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Chapter 3

WAIKATO TANIWHARAU: PRIORITISING COMPETING NEEDS IN THE MANAGEMENT OF THE WAIKATO RIVER

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ABSTRACT

The Waikato River system is New Zealand's longest river and has significant spiritual relevance for the Waikato-Tainui people and other river iwi, who regard it as an indicator of their mauri or well-being, and central to their identity. The Waikato has also been the focus of on-going tensions between Māori cultural and spiritual values and beliefs, and national engineering objectives. The Waikato River was the primary source of food, transportation and communications link for the region and of pivotal military significance in the New Zealand land wars of the 19th Century. The river system is also a strategic asset for power generation and the flow has been extensively modified with the engineering of dams, lakes, tunnels and canals used to generate one sixth of New Zealand's total electrical generating capacity via the Waikato and Tongariro Power schemes.

Large scale deforestation in combination with altered hydrologic characteristics have resulted in siltation of the once navigable river. The Waikato is impacted upon by numerous sources of pollution including; Arsenic from a Geothermal Power Station; nutrient enrichment from fertilizer and effluent spreading practices in dairy farming; more than 80 point source discharges to the main stem; and 1,600 discharges to its tributaries.

The river system contains numerous fish types and has an international reputation for fishing. More than twenty communities extract and treat its waters for potable use including Auckland City. Historic practices resulted in significant adverse impacts on water quality and the mauri of the Waikato. The river is now administered by a regional council. These attributes make the Waikato River a complex management challenge: a

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contemporary relevance of the widely known metaphor; Waikato Taniwharau (Waikato with hundreds of guardians).

Aotearoa New Zealand is currently resolving policy issues for the effective management of its fresh water resource. A national survey of opinion in 2005 distilled public priorities for fresh water management. The Freshwater for a Sustainable Future consultation identified many concerns and that the management of these resources is not being carried out in a sustainable manner. The Land and Water forum acknowledged many of these issues in the National Policy on Fresh Water (2010). The New Zealand government is currently preparing to sell down its 100% control of the hydro generation assets on the river, through a sale of shares in the State owned Enterprises that manage these assets.

During the initial public consultation, responses from Māori, the indigenous peoples of Aotearoa New Zealand, indicated that there existed significant dissatisfaction with past management and a lack of confidence in future policy and water management decision making. The dissatisfaction manifested as broad opposition to and indifference towards participation in consultation. In subsequent years, some Māori groups have nevertheless chosen to engage in research processes seeking improvements on past practice. A Decision Making Framework (DMF) developed in 2004 has been adopted in several of these proposals due to its ability to balance the competing priorities of engineers representing the dominant western worldview and Māori, the Tangata Whenua (people of the land).

The Mauri Model DMF is unique in its approach to the management of water resources as the framework offers a transparent and inclusive approach to considering the environmental, economic, social and cultural aspects of decisions being contemplated. The Mauri Model DMF is unique because it is capable of including multiple-worldviews and adopts mauri (intrinsic value or well-being) in the place of money based assessments of pseudo sustainability using Cost Benefit Analysis.

The Mauri Model DMF does this using a two stage process that first identifies participants' worldviews and inherent bias regarding water resource management, and then facilitates transparent assessment of selected sustainability performance indicators. The assessment can then be contemplated as the separate environmental, economic, social and cultural dimensions of the decision, collectively as an overall result; or the priorities associated with different worldviews can be applied to determine the sensitivity of the result to different cultural contexts or worldviews.

A sustainability assessment for the Waikato River is presented within the context of new co-management aspirations that require decision making to reflect the values of both the Government and the Waikato-Tainui peoples. How might the Mauri Model contribute in the complex context of co-management of the Waikato River? Three existing resource uses are assessed to illustrate the contribution that alternative frameworks can make to an enhanced understanding of the challenges that the new co-management regime will need to overcome.

Keywords: Joint Management, Mauri, Decision Making, Water Management, Multi-criterion Decision Making, Waikato River, Systems Thinking, Indigenous Knowledge, Environmental and Cultural Sustainability, Mauri

GLOSSARY

Aotearoa	New Zealand (Land of the long white cloud)
Atua	Deity, of the gods

Hapū	Subset of Iwi associated with resource allocation or management
Iwi	Tribal group claiming decent from a common ancestor
Kaitiakitanga	Practice of enhancing mauri by Tangata Whenua
Mana	Authority, status or prestige of the hapu
Manaaki	Prestige associated with caring well for visitors
Māori	Indigenous people of New Zealand
Mātauranga Māori	Indigenous knowledge of the Māori people of Aotearoa
Mauri	Capacity to support life, uniqueness of things animate and inanimate
Ngā Puna o Ngā Atua	Weeping of Papa (wellsprings)
Ngā Roimata o Ranginui	Tears of Rangi (rainfall)
Noa	Profane
Papatūānuku	Mother earth
Pepeha	Hapu specific proverbs
Rohe	Geographic region typically a water catchment
Rāhui	Ritual prohibition either placed on a place, or part of a river, part of a foreshore or on certain resources
Ranginui	Rangi the sky father
Tangata	People, individual
Tangata Whenua	People of the Land with authority over that place (New Zealand Māori)
Tapu	Sacred
Taonga	Treasure/anything highly valued by Māori
Tino rangatiratanga	Self determination
Tīpuna	Ancestors
Tiriti	The Treaty of Waitangi (TOW)
Wahi tapu	Sacred place
Whakapapa	Geneology
Whakatauki	Proverb or saying
Wai	Water
Waitangi	The location at which the Treaty was signed in 1840
Whānau	Multi-generational family unit typically residing in a single household
Wharekura	The first indigenous house of learning / knowledge

INTRODUCTION

Recent settlements of Treaty of Waitangi claims require the inclusion of Māori input into water management, typically through mechanisms of Joint Management. Many of the tools available that facilitate joint management have not been developed specifically for Aotearoa, New Zealand. These tools struggle with ‘the dichotomy of wai’; that is, the tensions that exist between the conceptualisation of water as a taonga on one hand and as a property right on the other.

Hapū and iwi embody direct relationships to their waters and their geographic regions, conceptually reinforced in their pepeha and whakatauki (Morgan, 2007). Water bodies, the Waikato River in this case, are key elements in the identity, whakapapa and mana of hapū and iwi. The people of Waikato-Tainui are a river people. Over centuries, the life of the river became inseparable from the life of the people, and each took the name of the other, hence the understanding of the Waikato as their 'tupuna awa' or river ancestor (King, 1977).

In her paper discussing knowledge systems of the Waikato River, Muru-Lanning (2007) identifies the epistemological differences in the two knowledge systems that create the dichotomy of wai referred to above. Muru-Lanning argues that the Māori perception of the Waikato as a 'tupuna awa', or river ancestor, belongs to a distinctly different knowledge system from that which describes it as a sustainable or renewable resource. The distinction made is that the terms 'sustainable resource' and 'renewable resource' refer only to the economically important parts of the Waikato River.

From a western perspective, power-generation companies such as Mighty River Power who use the term 'sustainable resource', and Genesis Energy who use the term 'renewable resource', could be considered less exploitative or destructive commercial users of the Waikato compared to other industries. Yet even their use of the Waikato is considered an imposition by river iwi. The seven hydro dams owned by Mighty River Power have been described by river iwi as constricting the mauri of the Waikato awa like 'a rubber band on one's arm'. The discharge of cooling waters from Genesis Energy thermal power station into the river at Huntly is also considered to diminish the mauri of the Waikato.

Resource management in Aotearoa New Zealand is guided by legislation passed into law in 1991. The Resource Management Act requires taking into account the environmental, cultural, social and economic effects of our actions. This quartet of dimensions states that in law a cultural dimension should be considered equally alongside the usual triple bottom line dimensions acknowledged internationally.

It is suggested here that the different perceptions of the Waikato River strongly delineate western capitalism and indigenous wisdom. The distinction is framed as a preferential focus on either the economic well-being (effects of our actions) or the cultural well-being (iwi identity) respectively. This distinction is also a potential agitator of the historic adversarial relationships regarding past management of the Waikato River.

It is this context, a very common occurrence in Aotearoa New Zealand, that motivated the creation of the Mauri Model Decision Making Framework. This paper considers whether the Mauri Model could assist with the joint management process for the Waikato River.

WAITANGI TRIBUNAL CLAIM PRECEDENTS

The Waitangi Tribunal is a permanent commission of inquiry charged with investigating claims by the indigenous Māori as to Crown breaches of Treaty of Waitangi principles. A key principle is the Crown's duty to actively protect taonga, a concept that includes natural resources treasured by Māori. It is not surprising that water features strongly in the earliest Waitangi Tribunal reports. Before the indigenous peoples of Aotearoa New Zealand adopted a shared identity as Māori they were identified by tribal and sub-tribal affiliations. Though each tribal group maintained its own traditions, all are inextricably bound to the environment,

especially to waterways, by virtue of whakapapa (genealogy) which derives from the creation stories of humankind in Māori cosmology. They see themselves as direct descendants of the earth mother and sky father, hence sayings such as 'ko au te awa, ko te awa ko au', or 'I am the river and the river is me'. This interconnectedness lies at the heart of the way many Māori view the world and their waterways and is the basis for the unique environmental ethic of kaitiakitanga which dictates, among other things, that the mauri of waterways must be respected as a matter of priority.

A consistent theme of indigenous opposition reported by the Waitangi Tribunal introduces a spiritual and cultural perspective of the environment that hitherto had not been considered in resource management decision making in Aotearoa New Zealand. Early claims to the Tribunal including Motunui-Waitara, Kaituna and Manukau to name a few, concerned themselves with the impacts that engineering projects were having on the environment. Indigenous concepts raised in the Tribunal hearings for these cases included;

- The retention of intrinsic values / mauri
- Rangatiratanga
- Spiritual and cultural values based on a Māori world view
- Kaitiakitanga and manaakitanga
- Ngā whakatipuranga / future generations of descendents

These early claims culminated in a series of abandoned engineering projects that had threatened serious impacts upon the mauri of the receiving waters in each case. The abandoned projects also reflected a significant waste of engineering effort, expended with an inadequate understanding of the full social context within which these projects were being proposed. The government eventually responded to this unacceptable situation by introducing legislation intended to make provision for mātauranga Māori (indigenous knowledge).

The Resource Management Act 1991 (RMA) is the principal statute that regulates for the sustainable management of the environment. The RMA contains various requirements to take Māori interests into account in planning processes. The explicit purpose of the RMA is 'sustainable management': sustaining the potential of natural and physical resources to meet the reasonably foreseeable needs of future generations; safeguarding the life-supporting capacity of air, water, soil, and ecosystems; and avoiding, remedying, or mitigating any adverse effects of activities on the environment. Under the RMA, regional councils are primarily responsible for managing freshwater. Section 6 requires decision makers, such as councils, to recognise and provide for matters of 'national importance' which include the protection of wetlands, lakes and rivers; and indigenous relationships with their ancestral lands, water, significant and sacred sites; and other things treasured by Māori. Decision makers must also have regard to eight matters under section 7, the first being 'kaitiakitanga' – the 'exercise of guardianship by the tangata whenua of an area in accordance with tikanga Māori in relation to natural and physical resources; and includes the ethic of stewardship'. In achieving the purpose of the RMA, section 8 requires that decision makers 'take into account' the principles of the Treaty of Waitangi.

Roberts asserts that the recognition of Māori relationships includes intangible aspects such as the spiritual dimension and that everything in the natural world possesses mauri (Roberts, 2002). Mauri is a concept that permeates all Māori thinking and is significant

enough to non-Māori almost to have been included in the RMA. The original wording of the Resource Management Bill introduced into parliament identified the mauri of ecosystems as a matter of national importance (Durie, 1998). This was subsequently amended to read the intrinsic values of ecosystems instead, before the bill was passed into law.

Though the provisions of the RMA clearly intended for Māori interests in the environment to be recognised, such interests are vulnerable when presented as just one of many other considerations that decision-makers must take into account.

There are other concerns with the RMA ranging from specific habitats to governance. (Te Aho, 2005). Accordingly, the Waikato-Tainui people, like many other Māori claimant groups, turned to the Treaty of Waitangi settlement process of negotiating settlements directly with the Crown to reinstate their rangatiratanga and mana to influence decision making regarding the Waikato awa. The outcome is the joint management process that has recently been established.

This new management and governance model replaces the previous regime that has excluded Waikato Iwi influence on decision making for almost 150 years and allowed a range of users relatively unrestricted exploitation of parts of the Waikato River.

DIFFERENT CONTEXTS OF THE WAIKATO RIVER

The Waikato River system is the longest river in New Zealand extending 425 kilometres (Environment Waikato, 2009a) from the eastern slopes of Mount Ruapehu to the Tasman Sea and incorporating eight engineered lakes and many tributaries. It includes and drains from Taupō at the lake's north-eastern-most point, creating the Huka Falls, then meanders northwest, through the Waikato Plains increasing in size at the confluence with its main tributary the Waipa River.

Over generations the people of the Waikato River developed laws and practices which reflect a profound respect for the Waikato River and the life within. These related to the blessing of children, of cleansing, and of healing. Swampy lowlands and the river provided flax for weaving, and water fowl and eels for food. In the mid 19th Century, the river and its tributaries were famous for an abundance of food such as eel, freshwater crayfish, and whitebait. (Te Aho, 2009). The Waikato River also has healing powers and a significant spiritual relevance for river iwi such as Waikato-Tainui, who regard it as a source of mana (prestige) and an indicator of their mauri or well-being. The significance and spiritual relevance of the Waikato is captured in the proverb *He Piko He Taniwha He Piko He Taniwha,* meaning metaphorically at every river bend there is a Waikato chief. It also has the literal translation, at every river bend a spiritual guardian (taniwha). These metaphors continue to influence thinking today. An example is that in 2002, the taniwha *Karutahi*, thwarted construction of the State Highway 1 realignment for several months (Nalder, 2006), a suitable metaphor for the on-going tensions between Māori spiritual values and beliefs, and economically driven engineering objectives.

Historically the Waikato was a primary transportation and communications link for the region and of military significance in the New Zealand land wars between British colonial forces and Māori during the 1860's with the river playing a strategic role in the battle fought at Rangiriri. Resulting from these wars and the subsequent extensive land and asset

confiscations the relationship between the Waikato people and the Waikato awa was diminished. For a century and a half, the tenuous relationship has been marginalised by river management practices that have ignored the values and beliefs of iwi such as Waikato-Tainui. The river system was identified as a strategic asset for power generation almost a century hence. Since the Horahora hydro-electric power station (now located deep beneath the surface of Lake Karāpiro) was built to supply electricity for the Martha gold mines at Waihi in 1913, the Waikato river flow has been extensively modified with the engineering of dams, lakes, tunnels and canals used to generate hydroelectric power in the Waikato and the Tongariro Power schemes built on the headwaters of the Tongariro and Whanganui River systems. The hydro schemes are shown in Figure 1 below.

The diversion of the Whanganui River in 1973 (which naturally flows southwest from Ruapehu) now directs a large proportion of flow north via canals and tunnels to the Rangipō Power Station (120MW) and then the Tokānu Power Station (160MW) which empties into Taupō increasing the flow in the Waikato (Miles, 1984).

Figure 1. Taupo / Waikato Catchment Hydro Stations (Mighty River Power).

The Waikato power scheme begins at Taupō, which has control gates regulating the discharge, and then flows through a series of eight hydroelectric power stations built between 1929 and 1973. Approximately 5400 gigawatt hours (GWh) of electricity are generated annually by the schemes, approximately one sixth of New Zealand's total electrical generating capacity (Mighty River Power, 2009).

The Waikato River and its hydro lakes are home to more than 19 types of native fish and 10 types of introduced fish (Wikipedia, 2009). The introduced species have had a significant impact on the Waikato river ecosystem. Some species in particular, brown and rainbow trout have given the Tongariro river system and Taupō an international reputation for fishing. Other recreational uses include a wide range of water sports such as kayaking, power boating, water skiing, rowing, and swimming.

Other power generation types located on the Waikato River include geothermal, gas and coal fired. High Arsenic and Boron concentrations occur immediately downstream of the Wairākei Geothermal Power Station significantly modifying the quality of water discharging from Taupo where water quality is classed as excellent. In places the Arsenic concentration reaches 0.035 mg/l (TeAra, 2009) which exceeds the WHO guidelines of 0.01 mg/l (World Health Organization, 2006). The Waikato is also the source and repository for cooling water for the coal and gas fired thermal power stations at Huntly. Via resource consent conditions, power station discharges are constrained to protect aquatic life, specifically the quantity of water that can be removed by the stations and the maximum temperature of the cooling water when returned to the river (25°C). A number of significant impacts have resulted from these power generation developments including sediment, nutrient and mineral level increases, nuisance aquatic plants and phytoplankton growth occur in the slower flowing river, and the water class for the lower Waikato is nutrient-enriched (Environment Waikato, 2003). Land management practices have also contributed to these impacts.

The Waikato River has a catchment area of 14250 square kilometres(Environment Waikato, 2009a) a significant proportion of which was converted from indigenous rainforest to intensive agriculture following the land wars. Some agricultural uses have reverted to exotic Pinus Radiata plantations for subsequent harvesting. Mismanagement of nitrogen fertilizer and effluent spreading practices in dairy farming cause significant agricultural pollution which is leached into groundwater and carried into water courses by runoff. The indigenous deforestation throughout the catchment in combination with the altered hydrologic characteristics due to the series of hydro-electric power stations has resulted in the siltation of the once navigable channel in the river with loose soils from eroded farmland.

The Waikato is impacted upon by numerous sources of pollution. There are currently more than 80 point source discharges to the main stem of the Waikato River 40% of which are classed as large and a further 1,600 discharges to its tributaries. Thousands of cubic metres of wastewater are discharged daily from nine municipal treatment plants into the Waikato from most of the communities sited along its reaches. Other point source discharges include the Kinleith pulp and paper mill, the Te Rapa dairy factory, and the meat works at Horotiu all strategically sited on the banks of the river. Unlined waste dumps line the river with industrial and metropolitan waste leachates being a constant source of pollutant from these poorly designed and located landfills. These include the unlined waste dump at Horotiu whose leachates include persistent organic pollutants such as dieldrin in quantities toxic to freshwater marine life. The continued operation of this dump is associated with the occurrence of dead, disordered and distressed fish in the area (Environment Waikato, 2009b).

Some of these sites have been repatriated for community use such as the the Hamilton city dump capped with a clay lining and developed as the Hamilton Rose Gardens incorporating the largest toilet extension in the world, a 1100m2 exhibition complex constructed in 1988. The Ngaruawahia dump was purchased by Te Puea Herangi in the early 1920s to establish a national marae for the Kīngitanga, the meeting house *Mahinarangi* being opened in 1929. Waikato-Tainui host an annual regatta at Tūrangawaewae on the Waikato River which incorporates traditional water-based activities such as waka (canoe) hurdles, waka ama racing, and the waka tauā (carved 60 man canoes) display.

More than twenty communities sited along the Waikato, extract and treat its waters for potable use. In 2002 the completion of a $155 million infrastructure project allowed Auckland City to extract 75,000 m3 water daily from a water intake near the seaward end of the river that now supplements up to 10% of the city's domestic water supply. At the time, the Waikato River Water Treatment Plant was the most sophisticated plant in Australasia and uses membrane filter technology.

Western societies relate to water in terms of its economic value. Thus relationships are created through the granting of a property right that enables the exploitation of characteristics of a water body for direct or indirect economic gain. The whole length of the river has historically been administered by Environment Waikato, the Regional Council. Historic planning practices combined with engineering and scientific technologies have enabled western development that result in water quality down-grading over its upper reaches from excellent to nutrient enriched, and has significantly impacted upon the mauri of the Waikato.

CONCEPTUAL CONFLICT

Muru-Lanning (2007) researched the dichotomy of the Waikato River evaluating the interaction of the 'tupuna awa' and 'sustainable resource' knowledge systems using the perception of these as cultural landscapes. She observes that Waikato iwi construct the knowledge system associated with their 'tupuna awa' using tikanga as the basis supported by western knowledge systems; and in contrast, the 'sustainable resource' knowledge system is shaped by ideas emerging out of western capitalism, environmentalism, neo-liberalism and science. The difference is that the 'tupuna awa' knowledge system is an integrated holistic understanding, while the collection of ideas that make up the 'sustainable resource' knowledge system are disjointed, competing to dominate the decision making process.

> It is evident that when tupuna awa knowledge is forced to merge with sustainable resource knowledge, philosophical tensions appear. Embedded within tupuna awa is a wealth of Māori knowledge which includes the collecting and harvesting of customary foods; maintaining water quality; access and use of the river; prohibiting behaviours and activities; purification rituals; ceremonies for group interactions; identification and access to sacred sites and guardianship obligations (Muru-Lanning, 2007).

The contemporary management of water in Aotearoa New Zealand is based on the historic practice of resource consumption facilitated by property rights. Contemporary Western society participation in and commitment to Joint Management assumes that Māori concepts can be integrated within this approach. Conversely Muru-Lanning asserts that while

the ‘tupuna awa’ knowledge system competently deals with both the physical and spiritual attributes of the Waikato ……the ‘sustainable resource’ knowledge system does not. This economic focus of western science is a fundamental flaw within most western concepts of sustainability. It is a problem for western society as it is unwise to measure sustainability using a metric that constantly diminishes in value.

An alternative metric to money could provide an enhanced understanding of the decision making context and more holistic integration of all the issues that require consideration. The Mauri Model adopts mauri in place of money to address this problem.

An Alternative Approach: The Mauri Model Decision Making Framework

The Mauri Model takes an alternative approach and considers how these diametrically opposed perspectives can be synthesised to facilitate better management of the Waikato. There needs to be an acknowledgement that historic management excluding the Waikato people has been less than perfect. Further that the future management of the Waikato awa can not only benefit from the combination of both western science and indigenous wisdom knowledge sources, but must do so to gain political acceptance.

Indigeneity is described by Durie (2005) as; Unity with the environment (holistic); Geographic relationship/belonging (relevance); Endurance over many generations (time); Development of a distinctive culture (identity); System of knowledge; A unique language; and epitomises sustainability. Indigeneity is in this context an enduring relationship between peoples, their territories, and the natural environment. Durie’s definition suggests that the facets of indigeneity identified ultimately culminate in sustainable practices and beliefs. This suggests that these facets of indigeneity may be what is missing from current sustainability thinking in the western sense.

This definition parallels the understanding of the relationship that the Waikato Iwi have with the Waikato awa, and Durie describes this relationship as the epitome of sustainability. This strategy of sustainability has been practiced over many centuries to ensure the survival of the Waikato epistemology and ontology in relation to the Waikato. Muru-Lanning points out that western knowledge systems struggle to incorporate the meta-physical concerns that can readily be acknowledged and indeed underpin the Waikato understanding of the Waikato as a ‘tupuna awa’.

Returning the discussion to the indigenous concepts raised in Waitangi Tribunal hearings, a more thorough discussion of mauri, kaitiakitanga and manaakitanga is required. In the context of kaitiakitanga, Barlow (1991) provides an alternative definition of mauri, as a special power only of the gods. Mauri makes existence possible. Mauri is the force created by the mana of the atua that binds the two parts of body and spirit. This definition is reiterated in Durie (1998) as the binding force between the physical and the spiritual.

The central proposition underpinning the Mauri Model is that mauri is the binding force, the power of the gods (Barlow, 1991), the fusion that makes it possible for everything to exist, by holding the physical and spiritual elements of a being or thing together in unison. When actions impact negatively upon the mauri of something, this essential bond is weakened, and can potentially result in the separation of the physical and spiritual elements resulting in the death of a living thing or alternatively the loss of a thing’s capacity to support other life (Morgan, 2008).

Mauri is therefore the base metric, as the mechanism that facilitates kaitiakitanga is the practice of continuously valuing and enhancing mauri. If the mauri of a forest or river is not respected it will not flourish, but rather it will loose its vitality and fruitfulness. The life of the forest or river must not constantly be dominated by that of man. The natural, healthy and proper state is one of balance (Patterson, 1992).

Traditional rituals and practices regarding mauri provide both an indication of the broad extent of the concept's relevance in Māori life and a deeper understanding for the reader. Reference is made to the following examples:

King (1978) stated that when acquiring knowledge the recipient benefited from the transfer of the mauri (aura, life force) of the knowledge being given particularly knowledge of ritual or genealogy, and conversely Rangihau (1977) stated that when passing on tapu information you shed part of your mauri, reinforcing the notion that sacred knowledge is a taonga, a valued possession that should not be shared without consideration of the future implications for the use of that knowledge.

The mauri of ecosystems was actively managed to ensure conservation for current and future generations. Exploitation, depletion, degeneration of a resource and the pollution of the environment to the extent that pro-life processes within the ecosystems of Papatūānuku might collapse was prevented with the institution of rāhui. To aid the processes of recovery and regeneration, a ritual would be conducted, concentrating the mauri of the species within a stone which would be placed within the area encompassed by the rāhui or on a fishing ground (Marsden, 1992).

Tāne planted three mauri in Wharekura, the first whare wānanga. Mauri Atua (mauri of the gods), Mauri Tangata (mauri of the Tangata Whenua), and Mauri Manaaki (mauri of the guests and visitors). Manaaki means to bestow a blessing, the presence of visitors being a blessing on the hosts, and in fulfilling the reciprocal relationship the tangata whenua giving the best of their provisions in the hākari (shared meal) *(ibid*).

To a degree this act of Tāne helps to frame the contemporary relevance of mauri in joint management decision making. The four well-being dimensions identified in the Resource Management Act can be seen to have parallels in the Māori worldview. The parallels are suggested as:

Mauri Atua	Ecosystem (Environmental Well-being)
Mauri Tangata	Whanau (Economic Well-being)
Mauri Manaaki	Western Society (Social Well-being)
Mauri Iwi / Hapū	Identity (Cultural Well-being)

The additional Mauri dimension is necessary in our bi-cultural society to reflect the intentions of the Treaty of Waitangi. Harmsworth et. al.(2002) first proposed a framework for conceptualising Māori sustainable development that sets goals much wider than those focused solely on economics. The framework advocates the separate consideration of cultural objectives and proposed the addition of this dimension to sustainability assessment effectively introducing quadruple bottom line reporting. This philosophy is attributed to Durie (1998, (Durie, 2000) and Winiata (2000) by the authors and described below;

> A cultural and social assessment is essential to identify the cultural health and condition of Māori well-being in Aotearoa New Zealand, and to build a strong cultural, economic, and

social base to capitalise on future development opportunities whilst maintaining cultural integrity and resilience (Harmsworth et al, 2002).

If these parallels are accepted, the integration of the mauri concept with western decision support techniques designed to deal with complexity facilitates the first stage of the Mauri Model Decision Making Framework which is the prioritisation of dimensions to reflect the western capitalist and Māori worldviews, aiding communication and cross-cultural understanding. This initial stage allows the bias of stakeholders to guide the identification and selection of appropriate performance indicators for a sustainability assessment. A transparent assessment can then be carried out for the performance indicators using the second stage, the Mauriometer. The results from the Mauriometer assessment are then subjected to a sensitivity analysis. This is done by applying the stakeholder bias / priorities to the raw scores attributed by the Mauriometer to check the result for sensitivity to different worldviews.

Thus mauri is the central concept through which the Mauri Model Decision Making Framework seeks to empower Hapū and Iwi priorities within the joint management process. The Mauri Model is also aligned to New Zealand legislation and this enables the integration of the disparate conceptualisations of wai evident in many of the Waitangi Tribunal claims. The aim of this paper is to introduce the basis for the Mauri Model, a decision making framework that can empower the hapū and iwi perspectives of sustainable water management within the joint management process.

The Waikato-Tainui River Settlement

The early reports of the Waitangi Tribunal highlighted the importance of Māori participation in decisions that affect their taonga (treasures). The Tribunal laid the foundation for the notion of joint management as a strategy that recognises indigenous interests in the environment, and the different ways that peoples view the world. Sustained efforts of generations of Waikato-Tainui leaders, headed by the Kīngitanga (King Movement), culminated in a settlement reached by negotiating directly with the Crown, rather than via a full Waitangi Tribunal hearing process. The two founding pillars of the settlement are enshrined in the Waikato-Tainui Raupatu Claims (Waikato River) Settlement Act 2010 (the Waikato River Act). The first, Te Mana o Te Awa, recognises that the Waikato River is an ancestor which has mana (prestige) and mauri (life force). The second, Mana Whakahaere, embodies the authority that River Iwi have established in respect of the Waikato River over many generations, to exercise control, access to and management of the Waikato River and its resources in accordance with tikanga (values, ethics and norms of conduct). Setting the issue of ownership aside, the overarching purpose of the settlement is to restore and protect the health and wellbeing of the Waikato River for future generations, and it focuses on the notion of joint management across a range of agencies such as regional and local authorities and a unity of commitment to achieve this. The settlement centres around a Vision and a Strategy document, Te Ture Whaimana o Te Awa o Waikato. Resource management issues are an integral part of the Waikato River Settlement. For example, in order to realise the vision, a number of objectives are listed. They include the integrated, holistic, and co-ordinated approach to management of the natural, physical, cultural, and historic resources of the Waikato River; and the adoption of a precautionary approach towards decisions that may

result in significant adverse effects on the Waikato River. To achieve the vision, twelve strategies will be followed. The first two strategies are to ensure that the highest level of recognition is given to the restoration and protection of the Waikato River, and to establish what the current health status of the Waikato River is by utilising matauranga Māori (traditional Māori knowledge and knowledge systems) and the latest available scientific methods. The vision and strategy is to be the primary direction setting document for the Waikato River and activities within its catchment affecting the Waikato River and it prevails over certain sections of the Resource Management Act, and over national policy statements. There are a host of provisions which stipulate that decision-makers under statutes such as the Conservation Act 1987 and the National Parks Act 1980 will be required to give effect to the vision and strategy. Decision-makers under other statutes including the Fisheries Act 1996 and the Local Government Act 2002 will be required to have particular regard to the vision and strategy. The Act is also notable in that it includes provisions for co-governance as well as co-management. Governance functions relating to the Waikato River are to be carried out by the Waikato River Authority, made up of equal numbers of Crown and iwi appointed members, which includes some of the other iwi with interests along the river. The Waikato River Authority is responsible for monitoring and implementing the vision and strategy and will also administer a contestable clean-up fund for restoring and protecting the health and wellbeing of the Waikato River. Iwi appointed commissioners are to participate in hearing committees and boards of inquiry in respect of applications for resource consents for activities which include taking, using, damming, or diverting water in the Waikato River, and point source-discharges to the river. At a joint management level, joint management agreements are required between Waikato-Tainui and the regional council and between Waikato-Tainui and relevant territorial authorities for specified functions under the Resource Management Act insofar as those functions relate to the Waikato River and activities within its catchment. As well, certain customary activities are recognised such as traditional whitebait stands and eel weirs, and the right to continue traditional ceremonies. As such the settlement is an innovative and inclusive model of power-sharing.

Applying the Mauri Model to the Waikato

The results of a preliminary desktop assessment for the Waikato River, New Zealand's longest river system, are presented here to demonstrate the distinctive attributes of the MMDMF that make it well suited to such complex decision making challenges. The application of the Mauri Model to the Waikato River and its sustainable management provides an insight into potential opportunities for application in other Asian and Pacific contexts where opposed worldviews are relevant.

The Mauri Model Decision Making Framework (Morgan, 2008) uses a series of ten steps to provide insights into the drivers of different worldviews, how these drivers influence the selection and prioritisation of indicators used in decision making, and therefore how different worldviews can best be accommodated and involved within a decision recommendation. The ten steps are;

1. Correlation of MMDMF to local Sustainable Development legislation;
2. Analytic Hierarchy Process and Likert Scales determine dimensions ranking;

3. Ranked results are normalised and converted to percentage weights
4. Case studies are selected using Thurstone Scales and modal analysis;
5. Indicators for each dimension are identified and selected;
6. Each indicator is considered in terms of sustainability (Mauri-ometer);
7. Scores for each indicator and dimension are determined;
8. The sensitivity of each result to different priorities is analysed;
9. Alternatives or scenarios are evaluated;
10. Preferred options or actions are selected or new options are generated.

The series of ten steps comprise two stages each involving an assessment process. The two assessments have separate purposes; the first identifies differences in worldviews and values. Note that all worldviews are respected and valued for the understanding that these bring to the discussion and their contribution to the selection of a robust solution. The value of this stage is that it helps participants understand the limitations of their own worldviews, which is essential in terms of fairly representing the values of others. While this stage will identify differences in values it will also identify some similarities which can be built on as the basis for trust, involvement, and collective ownership of the framework outcome.

The Analytic Hierarchy Process (AHP) is a multi-attribute decision support process (Saaty, 1980) and the final step for the first stage. AHP is used in the field of systems thinking to clarify relationships between dimensions with dissimilar attributes that defy intuitive direct comparison.

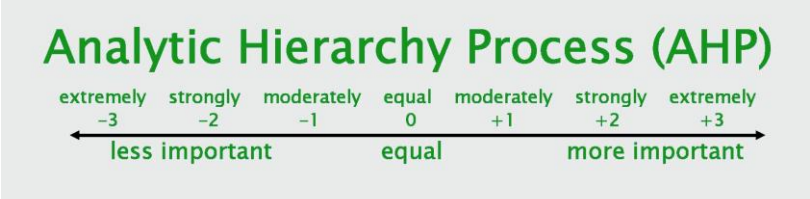

Figure 2. Analytic Hierarchy Process used in Mauri Model.

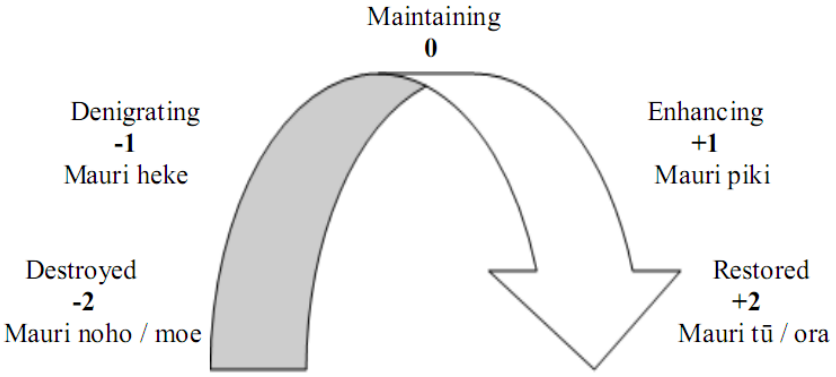

Figure 3. Absolute Sustainability Assessment using the Mauri-ometer.

In this application the pair-wise comparison of mauri dimensions is carried out using a seven point Likert Scale (Figure 2) to compare the importance of dimensions and provides an understanding of the differing priorities resulting from different worldviews.

The second assessment shifts the focus to the actual problem definition, and choice of performance indicators. Potential solutions can then be assessed using the Mauri-ometer (Figure 3) which gives an absolute determination of the impact upon mauri for each indicator. The Mauri-ometer provides an absolute sustainability assessment for each performance indicator chosen and for each mauri dimension. The assessment is intuitive asking a sequence of questions that establish the impact upon the mauri of each indicator. Using this approach there is usually little debate regarding the impact upon mauri as the scales are simple to apply. The purpose of the Mauri-ometer assessment is to determine long-term trends, and whether an option is identified as fully restoring, enhancing, maintaining, denigrating, or destroying the mauri of the indicator or dimension being considered. As mauri is the measure of sustainability, how the mauri is affected is a long-term indication of an option's viability and sustainability. Five ratings have been defined for the impact on mauri averaged for each dimension as shown in Figure 3.

The rating (raw score) for each indicator is finally multiplied by the relative dimension weighting, summed, and then divided by the number of indicators used in each dimension, to indicate the sensitivity of the result to different worldviews. The result can then be placed on the Mauri-ometer and compared to other options and worldviews.

Step 1: Correlate to Local Sustainable Development Legislation

The Environment Act 1986 is an Act to ensure that, generally,in the management of natural and physical resources, full and balanced account was taken of:

i. the intrinsic values of ecosystems; and
ii. all values which are placed by individuals and groups on the quality of the environment; and
iii. the principles of the Treaty of Waitangi; and
iv. the sustainability of natural and physical resources; and
v. the needs of future generations (PCE, 2002).

The principal statute that regulates the management of waterways in Aotearoa New Zealand is the Resource Management Act 1991 (RMA) . As noted above, the relationship between Māori and the environment is specifically provided for in several sections of the RMA. Section 6, for example, sets out matters of national importance and refers to the relationship of Māori and their culture and traditions with their ancestral lands, water, sites, wāhi tapu, and other taonga. Roberts asserts that the recognition of Māori relationships includes intangible aspects such as the spiritual dimension and that everything in the natural world possesses mauri (Roberts, 2002).

Mauri is a concept that permeates all Māori thinking and is significant enough to non-Māori almost to have been included in our legislation.

Table 1. Well-being Criteria and Mauri Dimension Equivalents

Well-being Criterion	Mauri Dimension Equivalent
Environmental Well-being	Mauri of Ecosystem
Cultural Well-being	Mauri of Hapū / Iwi
Social Well-being	Mauri of Community
Economic Well-being	Mauri of Individual / Family

The original wording of the Resource Management Bill introduced into parliament identified the mauri of ecosystems as a matter of national importance (Durie, 1998). This was subsequently reverted to read the intrinsic values of ecosystems instead, before the bill was passed into law.

The Local Government Act 2002 requires that sustainable development should be holistic and promote social, economic, environmental, and cultural well-being. To assess each of these well-being dimensions using mauri as the measure of sustainability, it is necessary to identify physical representations of those dimensions for which the impact upon mauri can be evaluated. The correlation of each well-being criterion to mauri dimension is shown in Table 1.

Steps 2 – 4: Conceptualisations of the Waikato River

It is necessary for Mauri Model users to apply weightings to each of the four mauri dimensions. Weightings reflect the relative importance given to social, economic, environmental and cultural well-being. The allocation of equal weighting to each dimension has little validity as the lack of bias between them assumes that these dimensions are given equal importance in the real world. This is not a valid assumption in the Aotearoa NZ context. Further it is difficult to imagine any context where this assumption might be valid other than the court room, where a legal interpretation of the legislation would hold this view.

For the purposes of this desktop assessment demonstration, typical weightings are adopted that reflect the priorities depicted in the following conceptual understandings of the Waikato River. Stereo-typical Māori priorities would place the ecosystem and Hapū mauri most important: E35% / H35% / C15% / F15% for example, while government priorities might place most emphasis on economic well-being: E20% / H10% / C20% / F50% respectively. More extreme economic rationalism, although prevalent in economic advice to the government, does not tend to accurately reflect reality (Peet, 2006), and the intent of New Zealand legislation moderates the priority setting to a degree.

Step 5: Selection of Indicators for Mauri Dimensions

The proposed indicators have been identified from the conceptualisations of the Waikato River provided earlier in the paper and are listed in Table 2. The indicators selected are what Peet (2004) describes as ‘red light’ indicators in complex systems, those needing greatest attention in order to ensure sustainability of the system under examination.

Table 2. Indicators for Mauri dimensions

Dimension	Ecosystem	Hapū / Iwi	Community	Family
Indicator 1	Nutrient enrichment impact on Water Quality	Iwi identity / Mauri of Taniwha	Transportation of People and Goods	Contribution to Regional Economy
Indicator 2	Land management impact on Sedimentation of river	Spiritual Integrity at Sacred Places	Public ammeniy use for Sports	Contribution to local Employment
Indicator 3	Pollution impact on Aquatic Biodiversity	Traditional Food Harvesting Practices	Recreational Fishing/ecotourism	Infrastructure Corporate Return

Steps 6 and 7: Mauri-ometer Assessment of Absolute Sustainability

The Mauri-ometer assessment is now carried out to determine the long-term trends for the mauri of the Waikato River. Māori planning timeframes tend to use genealogical understandings of temporal separation such as the great-grandchild of your grandchild, approximately six generations or 150 years, as this time is potentially only two meaningful conversations away (Morgan, 2002). 150 years is appropriate in this assessment as the temporal shift reflects the timing of the historic change in water management priorities resulting after the New Zealand Wars in the 1860's. Table 3 provides the results of a Mauri-ometer assessment conducted for 1860 and for three important river uses in 2010.

The assessment results indicate that in 1860 the management of the Waikato River catchment produced positive results for each mauri dimension and an overall average raw score of +1.33. The results for the river uses 150 years hence are not so positive. It can be seen that while all of the activities (Power generation, Pastoral livestock farming, and Urban wastewater) have a net positive impact economically, the mauri of the remaining dimensions is being denigrated.

Table 3. Mauri-ometer Assessment of Waikato River 1860 and 2010

Metric	Waikato River Mauri Indicator	1860 Māori	2010 Power Gen	2010 Farming	2010 Wastewater
E1	Water quality – Nutrient enrichment (P, N)	+2	0	-1	-1
E2	Endocryne disruptors / heavy metals /oil	0	-1	0	-1
E3	Sedimentation of Water Course	+2	-1	-1	0
H1	Iwi Identity – Mauri of Taniwha guardian	+2	-1	-1	-1
H2	Spiritual integrity of Sacred Places	+2	-1	-1	-2
H3	Traditional and seasonal food harvesting	+2	-2	-1	-2
C1	Transportation - people and goods	+2	+1	0	-1
C2	Public ammenity – sporting activities	0	+2	0	-1
C3	Recreational fishing / ecotourism	0	+1	0	-1
F1	Contribution to Regional Economy	+2	+2	+2	+1
F2	Contribution to Regional Employment	+2	+1	+2	+1
F3	Infrastructure Corporate Return	0	+2	+1	-1
	Average	+1.33	+0.25	0	-0.75

In particular the results show greatest negative impact for Hapū mauri (cultural well-being) and to a lesser extent ecosystem mauri. The overall results are +0.25 for Power Generation (better if the impacts of Wairakei and Huntly are not included), 0 for Farming, and -0.75 for Wastewater discharges into the Waikato. Note that while Power Generation achieves a result greater than zero, due to the forced coarse scale for mauri impact measurement, results +0.25 or – 0.25 about 0 are indecisive in terms of their long-term trend regarding impact upon mauri and resulting sustainability.

The trends identified are not encouraging and suggest that current management approaches and river uses that have evolved under the immediate past administration of Regional Council require review. A co-management approach that integrates the under-pinning values of the 1860's management approach has a higher likelihood of sustainable outcomes. Conversely, Peet (2004) has noted that modern human settlements have effects that are highly polluting, and that if a system can only survive in the short-term by severely depleting or fouling the resources of its surrounding environment, then clearly the long term sustainability for both is questionable. Based on the results of the Mauri-ometer assessment this conclusion seems unavoidable in terms of the Waikato River.

Steps 8 - 10: Mauri-ometer Assessment Sensitivity Analysis

A strength of the Mauri Model Decision Making Framework is that when the priorities for different worldviews are applied to check result sensitivity, these can produce a movement that supports the polarised viewpoints taken regarding some uses. The modified results are shown in Table 4 and provide insights into the political justification of power generation and pastoral farming impacts on the Waikato River, while urban wastewater discharge into the Waikato River is not sustainable regardless of the weightings adopted.

The weightings applied in Table 4 reflect different worldview sensitivities that emphasise the impact upon the more highly valued mauri dimensions. Both power generation and farming achieve positive results from the government perspective (+0.83 and +0.60 respectively), however other users of the Mauri Model have required minimum 'hurdle rates' to justify a commitment of resources to a particular course of action (Morgan, 2008).

Table 4. Mauri-ometer Assessment Sensitivity Analysis

Dimension	Community	Family	Ecosystem	Hapū / Iwi	Average
Raw 1860	+0.67	+1.33	+1.33	+2.00	+1.33
Māori priorities	+0.10	+0.20	+0.47	+0.70	+1.47
Government	+0.13	+0.67	+0.27	+0.20	+1.27
Power Gen	+1.33	+1.67	-0.67	-1.33	+0.25
Māori priorities	+0.20	+0.25	-0.23	-0.47	-0.25
Government	+0.27	+0.83	-0.13	-0.13	+0.83
Farming	0.00	+1.67	-0.67	-1.00	0
Māori priorities	0.00	+0.25	-0.23	-0.35	-0.33
Government	0.00	+0.83	-0.13	-0.10	+0.60
Wastewater	-1.00	+0.33	-0.67	-1.67	-0.75
Māori priorities	-0.15	+0.05	-0.23	-0.58	-0.91
Government	-0.20	+0.17	-0.13	-0.17	-0.33

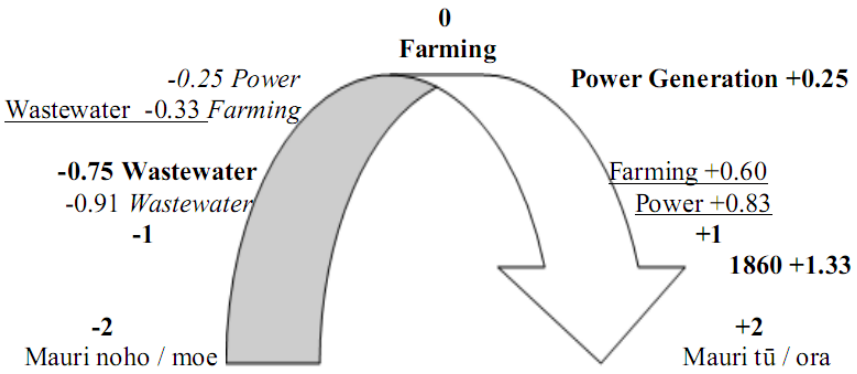

Figure 4. Sustainability Assessment for Waikato River using the Mauri-ometer.

Adopting such a 'hurdle rate', +0.25 for example, is similar to incorporating the precautionary principle into the decision making process, making allowance for the incomplete understanding of the challenge being considered. In this case, contemporary farming approaches would not meet the hurdle rate and require modification or termination.

Achieving the hurdle rate while adopting the weightings of a particular perspective is not sufficient however, as the alternative weighting associated with the Māori worldview must be taken into account, and further if the decision to continue to allow these activities was challenged through the Environment Court, the legal position regarding the Mauri-ometer assessment would be to adopt the raw score result before the sensitivity analysis was carried out. In this case, farming without enhancing current practices would be considered too marginal to justify continued confidence that these uses represented sustainable practice with respect to the mauri of the Waikato River.

In checking result sensitivity, the application of typical Māori priorities (*Italics*), contrasted against government priorities (underlined), produces insights into what dimensions of each use are most detrimental causing unsustainable assessments.

It can be seen from Table 4 that the most influential negative scoring dimensions are Ecosystem and Hapū mauri, suggesting that these considerations have not been fully understood or accommodated within the existing approaches to power generation, farming, and wastewater disposal.

The worldview sensitivity modified results are presented on the Mauri-ometer in Figure 4 to illustrate the insights provided by this process.

CONCLUSION

How then might the Mauri Model Decision Making Framework contribute in the complex context of co-management for the Waikato River? The assessment of three contemporary uses identifies a polarisation of the co-management parties' perspectives regarding the relative merits of both farming and power generation, while all assessments of wastewater discharges into the Waikato find this practice unsustainable. The polarisation can be understood as the differing priority placed on economic and social outcomes versus ecological and cultural outcomes.

When compared to the 1860 mauri assessment for the Waikato River, the time at which Waikato-Tainui peoples were the managers of the River, the immediate past 150 year administration of Regional Council has been less successful in sustaining the life supporting capacity of the Waikato River. The polarisation of management priorities hints at the changes that will be necessary under a joint management approach.

Water has its own mauri, which is important to protect from denigration. Therefore Māori involvement in management should incorporate the conceptualisation of water as a taonga and seek to maintain or enhance its mauri. The Mauri Model adopts mauri as the basis for sustainability assessment within a framework that readily aligns to contemporary legislation. The Mauri Model can also account for the different priorities inherent in the indigenous (Waikato-Tainui) and western scientific (Regional Council) worldviews.

These characteristics of the Mauri Model make it well suited to the challenge of effectively incorporating the conceptualisation of water as a taonga on one hand and as a property right on the other. Thus, joint management of the Waikato, if based upon a framework that respects, values and includes all relevant knowledge systems, is a possibility.

Mauri tū, mauri ora ki a tātou katoa.

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