering that Hydropower has been used for decades and that the technology is well-established, understood and ready in a way that other renewables are not yet. On top of that the Kaimai Scheme specifically has a small ecological footprint.

One of, if not the biggest, threat to indigenous ecosystems, water security and biodiversity is climate change. The New Zealand government recognizes this fact and has laid out plans to lower their emissions to do their part to mitigate the effects of climate change. As previously noted, New Zealand aims to be carbon neutral by 2050 and is therefore seeking reliable renewable electricity generation. The Kaimai Scheme fits this description perfectly. We have a clear need and demand for new renewable energy sources, significant public will to protect the environment both locally, nationally and globally and yet the current resource management systems do not appear to allow for such a scheme to be built.

There are many valid criticisms of Hydro projects and their consequences in New Zealand and worldwide. The national policy statement on renewable electricity generation acknowledges that “renewable electricity generation capacity can have environmental effects that span local, regional and national scales, often with adverse effects manifesting locally and positive effects manifesting nationally (Ministry for the Environment , 2011, p. 3).” The positive effects are clear, electricity generation without greenhouse gas emissions or the risk of pollution that would come from other electricity sources. The negative effects vary, but include impacts outlined here, such as negative effects on indigenous plants and animals and can also include the displacement of people among other risks and cultural concerns. Other examples of the negative effects of hydro include the creation of lakes behind the dams displacing people and destroying the natural environment. The concern about raising the lake levels in Manapouri was a pivotal moment in New Zealand’s environmental history and shows that strong public opposition to a project can lead to changes in outcome as well as the strong demand for environmental protections.

But these issues of displacement do not apply to the Kaimai Scheme, where no people were displaced, or large areas flooded. Due to the nature of the existing rivers and waterfalls, it was already difficult for fish to pass and therefore there has arguably been minimal effect on indigenous fish species. Further through dialogue with local Iwi it is clear that there would be ways to operate this scheme in collaboration with the indigenous population. In many ways it is an ideal scheme as it removes millions of dollars of emissions from the environment, while also being low impact and reliable in dry years.

The threat of potential negative consequences, coupled with an understandable general distrust of the government, which has been displayed by local Iwi, explains why there could be some opposition or additional roadblocks involved when for hydro scheme developers. However, the complete stop to hydropower development could indicate that the regulatory hurdles are counterproductive, particularly in light of the climate crisis. Instead, I would argue there is another important element to the dynamic.

Privatization or Public Investment in Infrastructure

There has long been debates about the most efficient methods to manage markets and resources. This debate has taken many forms and remains contentious. The idea that private companies are more suited to managing and providing public goods things such as electricity or water developed in the 1960s through Milton Friedman but did not gain mainstream appeal until the 1980s, symbolized by the elections of leaders such as Margaret Thatcher in the United Kingdom and Ronald Reagan in the United States. The broad idea put forward by Friedman was that the government operates as a monopoly and as such microeconomic theory would indicate that more efficient outcomes could be achieved through competition. This became popularly known as “privatization” and generally refers to a situation where a service or asset built or managed by government institutions is sold to for profit companies to manage. (Henig, 1990) The theory is that

the efficiencies of the private management offset the increased costs represented by profits, which a public company would reinvest in operations.

This theory does not always reflect reality as there are countless instances of private companies being unwilling or unable to properly manage public resources. For example, a study of all the water supply companies in France found that on average the public ones were more efficient (Le Lannier & Porcher, 2014).

Nevertheless, privatization spread throughout the world in a way that has been described as revolutionary (Henig, 1990, p. 649). These ideas are reflected in how electricity generation management shifted in New Zealand from the 1980s, just after the Kaimai Scheme was built, to the present. Up until the mid-1980s local Electricity Supply Authorities managed electricity and generation. In the case of the Kaimai Scheme it was the Tauranga Joint Generation Committee. This was a statutory monopoly and there was heavy political decision making in investments and all electrical generation matters. By 1993, with the introduction of the *Electricity Act*, these monopolies were removed and the electricity market was deregulated in the anticipation that this competition would lead to more efficient management and lower prices. By 1995 a wholesale electricity market was announced by the government along with the breakup and sale of more publicly owned generation and distribution assets. Up until these reforms government approval was needed to sign off on wholesale prices of electricity. (Ministry for Business Innovation & employment , 2015)

This history is reflected in Manawa Energy, which currently operates the Kaimai Scheme. The Tauranga Electric Board was formed in 1923 and managed all electricity generation in the region, including building and managing the Kaimai Scheme. In 1994 as a consequence of the reforms it was renamed as Trustpower and was listed on the New Zealand Stock Market. In the following years Trustpower would merge with Tauranga Electricity and purchase more hydropower assets from the government. Over the years there have been various mergers, acquisitions and sales, the final being in May 2022, when the market retail side of the business was sold and the company was renamed

Manawa Energy. Manawa Energy is the largest independent electricity generator in New Zealand. (Manawa Energy , 2022) There are still three state owned power companies in New Zealand with which Manawa Energy competes: Genesis Energy, Mercury and Meridian Energy, where the government of New Zealand owns 51% of each company's shares.

Today Manawa energy exists as a for profit company traded on the New Zealand Stock Exchange. While clearly the Kaimai Scheme is a valuable asset as it would not choose to operate otherwise, it is also clear that the Kaimai Scheme as an investment is would not today be feasible or sufficiently profitable regardless of the obvious benefits to the public.

While privatization was not unique to New Zealand, Deputy Prime Minister Jim Anderton remarked in a speech to the Commonwealth Business Forum that "As far as I am aware, no other country in the eighties and nineties deregulated and privatised as far or as fast as New Zealand attempted." (Anderton, 2001) This was a trend in many sectors of the New Zealand economy, not just electricity markets and includes other key infrastructure, such as banking, rail and telecommunications. Anderton goes on to list several examples of how this push for privatisation has had negative consequences for the people of New Zealand. Power outages and appeals to use less power, some of the highest telecommunication prices in the world and many rural communities not having access to banking due to private banks not seeing these services as profitable. As a result, the government has had to, at times, reintroduce itself into an industry to ensure good outcomes for its citizens. Furthermore, Anderton pointed out that public services such as NZ Post can be profitable, while offering service at a lower cost than private competitors. It would be fair to say that the rush to privatise New Zealand's public infrastructure was misguided and that experience should be taken into account when analysing how decisions are made today.

There are many ways to value infrastructure beyond the need for profit. Even if more expensive, a power source that does not pollute would likely be more valuable to the community. The problem with private ownership of utilities is that the owners only benefit through profit and

are often incentivized to disregard potential negative effects. The company bears all the costs but none of the benefits of responsible but less profitable practices, whereas the public bears all the negative consequences of cost cutting measures without any of the benefits other than potentially cheaper electricity costs. Though this is not guaranteed as there is also a history of utilities around the globe functionally being monopolies and using their monopoly position to price gouge (Johnston, 2014). This dynamic is one of the reasons that throughout the world there are many instances of private companies managing infrastructure irresponsibly in the name of profit.

An example of irresponsible management, as a result of cost-cutting by to attempting to a for profit company, is how the utility company Pacific Gas and Electric started the 2018 “Camp Fire” in California which destroyed almost 20 000 structures and killed more than 80 people. This fire was started after a power line fell which had not been maintained in years. After court hearings the company was found to have acted irresponsibly and found at fault for the fire. (Cox, 2020) To further highlight this dynamic a study of wildfire risks from the Wharton school of Business at the University of Pennsylvania states, “it is essential that utilities bear some wildfire costs in order to have an incentive to undertake cost-effective precautions under their control.” (Kousky, Greig, Lingle, & Kunreuther, 2018) This highlights the reality that power companies will often only take actions if there is a financial incentive to do so. This is not to suggest that Manawa Energy has been irresponsible in its management of the Kaimai Scheme, rather simply to highlight the incentives at play and why a scheme that would be beneficial to the public will not be developed by a company, due to the financial risks involved.

It is important to note that while a large percentage of power companies in New Zealand are “state owned” they are for profit entities in themselves and operate to make a profit. The only difference between the state-owned companies and others in the market is that the government owns 51% of the shares. The government does not manage day-to-day operations or influence investment decisions directly, and therefore in practice these companies operate much like a non-

state-owned company would. They are equally beholden to shareholders, who are expecting a return on their investment. In other words, they cannot take decisions that would benefit the public overall but have a negative impact on their shareholders. To summarize, in effect the New Zealand energy market consists of for-profit generators, and it would seem that the market consensus is that hydropower in New Zealand is not worth the investment. Within the energy cultures framework, we can see how this for-profit motive exerts pressure on the material culture of existing hydropower infrastructure as well as on the practices and decisions of those within the cultural ensemble.

Now that there is an understanding of the dynamics within the energy cultures framework which has led to this outcome, we can start to discuss what motivators could be shifted to achieve a more desirable outcome. There is an argument to make that if the Kaimai Scheme did not exist building it would be in the best interest of the community, however clearly the current state of power generation in New Zealand is not designed to achieve this desired outcome. An obvious suggestion would be that the government steps in and finances, builds and operates the scheme. This is how it originally came to be therefore it stands to reason it is an effective solution. In some parts of the world other methods of energy generation are being considered such as community energy projects. As mentioned previously many of the negatives from power generation projects are often localized while the benefits are broad. For example, in the Kaimai Scheme everyone in the Bay of Plenty benefits from the renewable energy generated while members of the local Iwi who no longer have access to their sacred waterfalls suffer the downsides. A study in Germany found that residents very swiftly built windfarms in their area when they were able to invest and have a direct financial stake in the electricity generated. (Li, Birmele, Schaich, & Konold, 2013) It is worth investigating if a financial stake of those impacted by new hydro development in New Zealand would be enough to make these projects more viable. While this would be an undoubtedly positive outcome it is still rooted in the idea that energy projects only have value when profit can be made. As is recognized in the *Resource Management Act*, the natural world has intrinsic value culturally and aesthetically. In order to protect the valuable natural world from climate change energy projects

must be considered that are not profitable. Further research into how actions within the cultural ensemble can be shifted by changing incentives are necessary but are beyond the scope of this project.

Broader Application

This case study is focused on the dynamics and developments within the regional context of the Bay of Plenty and national context of New Zealand, however the issues and context discussed have broader applicability. Many of the patterns and developments recognized here can be found across the globe. Firstly, climate change is a global problem and while not all nations will bear the same level of consequences if it goes unchecked, almost all nations have committed to lowering their carbon emissions as swiftly as reasonably possible. Thus, the need to find more renewable energy sources is a need shared by most governments.

Further the marginalization and subjugation of Indigenous people and the ignoring of their concerns and expertise is unfortunately not unique to New Zealand. The friction between Indigenous populations in their native lands and the building of infrastructure that will impact rivers of cultural and historical importance is also prevalent in Canada, Australia and other countries. A study of an environmental hearing in Manitoba, Canada regarding the construction of a Dam, found that the First Nations Communities had many of the same concerns as the Iwi in the Bay of Plenty (Buckland & O'Gorman, 2017). Similarly, research done in the Saskatchewan River Delta demonstrated how after the building of Dams in the 1960s on the Saskatchewan River caused ecological damage and that using Indigenous knowledge as well as collaborating with First Nations is invaluable for improving sustainable outcomes. (Abu, Reed, & Jardine, 2020) In North Australia research noted similar concerns (Jackson & Barber, 2016), which further shows how the lessons learnt from the Kaimai Scheme could be applied more broadly,

Finally, as was noted previously when discussing the privatization of public assets in New Zealand, there were many examples from across the world illustrating that, again, this issue is not unique to New Zealand.

In summary, the climate crisis, privatization of public utilities and conflicts between settlers and Indigenous populations are all global phenomena.

Conclusion

This research project was designed to elucidate the informal and formal pressures shaping licensing and resource management decisions in New Zealand today and the consequences of these pressures through a case study of the Kaimai Scheme. This is important as effective resource management is a pressing issue in light of the climate crisis - a clear and present danger to ecosystems, people, cultures, and infrastructure all over the world. New Zealand is no exception and has pledged to do its part, aiming to have net zero emissions by 2050. Net zero can only be achieved by both increasing the electrification of the economy and expanding the production of electricity through renewable sources such as hydro, solar, geothermal or wind.

The record clearly demonstrates that the Kaimai Scheme was built before concerns about protecting ecology, climate change, indigenous concerns, or carbon emissions were taken seriously by decision makers. The project was built because it was a cheap and effective way to provide power for the growing city of Tauranga. Nevertheless, it was and is an incredibly valuable piece of infrastructure, which should continue to provide value into the future.

If the Kaimai Scheme did not exist, you would expect that a scheme that could provide hydropower with very little variance, even in dry years, had a small ecological footprint and could produce enough to cover millions of dollars' worth of carbon emissions would be enthusiastically

supported by all major stakeholders. However, this is not the case. The regional council acknowledges that the consenting process now represents a major obstacle and the power company in charge of operating the scheme is not convinced that the consenting process would result in a favorable outcome. Even if consents were obtained, the costs associated with gaining initial consent and then complying with the current regulations would make such a project financially unfeasible in the current environment.

It is somewhat surprising that after years of efforts to protect the environment, it is now functionally impossible to build a hydropower scheme that is generally accepted to be an asset to the region as well as eliminating thousands of tons of carbon emissions that would be needed to provide the power through other means.

To be clear, I am not suggesting that efforts to protect ecology and respect Indigenous cultural values are not worthwhile or antithetical to fighting climate change. It should be accepted that in order to adequately protect public goods such as natural water resources, extra costs will be involved to ensure projects are carried out responsibly. It should be noted that is not impossible to gain consent for such a project in spite of the added regulations. It cannot be argued that removing environmental regulations or other oversight would be beneficial in the current paradigm, particularly if one considers the history of private companies acting irresponsibly with public resources and the long history of Indigenous exploitation.

As it seems power companies are not willing to pay the higher consenting costs across New Zealand, it would make sense for the government to step in and again fund the development and operation of such schemes. The public has made it clear that they want their natural resources protected and there is still a need for reliable renewable energy. Green power schemes funded in this way could be the step needed to ensure electrification in New Zealand is carried out in a manner that is ecologically low impact, culturally sensitive and adequately funded. In addition, there are sufficient potential hydropower sources in New Zealand that would be able to cover all of New

Zealand's electricity needs. However due to the interplay of conflicting pressures in the cultural ensemble, the undesirable outcome of less renewable energy would appear today to be New Zealand's inevitable fate. For this to change a power generation project should not be seen as an opportunity to make profit but instead as a public service to be run in the best interest of the community.

It must be noted that public management does not ensure that projects will be managed responsibly. The obvious example being the reckless process by which the Kaimai Scheme itself was consented to and built.

Put simply, today there is significantly more informal and formal pressure to ensure that the environment and ecology are protected when undertaking a project involving natural resources than there was in the 1970s, when the Kaimai Scheme was built. The conflicting pressures within the cultural ensemble caused have led to a surprising and I would argue, undesirable outcome. The rise of environmental regulations along with the profit motive of private energy companies has overridden the national need and demand for increased renewable energy generation which could be covered by hydropower. On the one hand there are laws, regulations and stakeholders who are pushing for strong environmental protections. On the other hand, we have global and national pressures to lower emissions in order to protect the environment from climate change. Therefore, one might expect that New Zealand would be looking to expand its hydroelectric portfolio, especially in favor of a scheme that is consistent even in dry years and has a small ecological footprint. However, for-profit power companies whose primary incentive is to earn money are unwilling or unable to meet this demand. As a result power companies avoid hydro schemes as too risky. Paradoxically, even in the face of a climate emergency the country of New Zealand is not fully taking advantage of renewable energy sources that it could access. The energy cultures framework illustrates well how these outcomes are and have been shaped by the cultural ensemble and external factors. With this as a basis further research should be conducted to better understand how

these incentives can be shifted to change this undesirable outcome for the future. Publicly funded and managed hydro schemes or community led and owned projects are worth further consideration as vehicles for changing the current paradigm to support the energy New Zealand requires.

Bibliography

- Abu, R., Reed, M. G., & Jardine, T. D. (2020). Using two-eyed seeing to bridge Western science and Indigenous knowledge systems and understand long-term change in the Saskatchewan River Delta, Canada. *International Journal of Water Resources Development*, 757-776.
- Anderton, J. (2001, October). *The lessons of privatisation*. Retrieved from beehive.govt.nz: <https://www.beehive.govt.nz/speech/lessons-privatisation>
- Bay of Plenty Catchment Commission. (1970, August 23). *Right in Respect of Natural Water*. Retrieved from Bay of Plenty Regional Council Archives
- Bay of Plenty Regional Council . (2023, May 20). *Assessment of Cultural Effects*. Retrieved from cdn.boprc.govt.nz: <https://cdn.boprc.govt.nz/media/747255/4310-assessment-of-cultural-effects-a4-information-sheet-web-use-only.pdf>
- Bay of Plenty Regional Council . (2023, June 11). *The consent process*. Retrieved from boprc.govt.nz: <https://www.boprc.govt.nz/environment/resource-consents/the-consent-process>
- Bay of Plenty Regional Council. (2023, May). *Treaty Toolkit*. Retrieved from boprc.govt.nz: <https://www.boprc.govt.nz/your-council/working-with-iwi/treaty-toolkit>
- Bond, J. (2021, June 11). *New Zealand's use of coal for electricity generation surges*. Retrieved from rnz.co.nz: <https://www.rnz.co.nz/news/national/444472/new-zealand-s-use-of-coal-for-electricity-generation-surges>
- Bosch, M. (2023, June 3). *Personal Communication*. Retrieved from Email Communication
- Boyt, E. (2023 , May 15). Personal Communication. *Operations Center, Team Leader*. . Manawa Energy.
- Buckland, J., & O'Gorman, M. (2017). The Keeyask hydro dam plan in northern Canada: a model for inclusive indigenous development? *Canadian Journal of Development Studies*, 72-90.
- Chancery Green . (2022, October 27). *Motukawa HEPS replacement consents: existing environment*. Retrieved from trc.govt.nz: <https://www.trc.govt.nz/assets/Documents/Environment/Consent-applications/Manawa-Energy-Ltd/Motukawa-Hydroelectric-Power-Scheme/Manawa-Energy-Existing-Environment-legal-opinion-response.PDF>
- Cox, K. (2020, June 18). *PG&E pleads guilty to manslaughter: "Our equipment started the fire."*. Retrieved from arstechnica.com: <https://arstechnica.com/tech-policy/2020/06/utility-pleads-guilty-to-84-counts-of-manslaughter-in-california-fire/>
- Doesburg, M., & Dickson, K. (2022, August 24). *MEMORANDUM: MOTUKAWA HYDROELECTRIC POWER SCHEME – EXISTING ENVIRONMENT ON REPLACEMENT RESOURCE CONSENT*. Retrieved from trc.govt.nz: <https://www.trc.govt.nz/assets/Documents/Environment/Consent-applications/Manawa-Energy-Ltd/Motukawa-Hydroelectric-Power-Scheme/Motukawa-HEPS-Existing-Environment-Legal-Advice-Obtained-by-TRC-.PDF>
- Donovan, D. W. (1992). *KAIMAI FISHERY*. Tauranga: Kaimai Hydropower.
- Henig, J. R. (1990). Privatization in the United States: Theory and Practice. *Oxford University Press*, 649-670.

- IEA. (2022, October 26). *Average CO2 intensity of power generation from coal power plants, 2000-2020*. Retrieved from [iea.org: https://www.iea.org/data-and-statistics/charts/average-co2-intensity-of-power-generation-from-coal-power-plants-2000-2020](https://www.iea.org/data-and-statistics/charts/average-co2-intensity-of-power-generation-from-coal-power-plants-2000-2020)
- IEA. (2023). *New Zealand 2023*. Retrieved from [iea.org: https://www.iea.org/reports/new-zealand-2023](https://www.iea.org/reports/new-zealand-2023)
- Jackson, S., & Barber, M. (2016). Historical and contemporary waterscapes of North Australia: Indigenous attitudes to dams and water diversions. *Water History*, 385-404.
- Johnston, D. C. (2014). Regulators let utilities gouge customers. *AMASS*.
- Khan, I. (2020). Impacts of energy decentralization viewed through the lens of the energy cultures framework: Solar home systems in the developing economies. *Renewable and Sustainable Energy Reviews*.
- Klaniecki, K., Duse, I. A., Lutz, L. M., Leventon, J., & Abson, D. J. (2020). Applying the energy cultures framework to understand energy systems in the context of rural sustainability transformation. *Energy Policy*.
- Koro, N. (2023, June 5). *Personal Communication*. Retrieved from Email Records
- Kousky, C., Greig, K., Lingle, B., & Kunreuther, H. (2018). WILDFIRE COSTS IN CALIFORNIA: THE ROLE OF ELECTRIC UTILITIES. *Wharton, University of Pennsylvania. Risk Management and Decision Processing Center*.
- Le Lannier, A., & Porcher, S. (2014). Efficiency in the public and private French water utilities: prospects for benchmarking. *Environmental and Natural Resource Economics Policy and Management*, 556-572.
- Li, L. W., Birmele, J., Schaich, H., & Konold, W. (2013). Transitioning to community-owned renewable energy: Lessons from Germany. *Procedia Environmental Sciences*, 719-728.
- Lilley, P. (2022). *Kaimai Scheme Operation*. Tauranga: Manawa Power.
- Manawa Energy . (2022). *Key Investor Information*. Retrieved from [manawaenergy.co.nz: https://www.manawaenergy.co.nz/key-investor-information](https://www.manawaenergy.co.nz/key-investor-information)
- Manawa Energy . (2023, June 11). *Our Communities*. Retrieved from [manawaenergy.co.nz: https://www.manawaenergy.co.nz/community](https://www.manawaenergy.co.nz/community)
- Manawa Energy. (2023, May 17). *Kaimai Power Scheme*. Retrieved from [manawaenergy.com: https://www.manawaenergy.co.nz/kaimai-power-scheme](https://www.manawaenergy.co.nz/kaimai-power-scheme)
- McClure, T. (2023, May 22). *The Guardian*. Retrieved from [theguardian.com: https://www.theguardian.com/world/2023/may/22/new-zealand-announces-its-biggest-emissions-reduction-project-in-history](https://www.theguardian.com/world/2023/may/22/new-zealand-announces-its-biggest-emissions-reduction-project-in-history)
- Meridian Energy. (2023, June 7). *Communities and partnerships*. Retrieved from [meridianenergy.co.nz: https://www.meridianenergy.co.nz/community-support](https://www.meridianenergy.co.nz/community-support)
- Ministry for Business Innovation & employment . (2015, August). *CHRONOLOGY OF NEW ZEALAND ELECTRICITY REFORM*. Retrieved from [mbie.govt.nz: https://www.mbie.govt.nz/assets/2ba6419674/chronology-of-nz-electricity-reform.pdf](https://www.mbie.govt.nz/assets/2ba6419674/chronology-of-nz-electricity-reform.pdf)

- Ministry for Business, Innovation & Employment. (2023, March 9). *New Zealand energy sector greenhouse gas emissions*. Retrieved from [mbie.govt.nz: https://www.mbie.govt.nz/building-and-energy/energy-and-natural-resources/energy-statistics-and-modelling/energy-statistics/new-zealand-energy-sector-greenhouse-gas-emissions/](https://www.mbie.govt.nz/building-and-energy/energy-and-natural-resources/energy-statistics-and-modelling/energy-statistics/new-zealand-energy-sector-greenhouse-gas-emissions/)
- Ministry for Business, Innovation and Employment . (2022, August 18). Retrieved from [mbie.govt.nz: https://www.mbie.govt.nz/building-and-energy/energy-and-natural-resources/energy-statistics-and-modelling/energy-statistics/renewables-statistics/](https://www.mbie.govt.nz/building-and-energy/energy-and-natural-resources/energy-statistics-and-modelling/energy-statistics/renewables-statistics/)
- Ministry for Primary Industries . (2020, September). *Te Mana o te Wai factsheet*. Retrieved from [environment.govt.nz : https://environment.govt.nz/assets/Publications/Files/essential-freshwater-te-mana-o-te-wai-factsheet.pdf](https://environment.govt.nz/assets/Publications/Files/essential-freshwater-te-mana-o-te-wai-factsheet.pdf)
- Ministry for the Environment . (2011). *National policy statement for renewable electricity generation*. Retrieved from [environment.govt.nz: https://environment.govt.nz/acts-and-regulations/national-policy-statements/national-policy-statement-for-renewable-electricity-generation/](https://environment.govt.nz/acts-and-regulations/national-policy-statements/national-policy-statement-for-renewable-electricity-generation/)
- Ministry for the Environment . (2022, December). *December 2022 Auction Results*. Retrieved from [etsauctions.govt.nz: https://www.etsauctions.govt.nz/public/auction_noticeboard/30](https://www.etsauctions.govt.nz/public/auction_noticeboard/30)
- Ministry for the Environment . (2023, June 5). *About the New Zealand Emissions Trading Scheme*. Retrieved from [environment.govt.nz: https://environment.govt.nz/what-government-is-doing/areas-of-work/climate-change/ets/about-nz-ets/](https://environment.govt.nz/what-government-is-doing/areas-of-work/climate-change/ets/about-nz-ets/)
- Ministry of Business, Innovation & Employment. (2023, March 9). *Electricity statistics*. Retrieved from [mbie.govt.nz: https://www.mbie.govt.nz/building-and-energy/energy-and-natural-resources/energy-statistics-and-modelling/energy-statistics/electricity-statistics/](https://www.mbie.govt.nz/building-and-energy/energy-and-natural-resources/energy-statistics-and-modelling/energy-statistics/electricity-statistics/)
- Moewaka Barnes, H., & McCreanor, T. (2019). Colonisation, hauora and whenua in Aotearoa. *Journal of the Royal Society of New Zealand* , 19-33.
- New Zealand Government . (2022). *Towards a productive, sustainable*. Wellington: Ministry for Environment .
- Orange, C. (1987). *The Treaty of Waitangi*. Wellington: Bridget Williams Books .
- Parliamentary Counsel Office. (1967, November 24). *New Zealand Legal Information Institute*. Retrieved from <http://www.nzlii.org/>: http://www.nzlii.org/nz/legis/hist_act/wasca19671967n135320/
- Parliamentary Counsel Office. (1987). *Conservation Act 1987*. Retrieved from [legislation.govt.nz: https://www.legislation.govt.nz/act/public/1987/0065/latest/DLM103610.html](https://www.legislation.govt.nz/act/public/1987/0065/latest/DLM103610.html)
- Parliamentary Counsel Office. (1991). *Resource Management Act 1991*. Retrieved from [legislation.govt.nz: https://legislation.govt.nz/act/public/1991/0069/latest/DLM230265.html](https://legislation.govt.nz/act/public/1991/0069/latest/DLM230265.html)
- Perry, N. (2022, August 16). *Whanganui River's personhood status offers hope to Māori*. Retrieved from [New Zealand Herald: https://www.nzherald.co.nz/nz/whanganui-rivers-personhood-status-offers-hope-to-maori/Y743E36CFEOXQGWZE7W6O2UPDI/](https://www.nzherald.co.nz/nz/whanganui-rivers-personhood-status-offers-hope-to-maori/Y743E36CFEOXQGWZE7W6O2UPDI/)

- Sadler, R. (2023, May 5). *Newshub*. Retrieved from Newshub.co.nz:
<https://www.newshub.co.nz/home/new-zealand/2023/05/transpower-warns-of-potential-tight-power-supply-as-new-zealand-heads-into-winter.html>
- Smith, M. (2022). Culture Shock: the legacy of the 1960s power generation schemes in Aotearoa New Zealand. *Architectural History Aotearoa*, 61-82.
- Stephenson, J. (2023). *Culture and Sustainability: Exploring Stability and Transformation with the Cultures Framework*. Dunedin: palgrave macmillan.
- Stephenson, J., Barton, B., Carrington, G., Doering, A., Ford, R., Hopkins, D., . . . Wooliscroft, B. (2015). The energy cultures framework: Exploring the role of norms, practices and material culture in shaping energy behaviour in New Zealand. *Energy Research & Social Science*, 117-123.
- Stephenson, J., Barton, B., Carrington, G., Gnoth, D., Lawson, R., & Thorsnes, P. (2010). Energy cultures: A framework for understanding energy behaviours. *Energy Policy*, 6120-6129.
- Te Runanga o Ngati Kahu. (2011). *Ngati Kahu Hapu Environmental Management Plan 2011*. Retrieved from boprc.govt.nz:
<https://atlas.boprc.govt.nz/api/v1/edms/document/A2773707/content>
- Towns, D. R., Daugherty, C. H., Broome, K., Timmins, S., & Clout, M. (2019). The thirty-year conservation revolution in New Zealand: an introduction. *Journal of the Royal Society of New Zealand*, 243-258.
- Trustpower. (2020, April 4). *PROPOSED CONSENT CONDITIONS FOR THE MOTUKAWA HEPS*. Retrieved from trc.govt.nz:
<https://www.trc.govt.nz/assets/Documents/Environment/Consent-applications/Manawa-Energy-Ltd/Motukawa-Hydroelectric-Power-Scheme/Application-attachment-Proposed-Conditions-Clean-version-x-14-Consents-Manawa-Energy-14-February-2023-REVISED.PDF>
- Trustpower. (2021, November 26). *MOTUKAWA HYDRO-ELECTRIC POWER SCHEME: Applications for Resource Consent and Assessment of Environmental Effects*. Retrieved from trc.govt.nz:
<https://www.trc.govt.nz/assets/Documents/Environment/Consent-applications/Manawa-Energy-Ltd/Motukawa-Hydroelectric-Power-Scheme/Application-AEE-Clean-Version-x14-Consents-Manawa-Energy-14-February-2023-REVISED.PDF>
- U.S. Energy Information Administration. (2023, June 4). *Energy conversion calculators*. Retrieved from eia.gov: <https://www.eia.gov/energyexplained/units-and-calculators/energy-conversion-calculators.php>
- U.S. Energy Information Administration. (2022, October 5). *Carbon Dioxide Emissions Coefficients*. Retrieved from eia.gov: https://www.eia.gov/environment/emissions/co2_vol_mass.php