POLITECNICO
MILANO 1863

New Zealand

Finding Alternative Energy Sources
for Māori Families

Design Methods
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1. BRIEF

In 2022, with the rise of energy prices, clear societal cleavages are being reinforced. It is not surprising to state that there is an indirect relationship between centralization and energy poverty. The most affected areas are usually rural or peripheral; centralized systems cannot always guarantee fair pricing, extensive infrastructure, and continuous service. In addition to a territorial disconnection, there is often a cultural disconnection. Ethnic groups represented as minorities tend to suffer the most from the effects of energy poverty because they live in areas disconnected from large cities. They also tend to have a lower level of education and, therefore, lower incomes. Having been asked to work on "Providing alternative energies to disconnected communities", we decided to focus on one of the most disconnected communities in New Zealand: the Māori.

The choice of this target group has been motivated by many factors, including New Zealand's colonization by the British in the 19th century. This event led to a massive exodus of the population into remote areas of the country, disconnecting them physically and culturally from the overall grid.

The Native Lands Act 1865 and the Native Land Court are early key mechanisms for converting traditional communal landholdings into individual titles, which facilitated widespread purchase and acquisition of Māori land by Pākehā (white New Zealander) and the Crown (New Zealand History, 2021). This resulted in 80% of the total Māori population having to leave their homeland for other cities (Derby, 2011).

In 2018, Māori people accounted for 16.5% of New Zealand's total population. 84% of those who do not have access to electricity live in rural areas. In general, indigenous peoples make up one-third of the extremely poor rural populations in rural areas (United Nations, 2017). 52.9% of Māori live in the Gisborne region (North Island), and in 2019, households in this area earned an average of between 5 and 10% less than the average median income. Ironically, it also turns out that energy prices in this region are 13% higher than average national prices due to the diffusely populated area and low competition between energy retailers. This allows the few companies operating there to bump up their prices, thus putting families living in these areas more at risk. In 2021, over 18% of Māori children lived in households with less than 50% of the median income before housing costs; meanwhile, 20.2% experienced material hardship (Stats NZ, 2022). In light of this, we chose to address the following issue:

How can we provide adequate and sufficient energy access to Māori families living in rural areas of New Zealand, thus allowing them to heat their water and space through alternative energies?

In order to find solutions to this brief, we created a list of research questions aimed at helping us to get a better understanding of the topic. To decide which issues to focus on, we attempted to define the fundamental themes and formulate clear, precise, and sufficiently well-defined questions to guide our preliminary research. In addition to more general questions aimed at better identifying the Māori community's history, culture and values, we have identified six main questions accompanied by more specific sub-questions to better direct us during the primary and secondary research phases.

1. **How do Māori manage their time? How much time do they spend at home?**
   This first question seeks to shed more light on our target group's household habits. By better understanding their customs, we can get a clearer overview of Māori's energy consumption patterns and abstract ourselves from our personal biases potentially caused by cultural differences.

2. **What kind of energy are Māori using? How?**
   This second question aims to help us better understand state of the art regarding current energy supplies and consumption within Māori families. The objective is to find out the type of energy used, why they use it and how it is distributed within individual households.

3. **How much electricity do Māori typically spend? How much energy do they really need?**
   With this question, we want to acknowledge quantitatively how much energy Māori people use daily and how much energy they would need to get out of energy poverty.

4. **How do they manage their energy?**
   Here, we hope to better understand how energy is used in each household and which energy-related activities Māori prioritize.

5. **What are the things they cannot do due to lack of energy? What would they like to do with more energy?**
   We want to find out what energy poverty actually means for this community by asking this question. We aim to learn which activities these people must forgo and why they choose to do so. It would also be very insightful to learn what they would do if they had more energy at their disposal.

6. **What are organizations doing to tackle these issues? What are the social resources they're using now? How do they access those resources?**
   The last question concerns organizations or policies that deal with energy poverty in rural Māori communities. We want to understand in detail if they exist and, if so, what resources they specifically deal with and who makes them available.

2. ETHNOGRAPHIC RESEARCH

2.1. The Māori, a Disconnected Ethnicity

In 2019, an Interim Climate Change Committee review found that Māori households spend more on electricity than other households (Stuff, 2021). According to the data, 100 000 *whānau* (extended families) lived in energy hardship (Ministry of Business, Innovation and Employment, 2021a). They are disconnected in several ways:

1. **Poor quality of energy distribution infrastructure:** Māori households in rural areas tend to live closer to energy extraction sites. However, they have limited access to energy due to poor distribution services, owing to their low population density and low density of power plant distribution.
2. **The lack of local energy infrastructure** has been identified as a constraint on Māori business development in many rural areas and a contributing factor to the inefficient use of energy resources and the general poor health of these communities.
3. **Poorly insulated houses:** *whānau* (families) struggling to make ends meet are a well-known challenge in New Zealand. The 2018 New Zealand Census reported that Māori and Pasifika were more likely to live in housing with mould and dampness than other ethnicities (Radio New Zealand, 2020).
4. **Their lower average income of 1020 NZD** (Ministry of Business, Innovation and Employment, 2021b) renders them more vulnerable to rising electricity prices in the future (as previously mentioned in the brief).

2.2 Primary Energy Source of the Māori: Geothermal & its Distribution

Geothermal energy is the first energy source used by the Māori. They were among the first to use this resource for medicinal, social, culinary, political, and economic purposes (Bargh, 2012). Geothermal resources continue to provide hot water for cooking, preserving, healing, ceremonial use, and bathing (Waikato Regional Council, 2022).

Despite this fact, Māori-inhabited rural areas have extremely low daily energy consumption. This is primarily due to the distribution of the country's energy supplies. According to the Electricity Authority (2018), the nation's geothermal energy sources are primarily concentrated in the North Island around the Gisborne and Northland regions. These regions also happen to be two of the places most populated by Māori (along with central areas of the North Island). However, in terms of energy supply, these two regions are distinguished by poor energy distribution service, owing to their low population density and low density of power plant distribution.

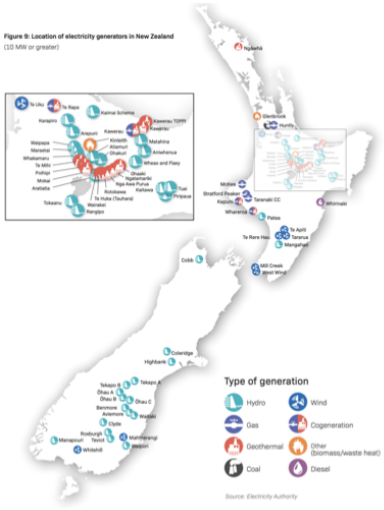

***Figure 1**. Location of Electricity Generators in New Zealand*
Source: Electricity Authority, 2018

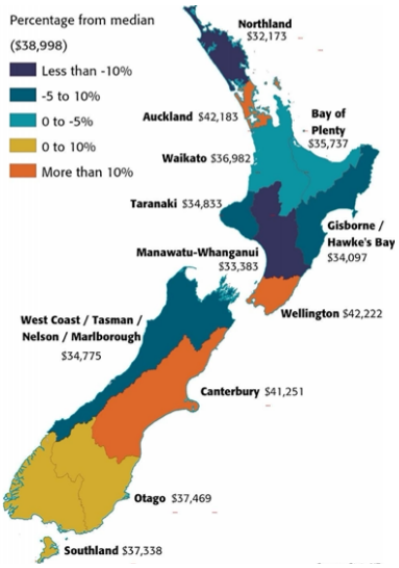

***Figure 2**. Household Equivalised Disposable Income Medians in 2019.*
Source: Stats New Zealand, 2020

The geographical distribution of energy-producing power plants in Figure 1 shows that there is only one geothermal power plant in the Northland region and no major power plants in the Gisborne region. The map shows that hydro or geothermal power plants are the closest to the region. This implies that these are the primary sources of energy for those regions. Analyzing the distribution services of the major energy distribution companies (Compare Bear, 2021) reveals that a large proportion of them are not active in the regions of our interest, and none of them distributes gas, especially in the Northland (Switchme, 2019).

As previously stated in the brief**,** the region of Gisborne is where a major part of the Māori population is concentrated. They are among the groups most affected by energy poverty due to limited economic resources and poor quality of energy distribution infrastructure. Because of the geographical proximity to the sources of extraction and the people's historical customs, geothermal

energy is the most commonly used energy source in those communities that are not off-grid. The other major source of energy is obtained by burning wood. They will primarily use these limited energy supplies for heating and lighting.

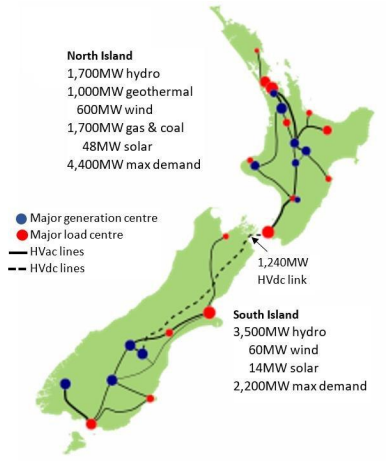

***Figure 3**. New Zealand's major transmission network.*
Source: Wikipedia, 2022

2.3 The Meaning of Energy for Māori

Even though Geothermal is evidently useful for the Māori's daily needs, the relationship between this community and energy extends beyond just the physical.

Since ancient times, Māori culture has strongly been intertwined with the world of nature, and people personify specific natural features such as mountains or rivers. In fact, the notions of home and energy are very intertwined. According to the Māori Perspectives on the Measurement of Energy Wellbeing Report (Haemata Limited, 2022), the Māori language has the word *Manaakitanga* which can be translated as the act of hospitality, of being generous with the people you are working with. Therefore, energy is an enabler of social wellbeing, allowing Māori people to carry out a series of actions linked to their community. With energy, Māori can receive guests (*manuhiri*) and "warm [their] *whare* and make a cup of tea. Without it, [they] cannot have visitors," (Haemata Limited, 2022). Energy in itself is therefore linked to the act of caring for others and having an unreliable supply of power means *whānau* are weakened in their daily practices and left isolated within their own community due to the lack of possibility to receive guests.

This specific relationship with their direct environment is important to keep in mind when considering Māori people's attitudes toward the oil and gas sector or any industry that has an impact on the environment. In the case of geothermal energy, on the other hand, many of the extraction sites are in Māori territory, where they are regarded as a vital source (Waikato, 2022).

2.4. Land Power Struggles: the Māori vs. Power Companies

Despite the presence of many energy assets on Māori land, Māori disproportionately endure energy poverty. The issues Māori have with external partners utilizing the resources go beyond

spiritual ownership. Power companies' existence has altered the environment of their land, causing them to lose access to other primary needs. They were forced to leave their homes, disconnecting them further from their tribal land, and losing access to food sources such as frog, eel, and tuna (Stuff NZ, 2021).

"The power station was an uninvited guest in our community," says Joyce Maipi (Waikato Tainui), a local Māori leader. "It was plonked here because the Government saw the natural resources – the coal, the land and the river. They were not interested in having a relationship with us, or understanding the impact the power station would have." (Stuff NZ, 2021).

Fortunately, over the recent years, Māori have become significant players in the geothermal space, with several major operators owned by *iwi* (tribe). The New Zealand government has also progressively started acknowledging the rights and requests of Māori populations for cultural recognition, and several measures have been put in place to solve the problem. Recent initiatives around creating 'homes' and 'home places' have examined Māori's design principles, community living and the natural environment to preserve and embed culture and identity (Boulton et. al, 2022).

Through many Treaty of Waitangi settlements, numerous *iwi* have had land returned to them and their traditional relationships with the geothermal resource formally recognised by the Crown (New Zealand Geothermal Association, 2022). Nationally run home insulation programmes were also multiplied through councils and other community organizations.

Another example of governmental help came in August 2020, when the Government announced a 28 million NZD fund that will be shared between projects on Māori housing and will be allocated through multiple funding rounds until 2024. As a result of the first two fund rounds for Māori Housing, solar panels and other renewable technologies will support more than 200 homes of *kaumātua* (tribal elders), *papakāinga* (housing of ancestral Māori land) and Māori-owned rentals to provide cheaper power, warmer, and drier homes, and valuable data. This is part of the Government's focus on creating targeted renewable energy solutions for Māori and public housing (MBIE, 2022c).

2.5. The Māori's View of Renewable Energy

According to the Māori Perspectives on the Measurement of Energy Wellbeing Report (Haemata Limited, 2022), a common point of discussion amongst *whānau* was the need for more *iwi* and Māori-led models in the energy sector. As previously stressed, Māori mainly use renewable energy sources, and the fact that non-Māori mainly dominate the energy distribution market could be a reason preventing them from wanting to use these services.

For Māori, oil and gas also have value beyond the purely utilitarian, and recognizing this helps determine how best to sustain and manage a resource. Furthermore, *iwi* have a strong interest in the energy transition as they are more sensitive to the impacts climate change can have on their land and resources. They also understand that fuel poverty will impact Māori harder than other New Zealand citizens due to their current socio-economic disadvantage (Roberts et. al, 2021).

Indigenous people's territories have been under assault in the name of clean energy in the past. Many cases of human and sovereign rights abuses are associated with renewable energy projects. Hydroelectric power projects, in particular, have been estimated to have displaced 40-80 million people globally (Imhof & Wong, 2002).

More Māori leaders or Māori companies leading or participating in the energy sector have proven, through many different studies, to guarantee the best outcomes for Māori.

Recent Crown-led initiatives in collaboration with *iwi* have started being implemented to find sustainable ways to go forward. For example, the Whanganui River has been deemed a legal 'person' with government and Māori "guardians" (Whanganui District Council, 2022), and the Waikato River is collaboratively governed and managed by Māori and the government (Parsons et. al, 2022). This might be viewed as a just way to allow for hydroelectric development and thus a transition to renewable energy.

Another problem Māori face in access to energy is also paired with a lack of community energy literacy (Haemata Limited, 2022). Several *whānau* expressed dissatisfaction with the market model for energy supply. They believe that there is a need for more agency and options over power-generating assets and information about energy that is relevant to helping *whānau*, including energy use, who uses it and how much. *Whānau* have also reported a lack of user-friendly interfaces for non-tech-savvy users, thus furthering the problem of connection to a wider energy system within the elderly Māori community.

In order to solve the challenge of educating and helping families to deal with energy hardship and the impossibility of paying the bills, some companies and organizations involved in the energy delivery process joined and created EnergyMate. This free-in-home energy coaching service aims to help families facing higher risks of energy hardship to reduce electricity costs and live in warmer homes (Wellington Electricity Lines Limited, 2019). EnergyMate supports people in hardship to help cut power bills and increase warmth by:

- getting on the best electricity plan for them.
- heating their home in the cheapest way possible.
- using simple tips to make their home more energy-efficient.
- connecting them with other services such as insulation or budgeting support.

Additionally, the government also has nine community energy education initiatives to help struggling New Zealanders with their power bills. These programs aim to enable families around *Kaikohe* (sacred place) and surrounding communities to be part of a *marae* collective energy audit and apply the lessons to their homes (Woods, 2021).

Recently, more Māori-led companies have emerged to directly deliver the energy distribution challenge to Māori homes. Nau Mai Rā, for instance, is the first *kaupapa* (initiative) Māori power company in New Zealand, founded by Ezra Hirawani (a Māori) and Ben Armstrong. It allows their customers to donate a portion of their power bill to support other relatives of their choice at no extra cost. This "*whānau* fund" helps those struggling to keep on top of their power bill. As of 2022, about 2000 Nau Mai Rā customers have given back around 45 000 NZD (Kohere, 2022).

2.6. What would Māori do with a new, alternative energy?

All previously stated initiatives aimed at improving Māori's access to energy have highlighted the following facts:

- The Māori Housing Renewable Energy Fund aims to provide Māori with warmer, healthier and more energy-efficient homes. With these new resources, Māori families should be able to stay warm and healthy during the winter without sacrificing their essentials to pay their electricity bills (Woods et. al, 2022).
- As most Māori lands are in rural locations, power connectivity and reliability are significant issues, especially for those still living on their *papakainga* (ancestral land). The establishment of

solar farms can bring a stable, reliable power source to local homes, including *papakainga* and *marae*. This opportunity will support Māori in alleviating energy hardship within their communities and maximize land use to build economic prosperity (Auckland Tamaki Makaurau, 2022).

3. DISCLAIMER

Before going further into our interview analysis, we would like to highlight a specific pain point we had during our research phase. When we settled on Māori as our target group, our team reached out to a considerable number of people in the hope of interviewing Māori people directly concerned by energy hardship. We sent over one hundred emails to Māori shelters, contacted various experts through Linkedin and activated as many of our weak links as possible.

However, after speaking to a few of the people who answered us, we quickly concluded that not only would it be hard to speak to such people, but it could also be unethical. The Māori, as we came to learn, have been subject to sometimes invasive studies in the past, the result of which has often come back negatively for them Asking them to answer personal questions related to their poverty situation without knowing them intimately could be intrusive and out of place. Figure 4 below shows the answer of one of our contacts when asked if he could put us in contact with Māori people in energy hardship.

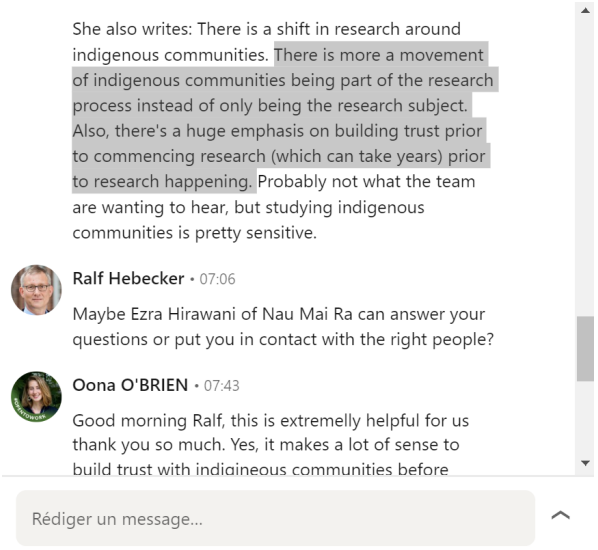

***Figure 4**. Conversation with Ralf Hebecker on researching indigenous communities*
Source: Linkedin

In light of this, we decided to only interview professionals who either worked with Māori or had insights into the topic of energy hardship within the Māori community. We shall now proceed with the explanation of our research plan and how we conducted our interviews.

4. RESEARCH PLAN

Purpose

Our goal is to understand better the daily lives of Māori households dealing with energy hardship. We will be taking a closer look at their culture in order to understand their daily routine, energy management, capital, resources, and other factors that could help clarify their energy problems. These elements will be vital to consider when designing a possible solution.

Method

We have conducted three interviews with professionals working closely with Māori or in the energy sector in New Zealand. We asked them open-ended questions, which were recorded and transcribed. We then extracted some relevant insights and opportunities from the recordings to help us answer our brief.

Location

We have carried out these interviews virtually through Zoom. Each participant was kind enough to turn their camera on and let us record the session.

Interview Guide

This is our initial list of questions directed at the interviewees. However, some of these may have changed depending on the person interviewed and their field of expertise.

1. What kind of living arrangements do Māori households tend to have? How many people are living in a typical Māori household?
2. How active is the Māori community with their *marae*? Typically, how many households are involved with a single *marae*?
3. Do Māori people attach any particular values to energy? Notably, Māori has the word “Manaakitanga” which connects energy and well-being.
4. What do you think is the biggest factor contributing to energy hardship in Māori households?
5. What different resources do Māori people have against energy hardship? Typically, what or who do they depend on?
6. What are the biggest barriers to improving energy distribution within Māori households?
7. Who is working to overcome those barriers? Are Māori involved in the efforts?
8. What are Māori people’s views on renewable energies? Has there been any pushback to installing renewable energy from the Māori community?
9. What things could the Māori community in rural areas do if they had more access to energy?

Consent & NDA

We began each interview session by briefing our interviewees about:

1. The purpose of this study.
2. The fact that each interview session is confidential. We will not be sharing the content of the interviews and the recordings with any third party outside of the Product Service System Design course at Politecnico di Milano.
3. The fact that we will be recording the session strictly for research purposes.

4. That we will submit this paper to each participant in order for them to check it and make sure their answers were implemented in a way which they deemed proper.

5. INTERVIEW RESULTS

5.1. Oliver Williams (Founder of Te Toi Taiao)

Our first interviewee is Oliver Williams, of Māori descent and founder of Te Toi Taiao, a company that specialized in bringing science into communities using traditional Māori knowledge mixed with western systems. The projects covered by Te Toi Taiao are centered on fresh water. They can range from enabling *marae* to build their capacities in the water sampling space to identifying both the cultural and scientific values of a river while also identifying many of the management issues associated with it.

We reached out to Williams in the hope that he could give us some more insights into Māori culture and the relationship Māori people have with energy. Additionally, we wanted to have his take on renewable energy sources in the country and the Māori people's perception of it.

According to Williams, Māori have a different perception of family as an entity which differs from the so-called “nuclear” family model found in Westernized countries (mother, father, children). “ Māori and other indigenous cultures as well, [...] tend to look at the family as more of an extended family. We are *whakapapa* so this means that you have ancestry from one another. [...]”. This could potentially explain why Māori households have a higher energy consumption on average. Because of their close links to all extended family members, it is not uncommon to have more crowded households which would raise the energy bill. Furthermore, “Māori and indigenous cultures generally tend to be a lot more welcoming towards family, and especially extended families. So that can potentially put some strain on your energy supply, or being able to pay for energy, depending on who's contributing.”

Another interesting remark raised by our interviewee was on Māori’s relationship with nature. Māori people personify nature and those living in rural areas are even more in tune with their environment, for as Williams explains “it's no secret that globally in [rural areas], finances can be quite tight. Generally you have a few people earning a lot of money and a lot of people earning not a lot of money. So, hunting in particular, [...] is not just a pastime, but it's also required to be able to feed the families or many families [...] Especially as they're coming into a global recession, people have to be very in tune with nature and their surroundings so that they can go off and provide these things.”

But this special connection to nature enjoyed by Māori communities has been threatened several times by government initiatives, and ironically enough by power companies. The following example given to us by Williams illustrates it. “On the Waikato River, when we had our upstream hydro-networks put in place, there were a few very productive geothermal areas that were effectively drowned by the dams. And it’s arguable that those geothermal areas would've had far more output into the grid as a result. By drowning them [the power stations] actually disconnected Māori from their environment and their traditional practices.”

This example is all the more relevant when you consider the fact that geothermal is one of the main sources of energy used by the Māori. Williams further stresses this by explaining that “there are also geothermal springs where resources were prepared or food was prepared, or maybe,

people would just simply soak if it wasn't too hot. [...]" He also reminded us that the issue with geothermal energy is that it's not storable "so generally you're having to produce the energy immediately before it's required."

Williams also confirmed the fact that Māori and Pasifiska earn below what the rest of New Zealand does. He added that "the statistics will show that Māori households are generally less educated. So you could say that there's a direct correlation between the amount of income a household receives and the amount of education that a household attends. [...] It's news in New Zealand right now that Māori who are enrolled in school as opposed to higher education, on average are only going to school about 58% of the time whereas the rest of our population is attending circa 78%." According to him, the reasons for this are multiple "but it's hard to get a high paying job if you've got minimal education. Nowadays [in New Zealand] if you really wanna get ahead in life, a masters or above helps."

Williams continued by describing some of the resources Māori people may be able to use against energy hardship. According to him, they are often the same options as any regular person living in the country. However, he highlighted the communal use of energy within the Māori world. "Within [a] community [or] village, a lot of people have generators. They're just responsible for whatever they want as they see fit that they need it. But the *marae* on the other hand, which is the focal point of that village, does have power lines going to it." Some of the exceptions worth noting were the ones of "communities [...] who do actually have a little hydropower that runs adjacent. That gives them relatively cheap or free energy. Actually if they do decide to continue to run their mini hydro stations [...] they'd actually put more energy into the grid, which potentially brings an income. [...] But it's not the norm." This example underlines an new interesting fact about Māori people's approach to technology. On average, Williams argued that Māori are eager to try them.

This is an important element to consider when dealing with renewable energies, given that both domaines go hand in hand. And according to Williams, when it comes to renewable energies, "sometimes there is a little bit of pushback and usually it comes down to what the land has already been used for or what the land has historically been used for. So let's say if there is a *wāhi tapu* or a sacred place in a particular area, [Māori] might not necessarily want winds put on it, or for it to be flooded. But I think in general, [when it comes to energy] it's very widely accepted that we need to shift more towards renewable energies [...] all communities are open to it."

Finally, Williams stressed the importance of agency when it comes to Māori people's relationship with energy. According to him it comes down to having a choice on which sort of system you wish to connect to in order to get a sufficient amount of energy. "Not everyone wants to be on the grid. And they have arguably a high quality of life as a result. But that's their choice. If they want to do that, they can do that."

5.2. Ben Armstrong (Co-Founder of Nau Mai Rā)

Our second interviewee is Ben Armstrong, himself a Māori, and the co-founder of Nau Mai Rā. This power company, which we have previously mentioned in section 5 of our ethnographic research, brings support to struggling Māori whānau by allowing their customers to donate a portion of their power bill to support a project of their choice. This interview aims to better understand the energy situation in New Zealand from the perspective of a Māori energy retail company, the community's relationship with energy, and the efforts being made in the sector to support them.

We interviewed Armstrong in order to get a clearer picture of the situation from a Māori and business perspective. The first thing that Armstrong told us was about the founding of Nau Mai Rā and the company's main goal, namely from a social standpoint. "The purpose of Nau Mai Rā is to reconnect Māori. In the first research months, Ezra and his business partner discovered that there was a huge problem of energy hardship and that most of the people concerned were Māori. The idea of Nau Mai Rā came from the idea of helping the 96% of Māori to find a simple way to reconnect back to their history."

According to Armstrong**,** "[...] Some of the main problems faced by the Māori community are infrastructures and consistency of energy to their home. [... Māori] are not able to keep their houses warm, especially in winter, they can't cook, they don't have the ability to use technology, because they do not have the power. It's a general problem, everything it's slower."

Other situations highlighted by Armstrong were "[...]Respiratory issues, unhealthy homes, terrible heating and insulation [...]. [Māori] can't keep children and their family warm, their families are getting sick. They need to decide whether to eat or heat, often they go without power in order to eat. In my opinion, hot water is the most expensive part of the home and heating in general."

Armstrong then continued by adding that an additional major barrier to improving energy distribution within Māori households is education. According to him, "[...] Māori don't understand how power works or how to use it in their own households. They don't know how much power they are using, and how to be efficient with energy, [...] for showering or using a certain type of heater."

Armstrong also confirmed the fact that the industry as it is, is complex, not just for the people who depend on energy but also for them as an energy retailer. This further points out the inequalities that exist in terms of energy prices, "[...] there is a complex industry in New Zealand, retailers want to keep it complex even to the consumer, it's a strong profit driven industry.[...] The poor pay more for power and the rich pay less. The generators are owned by the big retailers and it's a monopoly, the government owns 51% of major retailers. The coal station, for example, is built on Māori land. The Māori living there suffer the most from energy poverty, they don't have money to pay, the prices are going up every year. [...]The people who live on these lands and give it to the generators are not getting an equal share. The generators make millions and the Māori nothing."

Upon analysis of this situation, Nau Mai Rā started working to overcome those barriers. Armstrong told us that **"**[they] noticed a lack of culture and community in the industry. Sometimes technology brings us apart. [...] And it's hard to educate someone who is in survival mode, their main goal is to survive. So, now we want to give them relief, a platform or a way to get them out of the survival mode, we want to make them free to be educated and change habits."

He also explained to us how the pooled fund was created, " [...] during Covid a lot of our users lost their jobs and started living in energy hardship. Nau Mai Rā decided to create the fund. We use the profit of the fund to help pay the bills of the ones who live in energy hardship. We needed to make the decision quickly to help them.[...] Nau Mai Rā uses a lot of online culture, we talk about energy and the industry. We built a technology so that users can directly fund others with part of their bills. [...]We also work with community providers bringing financial education, food, and other projects about LED lights, warm curtains that keep the heat in the home. [...] It's very community service centered."

Another interesting topic brought forth by Armstrong is the government initiatives to build solar panels for Māori Households. "I really like the solar power idea for Māori. I often go to the North Island and my family there (and subtribe) applied for the funding and it was approved. Now they can benefit from renewable energy sources. Technology gives access to others in need, with

innovation. And the solar power that is not used in the *marae* is distributed to the community that is in energy hardship, there are a lot of limitations and it needs more fundings, but it is great. [...]I can't speak for all Māori. I don't think that there is a problem with nature and renewable energy. If it's helping utilize nature's features (land, sky, sun), it's better for them. We understand the importance of treating these entities as a whole".

When asked about the future of Nau Mai Rā's, the company's expansion and new initiatives, Armstrong replied that: "Nau Mai Rā has the goal to reach 10.000 customers. We would like to become more serious in order to face the prices that are increasing. Everyone is putting their prices up for the renewable future in New Zealand. We want to work with the big retailers because we figured that the problem concerns all the industry. [...]The future for us is working alongside local people and the government. Because when Nau Mai Rā came into the picture no one was trying to solve this problem. [...]We want a seat on the table as Māori People. To make sure Māori people's voices are heard, that they are part of the decisions. It's an industry problem, and it takes the industry to solve it.

Finally, Armstrong stressed the importance of fair prices that allow access to energy for everyone. "We want better prices for Māori *iwi* that own the lands where the generators are [...]. Power is no longer a privilege, it's not a luxury but a necessity, and everyone should have power in New Zealand. And the fastest way to do that is taking the prices down. The key is to have a collaborative approach between the government and *whānau* in order to get them educated."

5.3. Loren Pasquier (Creator of The Woven Women)

Our third interviewee is Loren Pasquier, a traveling artist and creative director based in Nelson, New Zealand. She is the creator of the *Woven Women* project, a multi-media exhibition which tells the story of Māori women. Through this initiative, Pasquier has worked closely with Māori women for the last four years. The aim of this interview is to get a better understanding of Māori culture, their household dynamics and worldview.

The first topic discussed by Pasquier was the difference between the way Māori families live today compared to the past. *Marae* are the focal point of Māori communities throughout New Zealand and include multiple households that live closely together. "Back in the day, people would grow up on the *marae* and they would always be involved. Life was around the *marae* and people would do things together," Pasquier described. "Today some people still get to grow up around their *marae* and be involved in this community. However, due to the urbanization over fifty years, some people have lost their connection to their *marae*, and in turn, their Māori-ness - the part in them that is Māori. They are disconnected and don't know which marae they belong to."

There have been efforts to reclaim the culture and the language recently. Pasquier notes: "there's been a really positive movement that I have felt since I have arrived here where Māori are trying to reclaim the culture. They're trying to reclaim the language. Through language, they reconnect to the stories, the way they perceive the world and nature, and the way they interact with each other. People are reconnecting to their *marae* - some have never had that connection."

Whether connected or disconnected to their *marae*, Māori households typically are in larger numbers as they have more children. Pasquier described that they have stronger connections and high respect for the elderly or members with more *mana* (prestige or authority). "The connections that they have are, I find, way stronger and more valued, at least in my experience as a French

person. There's a lot of respect for the grandparents. There is immense respect for whoever is above you and came before you or has more *mana*."

In Māori households, different generations tend to live in separate households. They stay where their family is, especially in the North Island where the Māori culture is stronger. The emphasis on preserving and inheriting the culture is so strong that it is common for the first child to be taken and raised by the grandparents, despite the mother's hesitance. Pasquier described, "It is really commonly done that the first kid will go to your parents or your grandparents and be raised by them. Most of the women that I've interviewed that have had their first kid taken away said, 'No, you're not taking my kid,' but it happens anyway. It's tradition and that's what happens. It's also because the grandparents have more knowledge of the Māori world and so the culture is being transmitted through that first kid and then ripples down."

As such, the Māori culture is immensely important for Māori, including their respect to nature. Pasquier explains, "*Whaea whenua*, or Mother Earth, is really important for them. *Whaea whenua* knows the way and we should only take what we need, and never more." This reverence of nature is further shown in the fact that in 2017, the Wanganui River in New Zealand has been recognized as a legal person - a significant milestone for Māori people. Pasquier added, "That was really important. [Māori] probably would want more rivers to have an identity as such."

When asked about energy hardship within the Māori community, Pasquier stressed that it was important to take into account that the majority of the Māori population experiences poverty. "Most Māori people that I've met live in poverty. It's still hard unfortunately for them to access certain jobs because there's a lot of racism. So it's hard for them to get an income that's needed to just live, you know. Inflation on the price of food and health is incredibly high."

According to Pasquier, Māori people also have difficulties renting properties to live in, affecting their energy access. The biggest barrier to energy hardship for Māori is the lack of financial security.

6. INTERPRETATION OF DATA

We shall now bring together our major findings collected throughout this research, which will help us answer our initial brief. We shall first start by diving deep into the cultural reasons which cause Māori people to experience energy hardship. We shall then highlight how their perception of the family and life within the household intertwines with their energy consumption. Māori's relationship with traditional and renewable energy will be explained in more detail before exploring their relationship with nature.

Finally, we will further explain Māori's difficult access to general and energy-related education before briefly returning to our new findings regarding government initiatives to help these communities.

6.1. The energy hardship faced by the Māori population is significantly impacted by their cultural practices, economic level, and inequality of land ownership

While the ethnographic research revealed that Māori are disconnected from energy in terms of infrastructure, housing, and price inequality, the interviews helped to shed light on some additional factors: cultural practices, urbanization, poverty, and land ownership.

To understand this problem's multiple facets, it is important to remind ourselves of the remnants of colonialism and how it has affected Māori populations in New Zealand. Māori people used to live closely together, united around a single *marae*. This has changed nowadays because of urbanization. Many Māori lost connection with their ancestral home, language, and cultural practices, along with the support a close community could have brought them when dealing with energy hardship for instance. However, there has been a recent movement to reclaim the Māori culture and language. This gives hope for the possibility of more active *marae* and communal life in Māori lands in the future.

Inequality still persists when it comes to energy prices and land ownership. First, Māori households pay unfair prices due to the laws set in their geographic locations, which New Zealand pledges to solve by phasing out the low-fixed charge tariff regulations in the next five years (MBIE, 2022b). Second, despite owning the land where a lot of the energy is produced, Māori still face energy hardship disproportionately. The power generators built on their land do not provide them with more energy. Additionally, it alters their lands and depletes it from available resources. This caused Māori to lose access to primary food sources and move away from their ancestral homes.

Poverty is also a significant factor that affects Māori's access to energy. According to Pasquier, many Māori struggle to find certain jobs or places to rent due to racism. In her opinion, the biggest barrier faced by Māori in this situation is the lack of financial security. In turn, not being able to access energy also prevents them from achieving a better quality of life, and access to proper nutrition, health, and technology.

6.2. Māori's non-nuclear family households affect their energy usage and are often not considered by new energy solutions

In the past, the *marae* was a prominent social touchpoint in the community, holding many households. Māori people grew up and lived there together. While the number of active *marae* has decreased due to urbanization, recently many Māori are reconnecting to their *marae* and culture. This implies an increase of active *marae* and more Māori households living closely together in the future.

Aside from the *marae,* Māori people also have an extended view of family as opposed to the nuclear family one - they consider their uncles, aunts, and cousins as part of their close family. This can lead them to live nearer one another, sometimes even in the same households. Typically, they also have more children, contributing to the large size of their households.

While different generations (such as grandparents) tend to live in different households, there is great respect for the elderly within the Māori community. The common practice of grandparents taking the first child into their household to 'teach and preserve the culture' illustrates the degree of respect in which the elderly are held. In contrast to the traditional western family dynamics, 'family' within the Māori can therefore allow non-members of the households to exert more control over the biological family members and perform traditional parental roles.

These different household arrangements affect their energy consumption. More members in the household lead to more energy consumption, and therefore to higher energy bills. According to Williams, Māori people often tend to invite their extended family over, leading to more use of energy. And while the extended family provides social support, a huge portion of Māori people face poverty, making it difficult to depend on one another to pay the energy bill.

Safe and affordable housing is one of the needs that Māori people, especially in the urban area, have difficulty accessing. While the lack of financial capital is the main reason, the other underlying cause is that most social housing built in New Zealand cater to the traditional nuclear-family arrangements. For example, a Māori woman had to give up four of her seven kids to her family in Auckland after not being able to find housing for all of them (Bradley, 2022).

In order to help Māori people struggling with energy hardship, it is important to provide safe housing that takes their cultural household arrangement and ways of living into account.

6.3. Energy within the Māori world

We shall now focus on Māori people's relationship with energy, how they use it, and what are their main struggles. Our research helped to highlight the fact that Māori use and distribute their energy supplies in a very communal way. The example given by Williams of different *marae* living together and sharing some generators and centralized power lines illustrates this quite well. Energy therefore plays a key role in their customs and traditions, working as an enabler of social practices and well-being which helps the Māori to connect and bond with each other.

When it comes to the problems faced by the Māori people's access to energy, our research helped to highlight some of the major causes for this issue and how this lack of energy impacts Māori communities' lives. As Armstrong mentioned, one striking element was the lack of infrastructure and consistency of energy in Māori's homes. He went on to explain that the problem comes from within the energy retail industry as the prices don't match people's levels of income, despite the fact that some of the Māori people own the land exploited by the power companies. The retailers therefore end up making a profit on a land which is not theirs without giving back their share of the deal. In the long run, unequal energy prices and land exploitation reinforces the discriminatory circle of the power companies getting richer at Māori people's expense while also charging them unfair amounts.

The energy hardship faced by the Māori prevents them from accessing primary needs such as heating their homes during the cold season, cooking, and using their different technological devices. In the long run, it also impacts their health.

All of these elements therefore put emphasis on the following fact: when catering to Māori people's needs, it is vital to give them a voice so that their complaints are heard and that their traditions and sense of community are respected. As outlined by our previous findings and as confirmed by both Armstrong and Williams, it is no longer possible to design for these people, but to design with them. And the best way to do this is to make sure that some Māori members are implemented at a decision-making level within the energy retail industry to make sure their needs are met.

It is also vital at this point to respect Māori people's agency over their energy sources when designing for them. As highlighted by Williams, it doesn't matter where Māori people get their

energy from - renewables, the grid, isolated power sources - as long as they can choose which one to pick along with the quality of life that goes with it.

6.4. Māori's perception of nature and renewable energy sources

We shall now dig deeper into Māori's relationship with nature, as this does play a key role in how they handle their energy. Communities living in rural areas have to be more sensitive to their environment as this can make the difference for them between eating or not, and having energy or not.

Williams very interestingly mentioned the example of the hunt which indeed shows how aware of their surroundings Māori communities must be. This is probably why these people personify nature and treat them as living entities. As highlighted by Pasquier, this perception of their surroundings has also led the Māori to respect and appreciate "Mother Earth" in a balanced way. The goal is not to exploit its energy resources but to live in harmony with them, only taking what they need, no more, no less.

A wonderful example of this greater understanding of nature, as mentioned by Williams, has led some *iwi* to transform natural geothermal sources into their energy supply system. This natural heating system enables them to "cook and prepare food or even bathe". Through such a use of nature, the Māori free themselves from the grudge of power retail companies. Our ethnographic research had also helped to explain Māori's perception of oil and gas as natural resources, resources to which Māori have given values beyond a utilitarian point.

TTwo other key findings of our ethnographic research, confirmed by Williams, was that Māori communities were generally very open to new technologies and eager to try and experiment with them. Given Māori's sensitive perception of nature, they generally favour the benefits of an energy transition towards renewable sources. Their sensitive apprehension of nature has made them more aware of the impacts climate change can have on their land and resources, as the fact that they will suffer the most from the lack of fuel within the country due to their current socio-economic disadvantage. Williams also underlined the fact that Māori, like "a vast majority of people in New Zealand" supported the energy transition towards renewables. As long as power companies respectfully use the energy sources present on their lands, Māori people were happy to benefit from it.

Māori people's perception of nature is therefore vital to take into consideration when catering to their energy problems. As previously outlined, it's not enough to assume that because sustainable energy sources are being implemented, it's a good solution for Māori. Their ethics and perception of these energy sources also need to be taken into consideration and be part of the wider problem. Again, involving Māori in the conception phase of this process is the best way to ensure that their values are respected.

6.5. Education as a determining factor for the Māori community to break the cycle of energy poverty

One of the major issues faced by Māori when it comes to hardship is the lack of education at different levels, from having access to it to the energy-related practices around it.

On the one hand, basic education and access to it is harder for Māori, as confirmed by Williams. According to him, it is now required to have a Master's in order to get a high-paying job. However, only 58% of Māori students attend school as opposed to 78% of their non-Māori counterparts. This triggers a poverty cycle which specifically affects young people: low income limits their access to energy, which in turn limits their access to higher, good quality education. It then evolves into a social issue which impacts their quality of life given that getting a high-paid job usually guarantees a better quality of life.

On the other hand, there is little access to specific knowledge related to energy, its consumption, distribution and topics such as energy efficiency, as well as specific literature. Armstrong highlighted this point in our interview by explaining that one of the main reasons why Māori live in energy poverty is the fact that they do not understand their own energy consumption patterns and how the overall system works. This puts Māori communities at a level of inequality with respect to the rest of the country's population. It is essential to bring this type of knowledge to the members of the community so that they can break this gap and make conscious decisions about their energy purchase and consumption.

Lack of knowledge causes Māori to continue on accepting what companies and the government offer them without having the capacity to propose or seek fairer alternatives. Breaking out of this cycle of ignorance can help them to get closer to energy-related projects. Education can therefore act as a social transformer, providing them with the tools to access a better lifestyle through clean energy, adapted to their culture. Māori people's communal way of operating as a group can also enable them to exchange their learnings about energy - good practices, healthy consumption patterns, distribution and access - through mutual aid within the *marae*.

6.6. Government-lead initiatives, a push of innovation within disconnected territories

The New Zealand government is leading multiple projects with the aim of bringing other energy sources to less connected regions of the country. These initiatives seek to promote projects related to clean and renewable energies, mostly solar.

One of the most interesting findings that Armstrong gave us is the fact that these projects are being effectively implemented in various regions of the country and many are strategically targeted at the Māori population. The people who are benefiting from these initiatives, in the regions where they are being implemented, now have the possibility to learn about clean and renewable energy, creating internal projects to improve their lifestyle.

Another interesting finding was discovering that programs like Energy Mate are willing to tackle the issue of energy poverty from different angles. The personalized education of customers is an extremely pertinent approach, as this shows that these entities have understood that each household has different situations.

However, some issues still remain. For one, government funding only enables the creation of a certain level of infrastructure and is solely focused on kickstarting projects. Long-lasting initiatives would require more funding and support from additional entities. Ideally, these entities could also be found outside of the energy sector and could support innovative initiatives developed locally, thus improving the quality of life of people in these regions. This would ensure that projects do not collapse due to a lack of resources or interest, leaving struggling communities once again in a situation of energy hardship.

7. SOLUTIONS

Having now reached the final part of this paper, we shall proceed by detailing which next steps are necessary to improve Māori people's situation when dealing with energy hardship. Throughout our ethnographic research and interviews, we have identified the two following leads as primordial to tackle:

1. Giving more opportunities to empower Māori people in the decision-making processes around the topic of energy
2. Furthering the progress being made to improve Māori people's access to energy-related education and education in general

These future leads are, of course, non-restrictive and non-exhaustive but aim to give a clear direction into what needs to be done to tackle energy hardship within the Māori world. We shall also complement these insights by suggesting additional research that needs to be done to get clearer insights into specific relevant fields.

7.1. Getting the power back into the hands of Māori people

Despite having natural energy resources on their land, Māori often do not have access to them as these resources are utilized by private energy companies. Major energy decisions were made in spite of their cultural practices, such as productive geothermal areas that were drowned by dams. Māori people have lacked agency over the natural energy resources on their land, and the most vital point to design for is to bring the power to choose back into the hands of Māori people.

First, at a large scale, there need to be more Māori-led models in the energy sector, as emphasized by Haemata Limited (2022). Such representation is important as Māori would then have the possibility to choose what is best for their community. Having Māori representatives on all levels, including in high positions of organizations or government bodies, would help to ensure that Māori's voices are actually taken into account during major decision-making processes related to energy.

Second, there needs to be active participation and even ownership of Māori over the projects carried out on their land. Taking the time to listen to Māori, connect, and build trust is essential to engage them in the project. Involving Māori people as early on as possible would help ensure that the end solution actually solves the problem.

Given New Zealand's pledge to provide renewable energy access to Māori people through the Māori Housing Renewable Energy Fund (MBIE, 2022c), renewable energy sources provide a promising lead. Māori are well-aware of the urgency of climate change and are generally open to renewable energy. However, such new initiatives cannot be built at the expense of their cultural practices and other primary needs such as food. At the start of the project, it is vital to have discussions on the constraints and the scope of the project, where all parties agree on the limitations.

Fourth, there needs to be more support for entrepreneurship projects from Māori where energy is at the centre, such as Nau Mai Rā. While the company has a massive impact on the betterment of 10,000 Māori families, 10,000 more are on the waiting list. There needs to be financial support from the government for Māori-led energy initiatives that are designed to alleviate the energy hardship faced by Māori.

Lastly, it is recommended to focus on decentralized solutions which target one community at a time. As one of the major factors of energy hardship in New Zealand is the poor distribution of resources, decentralized solutions provide opportunities for each community (perhaps centred in a single *marae*) to gain more agency over their energy in the long run. This is aligned with Māori's communal living arrangement, where a small community shares a single renewable power source. The New Zealand Government's sixteen small-scale solar projects (MBIE, 2022c) are a good example of such efforts; there need to be more projects in this direction, especially those that are Māori-led and take into account their cultural practices and ways of living.

For further research, it is recommended to conduct participatory research by living alongside the Māori community for a longer period of time. This approach will enable researchers to study the characteristics needed to be present in the design solution, especially if the marae acts as a single energy source for the community. Participatory research can reveal the daily habits and practices of Māori households related to energy and how their communal living affects their energy usage.

7.2. Empowering Māori through knowledge

As we have seen, access to education will ultimately play a key role in the Māori's chances of coming out of energy poverty. As it currently stands, Māori's access to education is complicated, and despite the country's efforts to boost education, this inequality gap is still evident today, perpetuating a vicious cycle of poverty.

This is why, when designing for Māori populations, it's important to keep in mind the fact that they are in "survival mode" (Armstrong, 2022). This goes hand in hand with the problem of being geographically isolated from the more populated urban areas: progress is slower, and so are the adoptions of technology. Therefore projects facilitating knowledge and the development of energy-related skills can contribute to narrowing the knowledge gap related to energy issues and also contribute to breaking the cycle of poverty.

Likewise, starting to engage in a bilateral exchange of knowledge between public or private entities and the Māori community for mutual learning would enable better communication channels. It would further ensure that agreements are respected, and initiatives are built under mutually established parameters. In parallel, the Māori population will learn and apply the knowledge that will leverage new initiatives not only for their own benefit but also for other minorities in need.

Finally, and for further research, it is recommended to reach out to people related to the education sector in New Zealand in order to have a better understanding of the real situation of the country and the gaps the Māori face. Moreover, it would be interesting to start co-creation sessions with certain Māori and startups that can help us to raise new questions related to improving the exchange of knowledge at different levels.

8. CONCLUSION

We have now reached the end of this paper. Throughout our research journey, we have investigated and understood some of the different causes of energy hardship within the Māori community.

Our ethnographic research, along with expert interviews, have also enabled us to get a first overview of what Māori culture is like, their specific relationship to nature, their perception of family, and how they view and use energy.

This has helped us to understand which first steps to take in order to solve this issue, such as empowering Māori people in the decision-making processes around the topic of energy and furthering their access to education.

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