Can non-market valuation measure indigenous knowledge?

Abstract

Current New Zealand resource management legislation requires local government actively recognise and take into account Maori epistemologies in resource management planning. The Maori world-view is holistic in nature in that it embodies historical, environmental, and spiritual values, as well as modern experiences. Concerns arise for Maori communities when planners and developers utilise only economic tools such as willingness to pay surveys to determine the total value of a proposed project. This paper draws from a survey of 700 respondents to identify the extent to which current conventional Contingent Valuation methodologies can measure changes in the environment where the response is culturally influenced, particularly from Maori respondents who identify strongly with traditional Maori cultural values.

Key Words

Aboriginal
Indigenous
Culture
Natural Resource Management
Well-being
Values
Traditional Owners

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1 Introduction

Indigenous nations recognise the inter-relatedness, the interdependence of all living things in the natural world. Whakapapa (genealogy) is an important concept within the Maori worldview. That is, the worldview of the indigenous people of Aotearoa/New Zealand. Whakapapa explains the relationship that Maori have with each other, natural resources, the environment, the world and the universe. Every living organism is connected through a common bond. Based on this belief a large number of responsibilities and obligations were conferred on Maori to sustain and maintain the well-being of people, communities and natural resources (Marsden 1989; Marsden and Henare 1992; Mead 2003).

Negative externalities caused by unsustainable practices such as sewage outfalls adversely affect the ability of Maori to provide for their whanau (family) and manuhiri (guests), and hence lead to a loss of mana (prestige). From a Maori perspective, this loss of mana is totally unacceptable (Waitangi Tribunal 1989; Waitangi Tribunal 1992). Maori feel they are not able to exercise Kaitiekitanga (natural resource management) within Aotearoa.

Maori perceive their value systems have been marginalised and the role of kaitieki (natural resource managers) has been diminished. Little weight has been given to Maori perspective and customs for conservation matters and for the management of natural resources (Awatere, Ihaka, and Harrison 2000). There is a growing realisation by local government that understanding Maori views and beliefs is essential for resource management decisions. There is an inadequacy in the Maori values information currently used by resource management agencies in New Zealand, which has resulted in very low participation rates by iwi and hapu in local government resource management processes (Whangaparita, Awatere, and Nikora 2003; Blackhurst, Day, Warren, Ericksen, Crawford, Chapman, Jefferies, Laurian, Berke, and Mason 2003).

Solutions for incorporating Maori values into iwi and local government decision-making processes are required. This paper investigates the potential of non-market valuation tools such as contingent valuation, to value Matauranga Maori. Tools such as non-market valuation are used by local government to help guide decision-making (Maddison and Mourato 2002; Boxall, Englin, and Adamowicz 2002; Kerr and Sharp 2003). The context of the paper is that of a Maori perspective. A brief description of indigenous knowledge is provided followed by an introduction to some key concepts of Maori natural resource management. The paper then analyses the willingess to pay to improve the environment of Maori and non-Maori participants in a contingent valuation survey.

1.1 What is Indigenous Knowledge?

Indigenous knowledge is intertwined with people, their history, culture and ecosystems. It is a knowledge system that is diverse, dynamic and holistic in nature. While similarities in knowledge exist between different indigenous peoples through a shared relationship with the natural environment, knowledge varies on national and even local scales. Furthermore, indigenous knowledge continually grows and changes as ecological pressures influence its development (Johnson 1992; Grenier 1998; Battiste and Henderson 2000; Sillitoe 2002).

Battiste and Henderson (2000) have recognised that indigenous ways of knowing share a similar structure based on the following concepts:

> *(1) Knowledge of and belief in unseen powers in the ecosystem; (2) Knowledge that all things in the ecosystem are dependent on each other; (3) Knowledge that reality is structured according to most of the linguistic concepts by which Indigenous describe it; (4) Knowledge that personal relationships reinforce the bond between persons, communities, and ecosystems; (5) Knowledge that sacred traditions and persons who know these traditions are responsible for teaching 'morals' and 'ethics' to practitioners who are then given responsibility for this specialised knowledge and dissemination; (6) Knowledge that an extended kinship passes on teachings and social practices from generation to generation(2000, p.42).*

Indigenous knowledge (IK) is defined by Grenier (1998) as the unique, traditional, local knowledge existing within and developed around the specific conditions of people indigenous to a particular ecosystem. The development of indigenous knowledge systems, covering all aspects of life, including management of the ecosystem, has been a matter of survival to the peoples who generated these systems. Such knowledge systems are cumulative, representing generations of experiences, careful observations, and trial and error experiments. Indigenous knowledge does not exist in a vacuum. It belongs to a community, and access to this knowledge is gained through contact with that community (Semali and Kincheloe 1999). No one person, authority or social group is the single repository for this knowledge or can claim to know the entire body of knowledge. It is more widely shared locally on the whole than specialised scientific knowledge (Sillitoe 2002).

A fallacy associated with indigenous knowledge is its alleged timelessness (Battiste et al. 2000). This concept centres on the belief that any change in traditional practices is an erosion of the very fabric it comprises. Mead (2003) believes that tikanga (the act of interpreting and practising Maori knowledge) is a rich heritage that requires nurturing, awakening sometimes, and adapting to the contemporary world for the development of generations to come. Matauranga Maori embodies the philosophy of the indigenous people of Aotearoa/New Zealand. It is a body of knowledge closely linked with the natural environment.

1.2 Matauranga Maori

The natural environment is an important component of Maori society. For Maori, the natural world is interrelated through whakapapa (genealogy). Every living organism is connected through a common bond. Maori view themselves as an integral component of the natural world (Marsden 1989; Harmsworth, Warmenhoven, Pohatu, and Page 2002), and maintain a continuing relationship with the land, environment, and people and with related spiritual and cosmological entities. Land, mountains, valleys, rocks, water and seaways are viewed not only as resources, but also more importantly, as the primary sources of collective identity. They are the essential roots that entwine the component parts of what it means to be Maori. Such resources are vital taonga to be protected. The role of kaitieki reflects the individual and collective role to safeguard nga taonga tuku iho[1] for present and future generations (Minhinnick 1989; Crengle 1993; James 1993; Tomas 1994).

Matauranga Maori encompasses all aspects of Maori knowledge from philosophy to cosmology. It is a dynamic and evolving knowledge system (Mead 2003). Some key concepts of Matauranga Maori are: mauri (life force), tikanga (customs and practices), tapu (sacred, set apart), wahi tapu (sacred place), rahui (prohibition), noa (ordinary), ahi kaa (right of occupation and use), and kaitieki (natural resource manager). These concepts are central to understanding the natural environment from a Maori epistemology.

[1] Translated literally as "those treasures that have been passed down."

1.3 The Role of Matauranga in the Resource Management Act

The Resource Management Act 1991 (RMA) is an important piece of legislation for Aotearoa/New Zealand that aims to protect natural and physical resources and manage them sustainably (Ministry for the Environment 1992). It is important for Maori who have a close affinity with the natural environment. On the other hand, elements of the business sector view the act as a barrier to economic development (Graham 2004). In contrast, other commentators believe that urban development in Auckland city has been driven by a market economy and guided by a laissez-faire planning regime (Dixon 2005). Other sectors of the community, including Maori, believe economic development is a positive step in our development, when undertaken ecologically sustainably (Fitzsimons 2004). The recent reviews of the RMA by central government aim to promote a balance between economic development and environmental protection. The focus is on enhancing the RMA through a review of processes and procedures rather than re-defining the principles of the Act (Office of the Associate Minister for the Environment 2004).

The RMA includes provisions to recognise and take into account iwi environmental interests under sections 6(e), 7(a) and 8. In practice, iwi perspectives of the RMA have differed from their counterparts in local government. A bone of contention for Maori (Minhinnick 1989; Crengle 1993; Kawharu 2000) is that the Act defines kaitiekitanga from an English Common law perspective. Section 7(a) of the Act defines kaitiekitanga as the act of stewardship. Stewardship is derived from the Old English word *stigweard* and means one who manages another's property, finances or other affairs. Kaitiekitanga on the other hand is a concept that is inherently Maori, and derived from hundreds of years of close association with the natural environment. Kaitieki and the exercise of kaitiekitanga as used in the RMA is taken out of context. A holistic approach needs to be taken to understand kaitiekitanga from the perspective of tangata whenua. The traditional institution of kaitieki does not stand alone. It is part of a complex social, cultural, economic, and spiritual system that has been established through long tribal associations with the environment. Kaitieki and kaitiekitanga cannot be understood without reference to the values inherent in the belief system (Minhinnick 1989; Crengle 1993; Tomas 1994).

2 Economic Value Framework

The total value of a natural resource can include both tangible and intangible values that can be grouped into the categories of economic, cultural, historical and intrinsic values. The total economic value of natural resource benefits consists of use and non-use values.

2.1 Use Values

Use values are derived directly and indirectly from a benefit. Sustainable fishing of crayfish in the form of individual transferable quota is an example of direct values. These values are easier to measure from market and survey data compared with indirect benefits. An example of indirect benefits from natural resources is biodiversity within the reef habitat. Biodiversity ensures ecosystems are healthy and continue to provide necessary ecological processes including natural nutrient cycles. Indirect benefits explain the ecological benefits derived from eco-systems. A third component of use value is option value. This is the value an individual has to ensure the future availability of an environmental benefit. This concept is analogous to purchased options in real estate or finance (Randall 1991; Pearce 1993).

2.2 Non-use Values

The other component of total economic value is non-use value. Pearce (1993) defines non-use values as existence, cultural, heritage and intrinsic values. The concept of existence value was first discussed by Krutilla (1967). Existence value is derived ex ante of resource use. This value may be expressed through donations to wildlife charities or other environmental charities (Krutilla 1967). Individuals can also derive a "vicarious" use value from the satisfaction they gain from viewing media or reading materials about the natural resource (Pearce 1993).

2.3 Biophysical and Cultural Values

Economists do not claim that the economic values framework represents the total value of a natural resource, rather they recognise that ecologists share the belief that the natural environment has intrinsic value, a non-anthropocentric value that recognises a natural resource exists within its own right. Indeed, ecological economists' theory of value is based on a biophysical perspective. Energy is seen to be the fundamental factor that determines the production or activity of all economic and ecological systems (Patterson 1998).

Cultural values are another important component in the total value of a natural resource. Culture has been defined by anthropologists as a set of shared meanings and beliefs. Western belief systems view the natural world as a wholly determinable realm, and knowledge is regarded as information that originates outside humanity (Battiste et al. 2000). The belief systems of indigenous people are fundamentally different from those of the Western world. Indigenous knowledge is local knowledge based on the eco-system in which the community lives, and no individual can know the whole system.

Deriving the economic value of indigenous knowledge such as the concept of mauri, can be problematic and is philosophically flawed. This exercise can be likened to valuing the spirituality that most New Zealanders have for natural icons such as the beach, fishing, bush, and mountains. This is not to disregard economic valuation completely, but rather to recognise its limitations and its usefulness in decision-making involving natural resources.

2.4 Economic Valuation

For conventional goods and services, markets provide important information about values. There is no market, however, for environmental services such as clean water, watershed protection and biodiversity (Kerr and Sharp 1987; Bishop and Woodward 1995). This is an important obstacle decision-makers face when determining how to incorporate community values into the decision-making process (Morrison, Blamey, Bennett, and Louviere 1996).

Non-market valuation methods can be used to estimate community values for changes in the quality of the environment (Kerr 1986; Pearce 1993). These techniques do not place a final "dollar" value on the environment; they can be used to measure the benefits and costs of developing or protecting natural resources. There are two generic types of non-market valuation techniques: stated preference and revealed preference. Stated preference techniques are characterised by the use of surveys, and include the widely used Contingent Valuation Method (CV) (Mitchell and Carson 1989; Hanley and Splash 1993; Hanemann 1994). Revealed Preference techniques rely on observations of people's behaviour in markets that are indirectly related to the environmental services under investigation and include the hedonic pricing method and the travel cost method (Bockstael, McConnell, and Strand 1991).

3 Methodology

3.1 Survey Design & Implementation

The "Improvements to the Road Surface and Roadside Survey" was pre-tested with a wide cross-section of the community. It was important the survey was pre-tested with a diverse range of Maori participants. As a section of the survey had been written specifically for Maori participants, feedback from these participants was essential to make the survey clear and to provide information participants want and need to make willingness to pay decisions (Mitchell et al. 1989). The principle of "equal explanatory power" guided the selection of the sample. Maori participants were deliberately over-sampled to produce reliable statistics of willingness to pay estimates for Maori. A random sample of the New Zealand population could approximately produce a sample distribution of 15% Maori and 85% non-Maori. As a result, the findings of the survey would predominantly reflect a New Zealand European perspective (Te Ropu Rangahau Hauora a Eru Pomare 2002). A total of 700 respondents answered the mail-out survey with more than half the respondents (377) identifying themselves as Maori.

The design of the survey followed as close as possible the guidelines set out by the NOAA panel (Portney 1994). Two contingent valuation scenarios were included in the survey. The first scenario described how better construction techniques can produce better road surfaces. The advantages described included: increased braking capacity by 10%; decreased noise by 5 decibels; and a decrease in fuel costs of 10% (Dravitzki and Wood 2000). The second scenario described the benefits of planting indigenous vegetation on roadsides. These benefits included: biodiversity, scenery, ecosystem support for fauna, and stabilising the roadside against erosion (Simcock and Smale 2003). The reference levels for Scenario 1 were quite clearly defined in terms of fuel costs, braking capacity and noise levels. Scenario 2, however, explained that planting costs would be more expensive. This implied the construction of roads in general would be more expensive if native vegetation was included in the road construction regime. As a result this cost might be borne by the participant in the form of rates or fuel price increases.

The referendum model was used to frame the willingness to pay (WTP) or bid questions. Mitchell and Carson (1989) prefer the referendum model for public goods as it invokes the correct payment context and the full range of appropriate values. They also recommend the "Take-it-or-leave-it approach" as the elicitation method for mail-out surveys. The main advantages of the Take-it-or-leave-it approach is that the participant only has to make a decision based on one price, an action similar to the respondent acting in a private market and other voting referenda. Starting point bias was minimised by basing the predetermined prices on a study by Opus Consultants that looked at the willingness to pay for road surface improvements (Walton, Thomas, and Cenek 2002). The Opus study used the open-ended format to frame the WTP questions. The range of bids for the "Improvements to the Road Surface and Roadside Survey" centred on the average WTP from the Opus study. Bids ranging from $1.00 to $5.50 with increments of $0.50 were framed for the "Improvements to the Road Surface and Roadside Survey." Each bid had a discrete sub-sample of participants who were asked if they were willing to pay for the proposed good or service.

3.2 Econometrics

A logistic regression model was applied to investigate the relationship between willingness to pay and ethnicity. The key difference between a logistic regression model and a linear regression model is that the dependent variable in the logistic model is binary or dichotomous. The methods employed in the analysis are essentially the same as those for linear regression.

There are differences between the models. First, the conditional mean for the logistic model follows a logistic distribution and is between zero and one. Another difference is that the marginal change in the expected value of the dependent variable given a quantity of *x* significantly decreases as it approaches zero or one. The distribution of expected value of the dependent variable resembles a cumulative distribution of a random variable. The expected value of the dependant variable given x can be notated as p(*x*). The logistic regression model is defined by Hosmer & Lemeshow (2000) as:

$$p(x) = \frac{e^{ß_0 + ß_1 x}}{1 + e^{ß_0 + ß_1 x}} \tag{1.1}$$

Transformation of the logit model results in similar properties as a linear regression model. This transformation is represented as:

$$g(x) = \ln \frac{p(x)}{1 - p(x)} \tag{1.2}$$
$$= ß_0 + ß_1 x$$

The logit regression has linear parameters that may be continuous, and may range from -∞ to +∞. The logistic model also differs from the linear regression model in that β, the slope measures the change in p(*x*). The intercept, $ß_0$ is the value of the p(*x*), if $x = 0$. This interpretation of the constant may not have any substance. The estimated coefficients for the referendum responses can not be interpreted as marginal influences on the probability of accepting offered bids, but the sign of the estimated coefficients indicates the direction of influence. However, given *x*, the probability of paying for an environmental improvement can be estimated (Hosmer and Lemeshow 2000). Two models were tested for this study and are given as the equations:

$$g(x) = ß_0 + ß_1 \text{ x } Bid + ß_2 \text{ x } Ethnicity \tag{1.3}$$

$$g(x) = ß_0 + ß_1 \text{ x } Bid + ß_2 \text{ x } Ethnicity + ß_3 \text{ x } GEC \tag{1.4}$$

Dummy variables are useful for explaining the relationship between the independent variable and a qualitative variable such as ethnicity (Maddala 1983). A dummy variable *Ethnicity* was created where one was given if the participant identified themselves as Maori, and zero was given for all others. *Bid* refers to the different "bid" values that respondents were asked to reply to by either yes or no. The variable *GEC* or general environmental concern was included in to the model to investigate the relationship between environmental concern and *WTP*.

4 Results

4.1 Demographic Profile

Participants were asked to identify the ethnic group or groups they belonged to. Multiple responses were expected for this question. The ethnicity groups used were based on those used by Statistics New Zealand for the 1996 Census (Statistics New Zealand 1996). A direct result of the over-sampling was the majority of participants identifying as Maori (46.3%). Other significant groupings included: New Zealand European (35.9%), Chinese (3.2%), Samoan (2.4%) and Other (12.2%). It is important to note that a number of participants identified with more than one ethnic group. Independent samples t-tests were therefore essential to determine whether there were significant differences between Maori and non-Maori mean scores in key dependent variables.

The annual median income bracket for Maori was found to be $26,000–$35,000. In comparison, non-Maori have an annual median income of $36,000–$45,000. These findings are reasonably high compared with the national averages of $27,872 for non-Maori and $25,220 for Maori (Te Puni Kokiri 2000). This would suggest annual average earnings are higher in the Auckland region. However, the important finding to note is that there is a gap between Maori and non-Maori income. A t-test for equality of means supported the fact that the two sample groups have significantly different incomes.

On average, the Maori and non-Maori median age groups were equal at 36–45 years of age. In comparison, national statistics indicate that 38% of Maori in 1996 were under the age of 15, compared with 23% of the non-Maori population (Te Puni Kokiri 1998). An older sample group is expected as the sample was drawn from the general electoral roles where participant ages are greater than 18 years of age.

4.2 General Environmental Concern

A General Environmental Concern scale (GEC) was included with the survey. The scale consists of 31 items and is designed to measure participants' concern for the environment. This scale was a composite of five previously reported scales (Walton, Thomas, and Dravitzki 2004). The scale of GEC was appended for the current survey with the addition of a question on cultural heritage. Participants were asked whether "Cultural and historical resources such as archaeological and pa sites should be protected from development." The majority of questions focused on participants' perceptions of pollution, property rights and environmental policies. The GEC scale from Walton et al. (2004) and the new GEC scale were collated and are presented in Table 1. The mean GEC for two sub-samples, Maori and non-Maori are compared, with the standard deviation presented in parentheses.

Table 1:General Environmental Concern

Variable	Maori	Non-Maori
GEC (Original)	91.9 (10.9)	87.4 (11.4)
GEC (New)	96.4 (11.2)	90.9 (11.8)
n	378	326

The statistics in Table 1 illustrate that the mean for Maori is higher than that for non-Maori for both *GEC* scales. On average, Maori have a greater concern for the environment. To investigate the significance of this result, the two samples were analysed using an independent samples t-test. Levene's test for equality of means (0.71) was not significant, indicating that the variances between the two groups are approximately equal for both *GEC* scales. A t-test for equality of means (6.11 and 5.30 with 688 degrees of freedom) indicated there is a significant difference between the two groups for *GEC (Original)* and *GEC (New)* scales at the alpha=.05 level. That is, there is a significant difference between Maori and non-Maori in terms of environmental concern. This difference can be explained by the differing worldviews, where Matauranga Maori is an epistemology founded on a close relationship with the natural environment.

4.3 Statistical Analysis of Willingness to Pay

Prior expectations suggest there is a negative relationship between the probability of accepting offered bids (or willingness to pay) and bid level. As the bid level increases, the

probability that a participant is willing to pay decreases. It was also expected that Maori WTP would be influenced both by income and price. That is, ethnicity would not be a factor in determining WTP for environmental improvement. The results however, provide a different picture.

Results from the logistic regression are presented in Table 2. These indicate the type of relationship between the explanatory variables, *Bid*, *Ethnicity*, *GEC*, and the independent variable, likelihood of paying for road surface or roadside improvement. The difference between Model 1 and Model 2 is the omission of *GEC* from Model 1. *GEC* is represented here as the new scale, with the addition of the cultural heritage question.

Table 2: Willingness to pay statistics

Variable	Improvement to road surface scenario		Improvement to road-side scenario	
	Model 1	*Model 2*	*Model 1*	*Model 2*
Constant	1.707*	0.321	0.408	-0.357
Bid Level	-3.090*	-0.305*	-0.187*	-0.189*
Ethnicity	-3.830*	-0.491*	0.440*	0.268
GEC		0.076*		0.145*
Number of observations	626	626	639	639
-2 log likelihood	798.868	791.198	851.537	821.947

Note: * p<.05

Scenario 1:Improvement to the Road Surface
Prior expectations were realised with a negative coefficient for the variable *Bid*. The dummy variable *Ethnicity* also had a negative coefficient and is significant for both models of the "Road Surface" scenario. This variable explains that in comparison with non-Maori, Maori are less likely to pay for improvements to the road surface. A probable explanation for this result is the lower median income of Maori. A positive relationship exists between *GEC* and *WTP*. The *t* statistic for *GEC* is significant at the alpha=.05 level. The relationship suggests a marginal increase in *GEC* would result in an increase in the likelihood of paying for an environmental change.

Scenario 2: Improvements to the Roadside
Significant coefficients at the alpha =.05 were found for all variables analysed in Model 1 of the "Roadside" scenario. The most notable result from this scenario is that Maori are more likely to pay for "Roadside" improvements in the form of native vegetation, compared with non-Maori. The difference in median incomes in Maori and Non-Maori groups cannot account for the result. A Pearson Correlation test between *Ethnicity* and *Income* was significant at the alpha=.01 level. This suggests there is a significant co-relation between Maori and Income. Lower Maori median incomes should result in a lower likelihood of paying for improvements to the roadside compared with non-Maori, as is the case with Scenario 1. This relationship clearly does not hold for Scenario 2. Income therefore does not explain the relationship between higher Maori WTP to improve the roadside. A factor other than income must be influencing Maori WTP to improve the roadside.

For Scenario 2, a second model was analysed to explore the relationship between General Environmental Concern and WTP. An interesting point to note from the results of Model 2 is that the significance of the *Ethnicity* variable is reduced. This could be caused by a moderator-type effect (Baron and Kenny 1986). Table 1 demonstrated that on average Maori

are more concerned for the environment than non-Maori. *GEC* therefore, is most likely masking the relationship between *Ethnicity* and *WTP* for this model.

5 Conclusion

Valuing the environment in monetary terms can cause some consternation among people who have a close affinity with the natural environment. They may ask "how can you place a dollar value on something that is so intangible such as the life giving force of mauri?" My response would be that it is very difficult to value indigenous concepts in an economic framework. Non-market valuation captures values that are defined in the economic framework, i.e. use values and non-use values.

From a Matauranga Maori perspective, natural resources are imbued with mauri, an intangible and intrinsic value. Tangata whenua derive satisfaction from ensuring the mauri of natural resources including waterways are maintained. A guiding principle for this, is the concept of kaitiekitanga, which is captured in the following statement:

> *I have always believed that tangata whenua play the most important role in ensuring that the mauri of the water is protected and looked after because we are of the whenua (land) (Awatere et al. 2000, p.19).*

Sustainable management of natural resources is an important part of indigenous resource management. Providing seafood at social functions is a direct way of nourishing and sustaining those gathered. While individuals gain direct benefit from the consumption of the shellfish, the tribe as a whole obtains mana (prestige) from adequately or successfully providing local kai (crayfish, for example, is a delicacy in coastal regions) for their guests. Failure to do so results in a loss of mana for the iwi, something that is unacceptable.

These findings indicate that on average Maori are more willing to pay for environmental improvements, regardless of income or price. Income factors that influence low WTP in normal circumstances are overcome when considering the environment. The implication for policy is: how can this WTP be "captured"? Indigenous knowledge is a shared system where no individual can obtain or store the entire knowledge system. As a result, resource management decisions are based on the collective knowledge of the community. "Capturing" WTP for environmental improvement from Maori communities may require adjusting the payment vehicle. Options for alternative payment vehicles could include labour or knowledge contributions. This issue requires further investigation.

The results also reveal that within an economic valuation framework, Maori are more likely to pay for environmental improvement based on a greater concern for the environment. The GEC scale shows that on average Maori are more concerned with the environment than non-Maori. The WTP statistics show that people who are more concerned for the environment are more likely to pay for environmental improvements. Qualitative analysis also supports these findings. The Matauranga Maori section showed that Maori have a close relationship with the natural environment through whakapapa and kaitiekitanga.

Colonised people live their lives within a dual perspective of the indigenous worldview and that of the coloniser. Economic decisions by indigenous people, therefore, will be based on this duality. It is hypothesised that the degree to which one perspective dominates the decision is based on the degree of cultural identity. Cultural identity is a consequence of birth, and is strengthened by both emotional and symbolic ties (Durie 2001). This theory will be investigated in the future.

Indigenous knowledge (IK) has an important role to play in resource management systems. On a local government level, IK can inform decision-making. A basic understanding of indigenous epistemologies enables policy analysts to promote resource management strategies consistent with the values of the community as a whole. Where there is ignorance on the part of an analyst about IK, the proposed resource management path will prove inefficient. In cases where indigenous perspectives are not taken into account, the result is most likely litigation. It then becomes an expensive ordeal for the parties involved and an unnecessary burden on ratepayers.

Recognition by government agencies that IK has a valid role in resource management can empower communities to become more active in local government decision-making. As a result, policies that truly reflect our diverse communities can be created.

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7 Glossary

Aotearoa	New Zealand
ahi kaa	right of occupation and use
hapu	sub-tribe
iwi	tribe
kai	food
kaitieki	natural resource manager
kaitiekitanga	natural resource management
matauranga	knowledge
mana	prestige
manuhiri	guests
mauri	life force
noa	ordinary
tangata whenua	people of the land
taonga	treasure
tapu	sacred
tikanga	custom
wahi tapu	sacred areas
whanau	family
whakapapa	genealogy
whenua	land

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