

An indigenous perspective on water recycling

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Abstract

The Maori people have always valued water as a taonga*. Waitangi Tribunal* reports from the previous twenty years demonstrate this. In these reports it is concluded that the rivers and tributaries within the rohe* of the hapu* claimant groups were and are taonga of the Tangata Whenua*. Water and water bodies such as rivers, lakes and wetlands, have their own mauri*, which it is important for the Tangata Whenua to protect from pollution, degradation and damage. Rivers, lakes and wetlands are also key elements in the identity, whakapapa* and mana* of the hapu. In order to include indigenous perspectives appropriately in infrastructure evaluation and decision-making the Mauri Model has been created. Mauri is the central concept that this evaluation model uses to identify the Tangata Whenua perceptions of the sustainability of various techniques under consideration for proposed infrastructure development. The Mauri Model has a strong foundation in traditional Tangata Whenua values and also parallels the current policy direction being taken by Central Government in New Zealand. This enables a direct comparison between the results of a conventional analysis of techniques available and the results based on analysis of impacts on mauri within the Mauri Model. Research presented in this paper identified significant differences with regard to the appropriate use of recycled water, in particular wastewater. Recycling is a concept recognised by the Tangata Whenua; however, the integrity of the mauri in recycled water greatly influences how it can be used. Further, recycling some of these waters in a culturally consistent manner could only be achieved by returning the water to the ground or onto land.

Keywords: Cultural; Water use; Holistic; Mauri; Sustainability

*See Glossary at the end of the article

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1. Introduction

The indigenous perspective of the Tangata Whenua in relation to the management of the environment is considered important and relevant in New Zealand. This is primarily due to the status of the Tangata Whenua recognised by the Treaty of Waitangi that was signed in 1840. In particular decision-making regarding infrastructure such as water supply, stormwater, and wastewater has been identified as an area that the indigenous viewpoint is highly valued.

Indigenous perspectives on water recycling can be considered in two contexts in New Zealand. The reason two contexts are relevant is that a purely traditional viewpoint is typically based on the pre-twentieth century paradigm of comparative abundance of fresh water supply. The contemporary application of this traditional viewpoint however is necessarily constrained by changed circumstances of water availability and constrained use in a predominantly westernised society.

Investigation of the traditional viewpoint provides the basis for an understanding of its contemporary application. Recent work in relation to fifty year planning strategies for regional government for the Bay of Plenty in the North Island of New Zealand considered the identification of appropriate infrastructure technologies [1] and has led to the development of a decision-making tool called the Mauri Model [2]. This model is discussed with regard to the analysis of the sustainability of infrastructure technologies from an indigenous perspective.

An indigenous sustainability analysis was carried out in parallel with assessments by professional engineers using a modified Hellstrom model [3]. Of particular interest are the technologies that achieve similar sustainability ratings as these provide a common basis for solution selection and development. The technologies that do not achieve a similar rating are also important as the reasons for the difference in rating can provide significant insight into the different paradigms

held by the indigenous people that differ from society in general.

2. Relevance of the indigenous perspective

The importance of indigenous perspectives in relation to the management of the environment in New Zealand is reflected in the recognition of indigenous values in legislation and government policy. This recognition generally originates from the Treaty of Waitangi, and significant references to indigenous values are included in the Resource Management Act (RMA1991), the New Zealand Waste Strategy (Government, 2002), and the Local Government Act (LGA2002).

With regard to sustainability, the RMA introduces the concept of kaitiakitanga (guardianship) as well as numerous requirements to take into account the traditional relationships that Maori hold with their lands, forests, waters, etc. The Local Government Act takes triple bottom line thinking a step further, when it prescribes that Regional and Territorial Authorities are to play a broad role in promoting the social, economic, environmental, and cultural well-being of their communities, taking a sustainable development approach. The New Zealand Waste Strategy [4] states:

“Maori have a unique perspective and role in waste minimisation and management. They have played an important role in pushing change in the area of wastewater treatment and disposal... As New Zealand moves towards zero waste Maori are expected to become more active in waste management planning and waste prevention. Decision-making must allow for direct Maori input into policy, standards and guidelines, monitoring and evaluation, and iwi (tribe) consultation in preparing waste minimisation and management plans”.

Thus indigenous perspectives are valued in New Zealand and inclusive approaches are encouraged by the legislation. Nevertheless, adoption at the level of local governance has been very

difficult and frustrating for both Tangata Whenua and local government leaders and administrators. The problem stems from the juxtaposed paradigms of municipal engineering on one hand and the Tangata Whenua values and beliefs on the other. Whenever water management is considered there is often disagreement. An example is that those promoting continued water-based transport, treatment, and disposal of human effluent do so from a paradigm of public health and safety. Faced with a choice between this and the Tangata Whenua perspective that can be marginalised as ‘spiritual sensitivities’, it is not difficult to understand that decision makers display a conservative preference for business as usual.

Conversely, recent international trends in stormwater management [5] suggest that there is widespread adoption of holistically based stormwater management promoting sustainability rather than continuing the traditional expansion of urban drainage systems. More holistic approaches are consistent with indigenous thinking and a decision-making framework based on traditional beliefs.

Maori have always valued water as a taonga. The Waitangi Tribunal reports for the Mohaka River (1992), Te Ika Whenua (1998), and the Whanganui River (1999) demonstrate this. In these reports it is concluded that the rivers and tributaries within the rohe of these hapu were and are taonga of the Tangata Whenua.

3. Traditional viewpoint

Water and water bodies such as rivers, lakes and wetlands, have their own mauri, which is important for Tangata Whenua to protect from pollution, degradation and damage. Rivers, lakes and wetlands are also key elements [6] in the identity, whakapapa and mana of the hapu.

The traditional viewpoint of the indigenous peoples of New Zealand associates water and its management with the creation traditions of Maori. In addition the environmental management

regimes established in the traditional protocols of tapu (sacred) and noa (profane) ensure that the requirements of particular water status can be observed effectively.

The widely held belief is that through the many phases of creation as the world evolved a physical and spiritual element was created when Ranginui (the sky father) and Papatuanuku (the earth mother) were separated by their children, specifically Tane Mahuta the god of the forests. Once the parents were separated their children occupied and flourished in the various realms created, Tane Mahuta covering the land, Tangaroa the oceans, Tutewehiwehi the fresh water rivers and lakes, and Tawhirimatea the air space between their separated parents. These beliefs have parallels in many of the traditions of the South Pacific.

Another consequence of the separation of the parents was that each would grieve for the other, and so rainfall is considered to be Nga Roimata O Ranginui (the tears of Rangi) while the wellsprings are considered to be Nga Puna Tapu O Nga Atua (the weeping of Papa). As a result of the spiritual origins of these water sources, an appropriate level of tapu is therefore associated with these and this requires particular practices be observed to maintain the spiritual balance in our world. Thus water from rainfall and springs is considered sacred and is only suitable for human use after it has travelled over Papatuanuku and become noa.

Therefore the basic ‘traditional’ premise is that water, having been used for whatever purpose, should be returned to Papatuanuku if the mauri of that water is not suitable for the following use.

Papatuanuku is recognised as the mother who provides life for all living things through the waters in her womb. From her, life is derived. To her, the waste of life in the body, which is devoid of life, has to be returned. The life giving essence, water, must remain pure and unadulterated to provide life for those to follow.

Water is also considered to have a particular characteristic found in all living things. This

characteristic is mauri and it is the binding force [7] between the tinana (physical being) and the wairua (spiritual being). In all living things and water, the nature of that mauri can vary, being stronger or weaker or totally exhausted, depending on the circumstances impacting upon it at that time. It is this characteristic, the mauri of water, that is observed and assessed in the indigenous viewpoint. The impact upon the mauri is the measure used to determine the relative sustainability of various options when choices must be made.

4. Mauri Model

4.1. Mauri

Mauri is the essence that has been passed from Ranginui and Papatuanuku to their progeny Tane Mahuta, Tangaroa and others, and down to all living things through whakapapa in the Maori notion of creation. Mauri is considered to be the essence or life force that provides life to all living things. Water also has mauri.

The concept of mauri was incorporated into the Resource Management Bill however did not progress through to New Zealand legislation. This was argued on the basis that the New Zealand legal system could not cope with this concept at that time. Part II Section 7 of the Resource Management Act 1991, *Other matters* now includes 7(d) *Intrinsic values of ecosystems* which replaced *The mauri of ecosystems* in the Resource Management Bill that first went before parliament.

Mauri also establishes the inter-relatedness of all living things. The linkages between all living things within the ecosystem are based on the whakapapa of creation. This establishes the basis for the holistic view of the environment and our ecosystem held by the Tangata Whenua.

4.2. Mauri Model

The Mauri Model can be visualised as a Venn diagram shown in Fig. 1. The criteria; economic, social, and cultural are all successive subsets of

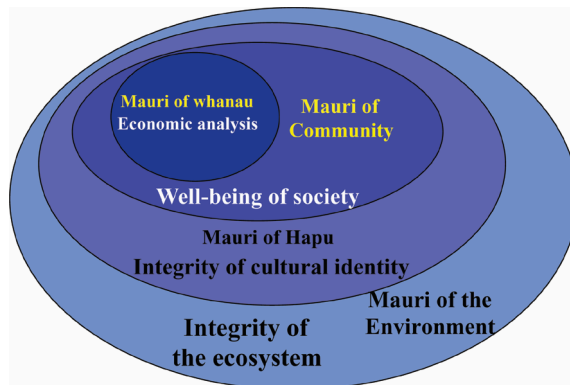


Fig. 1. Venn diagram representation of Mauri Model as four spheres of inter-relatedness.

the environment. These have been redefined as the impacts on the mauri of the whanau or family (economic), the mauri of the community (social), the mauri of the hapu (cultural), and the mauri of our ecosystem (environment) respectively. The relative importance of these aspects can be addressed independently by all users by choosing a weighting that is applied to each aspect before scoring is completed.

The Mauri Model takes the approach of incorporating health and hygiene considerations within the mauri of the community, and incorporating functional and technical considerations within the economic criterion. This has been done to better align the model with New Zealand policy on sustainability. Technical applicability is considered to be fundamentally a function of cost.

The Tangata Whenua evaluation is based on whether the option is identified as enhancing, diminishing, or neutral for the mauri of the aspect being considered. As mauri is a measure of the life-force in a particular living thing, then how the mauri is affected is a direct indication of the long-term viability and hence sustainability of a particular option from the Tangata Whenua perspective. The impact on the mauri is assessed independently from any weighting applied to each particular aspect.

There are five ratings for the mauri of each aspect. A rating of 4 is considered a viable practice, which enhances that mauri and is therefore totally sustainable. A rating of 2 is neutral, and a rating of 0 means that the practice is considered to be significantly diminishing that mauri and therefore unsustainable.

4.3. *Weighting of aspects*

The relative weighting for each aspect is chosen based on the Tangata Whenua understanding of traditional practices and how these relate to our ecosystem. The environment is considered the all-encompassing aspect being assessed and is given priority over the other aspects. In particular the environment encompasses culture as demonstrated by the practice of rahui (prohibition). A rahui is placed on an area or resource when its mauri is being jeopardised by overuse or some other significant event. This process prioritises the environment ahead of the other criteria until the mauri of that area or resource has recovered.

In terms of hierarchy the mauri of the hapu takes precedence over that of the community and the whanau (family). This is because of the relationship that exists between the Hapu and a specific geographic location, the rohe of that hapu. This relationship is permanent and established by whakapapa in the context of the Hapu practice of identifying with the geographical features of their specific environment. This relationship is eternal and the relationship to the landscape is central to the identity and mana of the hapu. The relationship that the community, or a whanau has with the environment is more transient than this traditional relationship.

The mauri or well being of the community takes precedence over that of the whanau. This is demonstrated in the sacrifices made by whanau to ensure the security of the community and hapu. Examples of this are the commitment of time and resources made by our kaumatua (elders) to counter the impact of external influences on the environment.

5. **Criteria for mauri assessment**

5.1. *The mauri of the environment*

The Tangata Whenua believe that the physical and spiritual integrity of our ecosystem is reflected by its' mauri and the state of the environment. This includes all land, air, flora and fauna, and water — nga taonga i tuku iho (treasures handed down). This holistic perspective is supported by the RMA1991, in that clause 7d) identifies the intrinsic values of ecosystems as being a matter for which practitioners shall have due regard.

Catchments are the natural partitions of the environment used by the Tangata Whenua to define the rohe of hapu. Thus the hapu is the appropriate traditional level for resource management decision making as the condition of a particular catchment and how it is managed impacts directly on the state of the environment and the standing and authority of the Tangata Whenua. Tangata whenua have for this reason stated that the mauri of water bodies must be protected.

The mauri of the environment is therefore measured in the context of both the physical health of the environment and its spiritual integrity. Consideration of the mauri in this context is related to the geographic boundaries established by a water catchment, the rohe of a specific hapu, and thus by definition includes consideration of the impacts of a specific practice on the waters within a specific catchment, and also the related impacts on estuaries, harbours and the ocean. The Tangata Whenua have stated that water is a taonga over which they have kaitiakitanga and in particular that cross rohe transfer, that is out-of-catchment transfer or disposal of wastewater or stormwater is a serious concern.

5.2. *The mauri of the hapu*

The mauri of the hapu is measured in a variety of ways some of which are described here:

- The condition of the environment that is passed on to future generations is most important and

can be demonstrated in whakatauki (proverbs) referring to nga whakatipuranga (descendents).

- The state of the environment that a particular hapu have mana over reflects on their authority to continue in the role of kaitiaki for that rohe. This is reinforced in clause 7(a) that states that the concept of Kaitiakitanga is a particular consideration for practitioners when carrying out any activities covered by the RMA 1991.
- Historically hapu have legally challenged the intentions of local and central government to prevent the discharge of sewage into rivers, lakes, estuaries and the ocean. These hapu have stated that the actions to protect the waters of these catchments shall be on-going and all-encompassing from their source continued throughout the catchment to its connection with the ocean. Further the mauri of the hapu is related to the mauri of the waters in the catchment and the ocean.
- The state of the environment also influences the ability of a hapu to manaki (respect) their visitors both on their marae (communal gathering places) and in their homes. Historically this ability to provide regional delicacies has been and continues to be an important part of the hapu identity.
- Maintenance of the knowledge base for the hapu is also linked to the physical landscape and its appearance as the whakapapa of the hapu includes the place names within the rohe. Many pepeha (hapu specific proverbs) identify the origins of each hapu in association with geographic features such as mountains and areas of occupation but always the water source and the significant water body to which the hapu claimed rights. The mauri of areas of cultural significance are to be protected, thus there exists a preference for no infrastructure to be located on ancestral sites.
- The ability of tohunga (experts) to teach traditional practices such as weaving, customary food gathering, or carving is also dependent on the resources being available from the rohe.

Thus hapu are vigilant in protecting the mauri of cultural resources.

These factors among many others impact directly on the mauri of the hapu and are relevant in any assessment of sustainability. This aspect of an analysis should always be carried out by the Tangata Whenua.

5.3. The mauri of the community

The community at large includes non-Maori and taurahere (other Maori) as well as the Tangata Whenua. The general health, safety and wellbeing of the community is important in this context and includes the ability to accommodate future needs such as land availability to satisfy housing demand or create employment opportunities.

Community wellbeing includes most aspects of day-to-day life such as recreational access to parks, forests, beaches, reserves, rivers, lakes, estuaries and the ocean or opportunities for employment. This aspect of wellbeing is reasonably well represented by Local Authority decision making in their current capacity of providing local government although historically this has taken place in a relatively narrow consideration of issues that relate to the community at large.

5.4. The mauri of the whanau

This is a measure of the direct personal effect that a specific technique will have. The way that this is perceived varies from whanau to whanau. The relevance of the state of the environment and the status of the hapu are taken into account under these specific considerations. The health and wellbeing of the whanau are taken into account within the context of the mauri of the community. Thus the direct personal effect is how the whanau or family is affected and this is primarily measured in economic terms in today's world.

Therefore, it may be considered as the impact of a particular infrastructure choice on an individual, for example, as levied directly in terms of individual contribution to Development Impact Fees, or

through allocation of a portion of rates to repay long term debt incurred by local government. In either case, there is no discretion on the part of whanau to allocate these financial resources to other priorities such as sustenance, electricity or accommodation.

This context of consideration of impact tends to be the level of analysis best understood when considering options available for technological solutions for an infrastructure requirement.

6. Infrastructure analysis

The use of indigenous perspectives to assist the evaluation of robustness in engineering design

has yet to be fully investigated. However, the different prioritisation of values identified in models such as the Mauri Model holds common ground with more recent research. Low Impact Urban Design (LIUD) is an example of this.

An analysis of the relative sustainability of selected infrastructure options associated with water recycling is shown in Table 1. This analysis has been carried out from the perspective of the Tangata Whenua using the Mauri Model. It has demonstrated that there is general agreement with regard to the sustainability of techniques associated with best practice stormwater solutions being used in Europe and being considered for adoption in New Zealand.

Table 1
Water recycling technique analysis using the Mauri Model

Opt	Technique	Tool	Wh	Cm	Ha	Env	WA	Rating, %	MEng, %
1	Peak leveling	Rainwater tanks	1	3	4	4	3.5	87.5	67.0
2	Peak leveling	Neighbourhood tank	2	4	3	3	3.1	77.5	75.0
3	Greywater use	To flush toilets	3	3	0	1	1.2	30.0	50.0
4	Greywater use	To garden	1	2	2	4	2.5	62.5	50.0
5	Greywater use	Public space irrigation	2	3	3	4	3.2	80.0	59.0
6	Rainwater use	Rainwater tanks	2	4	4	4	3.8	95.0	67.0
7	Rainwater use	Rainwater tanks + topup	3	4	4	4	3.9	97.5	50.0
8	Stormwater use	Pond to public space irrigation	3	4	4	4	3.9	97.5	84.0
9	Stormwater use	Pond to flush toilets	1	2	0	0	0.5	12.5	75.0
10	Stormwater use	Pond to garden	2	3	4	4	3.6	90.0	75.0
11	Stormwater use	Neighbourhood carwash	2	4	3	3	3.1	77.5	75.0
12	Wastewater reuse	Treat onsite to flush toilets	1	3	0	3	1.6	40.0	42.0
13	Wastewater reuse	Treat onsite to garden	1	2	4	4	3.3	82.5	42.0
14	Wastewater reuse	Supply treated to flush toilets	2	2	0	2	1.2	30.0	25.0
15	Wastewater reuse	Supply treated to garden	0	2	3	3	2.5	62.5	25.0
16	Wastewater reuse	Supply treated wastewater	0	1	0	4	1.4	35.0	17.0
17	Combined use	Onsite grey/stormwater to garden	3	4	4	4	3.9	97.5	42.0
18	Combined use	Local grey/stormwater to flush	2	3	0	0	0.8	20.0	42.0
19	Combined use	Local grey/stormwater to garden	3	3	4	4	3.7	92.5	42.0
20	Alt. toilets	Urine separation via domestic	1	3	3	4	3.1	77.5	50.0
21	Alt. toilets	Separating toilets	1	3	3	4	3.1	77.5	50.0
22	Alt. toilets	Composting toilets	1	2	4	4	3.3	83.0	58.0

Wh = whanau, Cm = community, Ha = hapu, Env = environment, WA = weighted average, MEng = municipal engineering analysis.

Notes: 1. The weighted average is obtained from the formula $WA = Wh \times 0.1 + Cm \times 0.2 + Ha \times 0.3 + Env \times 0.4$

2. The sustainability rating is obtained from the formula $Rating = WA/4 \times 100\%$

3. The MEng rating was obtained from a separate analysis based on a modification of the Hellstrom model.

Similar ratings for several of the stormwater techniques occur predominantly where a recycled use is associated with returning the water to Papatuanuku. General comparison of stormwater management techniques demonstrates a high level of agreement with the exception of stormwater reticulation and the disposal of treated stormwater to water bodies. Both of these options rate poorly for sustainability using the Mauri Model. This could demonstrate the relatively limited recognition of the impacts that the concentrated disposal of stormwater to water bodies has. These discharges interfere significantly with the local receiving environment during normal flow conditions, however can have an irreversible impact following flood events due to the flushing effect through that ecosystem. Therefore, from a Tangata Whenua perspective, an incentive exists to reuse the stormwater flow or recycle this water.

A selection of the specific techniques analysed is provided in Table 1.

Comparison of the assessment results for the wastewater treatment and disposal techniques also demonstrated some agreement. However, a general trend is that while the Mauri Model rated non water-based composting toilet systems higher in terms of sustainability, it also rated all reticulated systems lower, and in particular the conventional pipe in/pipe out approaches shown in Table 2. The recycling of wastewater for other uses was rated

more sustainable than discharge to water bodies for particular uses again for reasons associated with returning the water to Papatuanuku. For this reason the disposal of recycled wastewater to land was the higher rated option.

Conventional infrastructure techniques are provided in Table 2 for comparison.

7. Discussion

In environmental, cultural, social, and economic terms, sustainable urban water infrastructure is developed and operated in harmony with natural water cycles and water catchments. The Tangata Whenua perspectives incorporated into the Mauri Model would tend to suggest that this is the case. From a Tangata Whenua perspective, an integrated holistic approach to management is required. Integrated holistic approaches therefore need to:

- Maintain sufficient water flow to support ecosystems
- Increase water use efficiency and recycling
- Decrease wastage of the water resource
- Reduce, recycle or eliminate wastewater flow
- Reduce, recycle or eliminate stormwater flow
- Encompass the views of Tangata Whenua

These objectives are not often satisfied in conventional assessments of infrastructure requirements for communities as while the merits of these

Table 2
Analysis of conventional approaches using the Mauri Model

Opt	Technique	Tool	Wh	Cm	Ha	Env	WA	Rating, %	MEng, %
1	Pipe in and out	Reticulated water supply	4	2	2	3	2.5	62.5	75.0
2	Pipe in and out	Reticulated wastewater	3	2	0	0	0.7	17.5	75.0
3	Pipe in and out	Reticulated stormwater	2	2	0	0	0.6	15.0	59.0

Wh = whanau, Cm = community, Ha = hapu, Env = environment, WA = weighted average, MEng = municipal engineering analysis.

Notes: 1. The weighted average is obtained from the formula $WA = Wh \times 0.1 + Cm \times 0.2 + Ha \times 0.3 + Env \times 0.4$

2. The sustainability rating is obtained from the formula $Rating = WA/4 \times 100\%$

3. The MEng rating was obtained from a separate analysis based on a modification of the Hellstrom model.

approaches can be readily understood, many of the technical solutions delivering them result in a cost premium for the development. Thus recommendations for infrastructure solutions become driven by more immediate cost considerations that are based on relatively short timeframes.

What is needed then is a model that places the juxtaposed paradigms of conventional municipal engineering and the Tangata Whenua on a level playing field, and allows identification of the issues that are most contentious but also and more importantly identifies the issues upon which the two paradigms are in agreement. This common ground is sought as the basis for a positive relationship between the local authority and the Tangata Whenua.

It is possible to develop resource management policy and engineering design solutions consistently. The reality however is that the choice of what options are investigated and developed further, is strongly influenced by a practitioners background. Industry experience has identified the need for a model that can be used to identify and explain the different planning and engineering priorities that result when practitioners develop solutions from different cultural backgrounds to the Tangata Whenua.

An issue not addressed in this model however is the appropriate timeframe for consideration and analysis. Approaches that use timeframes less than or equal to the 50 year scope of many of the New Zealand sub-regional strategies are not considered appropriate. The timeframes applicable should be at least “the mokopuna of the mokopuna (grandchild)” or a minimum of 150 years [8].

8. Conclusions

In assessing the sustainability of infrastructure solutions related to water recycling, the potential contribution of a Tangata Whenua perspective has been considered in the context of the Mauri Model. This model can assist decision-making by

identifying significant differences as well as common preferences and therefore help to ensure that the choice of solution is balanced with regard to our social, economic, environmental and cultural well being.

Glossary

Hapu	Clan group associated with a particular rohe
Iwi	Tribal grouping of several hapu
Kaitiakitanga	Ethic of guardianship
Kaumatua	Elders
Mana	Authority, status or prestige of the hapu
Manaki	Respect, acknowledge, care for
Marae	Communal gathering places
Mauri	Binding force between physical and spiritual
Mokopuna	Grandchild
Nga Puna o Nga Atua	The weeping of Papa
Nga Roimata o Ranginui	The tears of Ranginui
Nga Taonga i tuku iho	Those treasures passed down generation to generation
Nga whakatipuranga	Descendents
Noa	Profane
Papatuanuku	Papa the earth mother
Pepeha	Hapu specific proverbs
Rahui	Prohibition
Ranginui Ranginui	The sky father
Rohe	Geographic region typically a water catchment
Tane Mahuta, Tangaroa	Deities in traditional genealogies
Tangata Whenua	People of the Land (New Zealand Maori)
Taonga	Treasure
Tapu	Sacred
Taurahere	Maori from outside the area
Tinana	Physical being
Tohunga	Experts
Wairua	Spiritual being
Waitangi Tribunal	Created by government to hear historic grievances
Whakapapa	Genealogy
Whakatauki	Proverbs
Whanau	Extended family of three generations living together

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