# EXPLORING VALUATION FRAMEWORKS AND PRINCIPLES FOR SUSTAINABLE SEAS

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EXECUTIVE SUMMARY

This report summarises work to date on frameworks and principles to improve the inclusion and consideration of diverse values in making decisions. Funded through the Sustainable Seas National Science Challenge, this project and report are concerned with improving consideration of values particularly in the context of coastal and marine management.

Valuation encompasses far more than estimating the financial value of marine developments and their social and environmental effects. It extends to almost any socio-political process in which people, by describing what matters about their places and environments, seek to shape the development of these places.

Through engagements with iwi[1] and other values-holders in marine decision-making processes in the Marlborough Sounds, we have seen the damage that can be done to individuals and communities when these processes are not inclusive, and have heard their aspirations for a better way of making decisions. Embedded experiences in local arenas, such as hīkoi and community workshops, can provide alternative valuation opportunities where some values-holders may feel comfortable with articulating values that are incommensurable, intangible and relational.

Decision-makers told us that they are often constrained by legislation and would welcome a systematic way to identify and assess values. Māori resource management professionals said, among other things, that decision-making should be based on the Treaty of Waitangi/Te Tiriti o Waitangi. In a workshop with stakeholders, we explored and refined valuation principles and frameworks, and started a discussion about how these might be applied.

From our work to date, we have identified several principles about valuation practices and decision-making processes that would acknowledge diverse values and values-holders, and help to maintain confidence in democratic institutions. These are as follows.

Decision-making processes for coastal and marine management should:

   a) make clear how and by whom the decision will be made, including any scope for co-governance or collaborative decision-making.
   b) where collaborative approaches are being used, enable participants to collectively decide what information they need to make the decision and how this information will be obtained.
   c) enable people with competing interests and/or values to see that they have many values and objectives in common, e.g. by co-designing a vision for the place of value including manawhenua values.
   d) provide multiple ways for people to express their values, including ways that are culturally meaningful to the values-holders.

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[1] See Glossary for English translation of Māori words.

e) where possible, use shared experiences with values-holders to understand values 'in place'.

f) use a clear and transparent framework for organising and considering information about values.

g) give all parties a fair chance to be heard and allow discussion to enhance understanding.

Principles suggested by Māori resource management professionals included:

a) The Treaty of Waitangi/Te Tiriti o Waitangi is the over-arching framework within which ecosystem-based management should sit, not the other way around.

b) Decision processes should reflect the Treaty partnership – decisions should 'give effect to' and not just 'consider' iwi views. If Treaty partners do not agree, they should talk further.

c) Iwi should be recognised at a governance level—kanohi ki te kanohi (face to face).

d) Co-governance and co-management should be properly resourced. It is not a true partnership if one party controls all resources.

e) Decisions and decision-making processes should:
   o recognise past abundance as a goal for the future
   o recognise that people are part of the food chain—if te taiao is not healthy, people are not healthy; and
   o recognise and maintain mātauranga Māori about living from the land and the sea.

Different frameworks may be suitable in different circumstances. We have explored valuation frameworks that represent three broad approaches to assessing values for decision-making: cost-benefit analysis (based on economics), assessment of ecosystem services (based on ecology) and structured decision-making (based on multi-criteria analysis that accommodates mixed value types).

Apart from the above principles, we have not explored Māori cultural values frameworks in the project thus far, though we have identified some frameworks that may be of interest. Further engagement with Māori is needed to identify frameworks and principles that would give them confidence in decision-making. Among other things, manawhenua want to explore situations in which they can share decision-making.

Possible frameworks and principles for valuation will be further tested in a Sustainable Seas case study in Tasman and Golden Bays, and the lessons learned will be documented with recommendations for future practice.

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GLOSSARY

atua	god, deity, ancestor with continuing influence
hapū	subtribe
heke	to migrate or move
hīkoi	journey
iwi	tribe
kai	food
kaitiaki	guardian
kaitiakitanga	guardianship, stewardship
kaiāwhina	counsel, guide
kaumātua	elder, authority figure
kaupapa	plan, initiative
mahi	work
mahinga kai	places where tangata whenua collect food, the species (plant or animal) collected, or the act of food gathering
mana	authority, respect, prestige
manaaki	to care for (others)
manaakitanga	hospitality and care for others
manawhenua	Māori who have authority over an area
manuhiri	visitors, guests
marae	meeting grounds, especially the open area in front of the wharenui (meeting house) where formal greetings and discussions take place
mātaitai	a marine area in which special Māori fishing rights are recognised
mātauranga Māori	a body of traditional knowledge held by Māori
mauri	life force
moana ora, mana moana	health of the sea, respect for the sea
mokopuna	grandchild(ren), descendant(s)
Pākehā	European or other non-Māori
pōwhiri	formal welcome
rāhui	temporary ritual prohibition, closed season, ban
rangatira	chief
rangatiratanga	chieftainship, right to exercise authority,
raupatu	seizure of land or other assets
ritenga	ritual, customary practice
rohe	boundary or area of authority
rongoā	remedy, cure
taiāpure	a marine area in which special Māori fishing rights are recognised and over which a Māori entity has specific management rights
Tangaroa	Māori god of the sea
tangata whenua	local indigenous people
taonga	treasure
tapu and noa	sacred and non-sacred (free from tapu)
taurekareka	slave
tautauhea	commoner, person of low status
Te Ao Māori	Māori world or worldview
te taiao	the natural environment
Te Tiriti o Waitangi	the Treaty of Waitangi, especially the Māori language version

tikanga	correct procedure, protocol
tino rangatiratanga	sovereignty, self-determination
tūpuna	ancestors, grandparents
wāhi tapu	sacred place
wairua	spirit
wānanga	workshop, seminar, learning exercise
whakamana	give authority to, enable, legitimise, empower
whakapapa	genealogy, lineage
whānau	family group, extended family
whanaungatanga	kinship, belonging to family
wharenui	meeting house, main building of a marae where guests stay

1. INTRODUCTION AND BACKGROUND

1.1. The Sustainable Seas National Science Challenge

The Sustainable Seas National Science Challenge Ko ngā moana whakauka was approved by the Ministry of Business, Innovation and Employment in early 2016, with the aim "to enhance use of New Zealand's vast marine resources, while ensuring that our marine environment is understood, cared for, and used wisely for the benefit of all, now and in the future".

The Challenge has adopted ecosystem-based management (EBM) as its strategic focus, as explained in the research plan:

> The use of whole-of-ecosystem based tools to manage the diverse range of activities in New Zealand's marine domain has been identified by the Challenge as the best approach to maximise the sustainable use of our marine resources and to overcome the impediments to gaining societal licence. Ecosystem-based Management (EBM) is a strategy that integrates management of natural resources, recognises the full array of interactions within an ecosystem, including human, and promotes both sustainable use and conservation in an equitable way. … It differs from many current management strategies by using an integrated approach that considers all of the activities that affect the marine environment, rather than the usual approach of individually managing single species or sectors (Sustainable Seas National Science Challenge 2015, p 9).

Sustainable Seas includes numerous research projects including one, "Development of valuation frameworks and principles", that is the subject of this report.

1.2. Valuation frameworks and principles

> Controversial management strategies, particularly those that are politically driven or poorly executed with little consideration for the local context, can lead to compliance problems, poor trust relations, and heightened conflict. An exploration of values can shed light on the ways individuals might respond to management initiatives as a person draws upon their values to evaluate management goals and management actions. (Jones et al. 2016, p 5)

A framework is a particular way of organising information for a given purpose. Here, the purpose is to present information about values to inform decision-making for the marine environment. Principles provide guidance about how decision-making should be carried out, e.g. in relation to a framework.

By identifying valuation frameworks and principles that can support EBM, this project aims to identify ways to improve the inclusion and consideration of values in making

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decisions about the marine environment. Within an EBM setting, these frameworks and principles will better reflect the complexity of social and ecological values for New Zealand's marine environments.

This need to widen the scope of valuation in environmental management follows recent analyses that have concluded that New Zealand's governance and management systems fail to appropriately acknowledge and accommodate Māori and community concerns, views and values (Dick et al. 2012; Turner et al. 2013; Stephenson et al. 2014). Our work in the Marlborough Sounds, described in this report, also found that many people, not just Māori, are dissatisfied with current decision-making practices in New Zealand.

1.3. About this report

This report documents what we have done thus far in the Sustainable Seas project on valuation frameworks and principles. Its purpose is to inform those who will be involved in the final part of the project and others who may want to know more about what we have done and how we reached our conclusions. Detailing our work to date here will also enable us to be more succinct when we report our conclusions; those who want more information can refer to this report.

The report starts with a brief introduction to the concepts of values and valuation and how these are applied (section 2), followed by a section on methodology (section 3). It then contains detailed accounts of the different aspects of our investigation thus far. The first part of the project was an exploration of how people have experienced the process of describing and advocating for the values of the marine environment, using the Marlborough Sounds as a case study. This involved a series of interviews (section 4), a boat trip and marae visits with tangata whenua (section 5), and a workshop with values-holders from the Marlborough Sounds (section 6).

The next part of the project included interviews with decision-makers (section 7), a wānanga with Māori resource management professionals (section 8) and another workshop with values-holders (section 9), some of whom had attended the first workshop, to progress the discussion about valuation frameworks and principles. Section 10 presents the tentative frameworks and principles that we have identified as warranting further investigation, with a short conclusion in section 11.

In the final part of the project, in late 2018 and 2019, we will further explore how these frameworks and principles can be applied when considering possible strategies to improve the marine environment in Tasman and Golden Bays. The lessons from this will be used to generate recommendations for future practice.

This report, rather than formal analysis, is essentially a descriptive narrative of a complex and multi-stage process that resulted in tentative conclusions, which will be explored and evaluated in forthcoming activities.

2. THE IMPORTANCE OF VALUES

2.1. Why values and valuation?

While New Zealand's marine environment contains significant natural resources and supports a range of related economic activities, it also has significant social and spiritual value, being an integral part of the lifestyle, culture and identity of generations of New Zealanders. New Zealand's marine ecosystems perform important ecological functions, such as nutrient cycling and coastal protection, and are also globally significant, being home to threatened populations of seabirds and marine mammals. Understanding the diverse ecological, socio-economic, and cultural values of these ecosystems is important if we are to benefit from our ecological heritage and demonstrate wise stewardship (Moore et al. 2008; Spangenberg & Settele 2010).

Recognising and characterising the diverse values of ecosystems requires concepts of value and worth that extend beyond quantitative ecological and economic metrics to include a much deeper spiritual and relational sense of meaning (Jansson et al. 2000; Šunde 2008; Chan et al. 2012). A valuation framework that accommodates a broad range of values within the decision-making process will enhance our ability to identify and prioritise management actions that are supported by different members of society (TEEB 2002; Ruckelshaus et al. 2013). Doing this would also make for a more fair and democratic society, where environments are governed in ways that acknowledge diverse perspectives.

2.2. What do we mean by 'values'?

With respect to the marine environment, the term 'values' can refer to i) features of the environment that people care about and the strength of preferences for them, and ii) principles for how humans should relate to nature and to each other.

Environmental features and people's preferences for them are often referred to as 'assigned values' (Brown 1984) and can also be thought of as 'values of place'. They refer to specific environments, places and activities and the qualitative and quantitative assessments of their importance to specific people. Examples of assigned values are the many ways fishing contributes to individual and community well-being. While people can and do disagree about assigned values, conceptually, these are

disagreements over facts—e.g. how many people fish here, what they catch and how fishing affects other parts of the ecosystem, including people.

We refer to principles-based values as 'governance values' (Schulz et al. 2017). Governance values refer to what is 'right' or 'good' in a decision-making process— they provide guidance for human behaviour and may be derived from religious, cultural or scientific sources. Governance values include principles related to the outcomes of decision making—pertaining to how people should relate to each other and to the environment (e.g. respect, manaakitanga, reciprocity)—as well as norms pertaining to how decisions are made (e.g. fairness, inclusiveness). A value or value statement that includes or implies how people 'should' act is a governance value. These are broadly similar to what Brown (1984) called 'held values' and relate to how society might govern values and valuation processes.

In this report, we are mostly addressing questions about assigned values—things and places that matter, and how much they matter, to specific people. When discussing valuation principles, we are referring to governance values about what is right or good, that is, to describe general propositions about how a decision-making process should be undertaken.

2.3. Using values: four aspects of valuation

In considering how assigned values are used in environmental decision-making, Sinner et al. (2014a) identified four aspects of valuation, which may be undertaken separately or in sequence.

- **Identifying** assigned values – identifying what aspects of an ecosystem or place matters and where these are located.

- **Understanding** assigned values – gaining a deeper appreciation for the meaning of certain ecosystems to human communities, and improving knowledge about how a system works, i.e. how one part influences another.

- **Assessing** assigned values – evaluating the relative significance or magnitude of an ecosystem feature relative to other places, or relative to other valued features, as well as how the significance would change if management changes.

- **Balancing** assigned values – making decisions about how to accommodate multiple meanings or reconcile competing uses, e.g. by comparing their respective magnitude or significance, e.g. as produced by a values assessment (p5).

Specific tools or methods are suitable for different aspects of valuation. Sinner et al. (2014a) briefly described more than 20 such tools relevant to New Zealand freshwater planning, and indicated which aspect of valuation each tool is appropriate for. In

Europe, Harrison et al. (2018) conducted a similar review and constructed a decision tree for choosing specific valuation methods for unique decision contexts. Globally, the 'new school' of environmental valuation scholarship has emphasised how dominant methods of valuation tend to rely on narrow concepts of value (i.e. quantitative assessment), which skews decision-making (Jacobs et al. 2016). These scholars argue that relying on a small set of methods (and their associated concepts) can be detrimental to robust, coherent and democratic decision making (Carnoye & Lopes 2015; Tadaki et al. 2017; Arias-Arévalo et al. 2018; Jacobs et al. 2018).

A valuation framework can include methods for a full valuation exercise, i.e. all four aspects, from identifying to balancing values. In this report, we use the term 'framework' in a more limited sense to refer to ways of organising information for assessing and balancing assigned values. These approaches typically make assumptions about the types of values that are relevant to decision-making and about how these values can and should be understood, e.g. by presenting categories of values (Sinner et al. 2014a; Tadaki et al. 2015). To avoid having decisions constrained by such assumptions, valuation principles remind decision-makers to be open to diverse ways of identifying, understanding, assessing and balancing values.

2.4. Values in practice

Statutes and associated case law often provide explicit or implicit decision-making frameworks and principles, by specifying what types of information (values) are relevant, how information is to be collected (e.g. through specific consultation processes) and/or decision criteria or rules (e.g. aiming for maximum sustainable yield for fisheries). These can have their own implicit governance values as well as explicit assigned value categories and hierarchies. One such example is the Resource Management Act 1991, which has its purpose and principles in Part 2 and a detailed consultation and decision-making process set out in Schedule 1. The Fisheries Act 1996 has decision principles in Part 2 and decision-making criteria for setting catch limits in Part 3. Legal frameworks such as these can create both opportunities and obstacles for the expression and consideration of values, e.g. by ensuring that consultation takes place and by constraining how it is done and what can factors be considered by decision-makers.

The application of new principles or frameworks might require changes to legislation. Our objective is to identify approaches that would improve decision-making; we leave it to others to determine whether legislation is required to implement them.

Different frameworks and principles might be relevant to different decision contexts, e.g. making decisions about regional plans vs resource consents or setting fish catch levels vs controlling fisheries bycatch. Some principles and frameworks have implications for timeframes for decision-making, which could limit their application in

contexts where quick decisions are required. In the case study leading up to June 2019, we plan to consider further which principles and frameworks are most relevant for decision-making about marine management in Tasman and Golden Bays.

3. METHODOLOGY

3.1. Project overview

This report is part of a project that aims to identify valuation frameworks and principles that can improve the inclusion and consideration of a range of values in making decisions about the marine environment. The first phase of the project was to understand how values are identified and considered in statutory decision-making about the marine environment. New Zealand statutes and decision-making processes can be understood as 'value-articulating institutions', i.e. statutory processes that influence the ways that values are expressed, documented and used in decision-making (Vatn 2005). For example, the Resource Management Act 1991 requires councils to consider costs and benefits of alternatives, which encourages framing of values in economic terms. The submission and hearings processes under these statutes provide an opportunity for alternative expressions of values but these are constrained by what can legally be considered.

Through a case study in the Marlborough Sounds, we investigated the experiences of values-holders in trying to communicate and give evidence for their values in decision-making processes. These observations were supplemented with interviews of statutory decision-makers, and then used to design a workshop with decision-makers, iwi and stakeholders in early 2018 to discuss frameworks and principles for valuation in marine environments.

3.2. Case study in the Marlborough Sounds

To start, we wanted to understand the valuation problem from the perspective of values-holders. Specifically, we explored the experience of values-holders in trying to communicate and give evidence for their values in decision-making processes.

We focused our study on the Marlborough Sounds on New Zealand's South Island, where there have been several controversial marine management decisions in the past two decades. These have included (roughly in chronological order):
- applications for operation of fast ferries in Queen Charlotte Sound
- mātaitai customary fisheries application for Tory Channel
- Iwi/Māori claim to foreshore and seabed, with implications for ownership of marine farming sites

- proposal to expand the Waikawa marina
- restrictions on recreational fishing, including temporary closure of fishing for blue cod in parts of Marlborough Sounds
- multiple applications for mussel farms, with concerns for cumulative impacts in some areas
- proposal to ban commercial fishing in Marlborough Sounds
- application for new salmon farms
- proposal to shift the location of existing salmon farms.

In addition, there have been ongoing concerns expressed about sedimentation of the Marlborough Sounds from historic and ongoing land clearance, including for forest harvesting.

We obtained research ethics approval for interviews of people who have been involved in these issues over several years and the subsequent workshop. Each respondent received an information sheet before the interview and signed a consent form agreeing to be interviewed and recorded.

Thirteen interviewees were chosen with broad representation in mind, although we do not claim our findings to be representative of all values-holders in the Marlborough Sounds. We sought a balance between marine resource users and people who represented environmental or community groups that were opposed to various marine activities. See Table 1. We were particularly interested in interviewing those with experience from several decisions, so that they could draw from a range of examples and provide comparative reflections. Iwi Māori, who were proponents of some commercial activities and opponents of others, presented unique insights into government decision-making processes from their position as Treaty of Waitangi partners and kaitiaki.

Table 1.   Type and number of values-holders interviewed

Type of values-holder	Number
Iwi Māori	3
Industry (commercial fishing, aquaculture and forestry)	5
Community interests (recreational fishing association, a residents' association, local environmental groups)	4
Government department	1

Interviews were one-on-one and lasted approximately one hour. They took place either at the Cawthron Institute in Nelson or at the interviewee's home or workplace. Interviews were transcribed and returned to respondents for possible corrections. The interviewer coded the interviews, discussed emerging themes with the project leader and prepared a presentation for a workshop (more on this below). Mindful that workshop participants might recognise the source of a quote (even if reported anonymously), the interviewer obtained permission for all quotes used in the presentation and eliminated any obvious identification when sharing those quotes.

Following initial analysis of the interview transcripts, the research team had the following engagements over a period of three days in March 2017.

- Pōwhiri to Te Hora marae in Canvastown
- Hīkoi (in the form of a boat trip) on Pelorus Sound / Te Hoiere
- Pōwhiri at Waikawa marae and overnight marae stay
- Workshop in Picton with iwi and stakeholders
- Research team meeting in Nelson

These engagements are described later in this report.

3.3. Interviews with decision-makers

To complement the interviews in the Marlborough Sounds, during the second half of 2017, we conducted additional one-on-one interviews with people in decision-making roles for the marine environment. The objective was to gain insights into the issues and perspectives of decision-makers and how they dealt with values.

Interviewees were selected opportunistically based on the interviewers' previous work and relationships with decision-makers. Because of this, most of the interviews focused on regional planning for aquaculture, with two concerned with fisheries decision-making and one on a process to develop an integrated spatial plan for the Hauraki Gulf near Auckland. The ethics approval for interviews of values-holders was updated to include the interviews with decision-makers. Between them, the project leader and another team member conducted ten one-on-one interviews with staff in central and local government and with elected councillors, all of whom have been involved in decision-making in the marine environment.

The interviews are not representative of all decision-makers or of the types of decisions made by government authorities regarding the marine environment. Considerably more interviews would have been required to achieve that, well beyond the project's resources. Instead, we were simply looking for insights that could add a different perspective to the experiences of the values-holders in the Marlborough Sounds. We asked interviewees what types of values were considered in decision-making, how the relative importance of values was determined, and what criteria, if any, were applied. While more interviews would have been preferable, there was sufficient commonality in comments from interviewees to give us confidence that the themes we identified were not unique to one or two individuals. This is not to say that they are universal, either.

The interviews were transcribed professionally and checked by the interviewers for accuracy. Transcripts were provided to any interviewees who requested them. The

two interviewers then separately analysed the transcripts for emergent themes, including the four aspects of valuation described in section 2.3 of this report. Themes were then discussed and combined into a common set, which is summarised in section 7.

4. INTERVIEWS WITH VALUE-HOLDERS

4.1. Interview objectives

The aim of interviews was to gain insight into a range of value-holders' experiences as part of marine decisions within the Marlborough Sounds, with a value-holder being either a proponent or an opponent of a proposed marine development. We initially set out to understand how submitters in marine decision cases presented their arguments and concerns, and whether they felt the decision-making criteria and process (i.e. the valuation framework and the principles that underlie it) were adequate or appropriate for addressing their values. During the interviews, we found that interviewees were less aware of decision criteria and focused instead on their experiences; that is, the personal and social costs and what they saw as inequality in the decision-making process.

The interview questions aimed to elicit responses on the following themes.

- Importance of the Marlborough Sounds to the respondent
- Decisions or cases the individual or their organisation were involved in
- How values and concerns were presented and evidenced in these cases, and how these were considered by decision-makers
- How decision-making processes might be improved.

4.2. Interview findings

The key findings from the interviews are summarised below and in Table 2. For more detail, see Šunde et al. (2018). All quotes in this section are from interviewees from the Marlborough Sounds case study.

4.2.1. The personal costs of valuation

Across the board, interviewees recounted the personal costs of valuation through their experiences as part of high-profile marine decision-making cases and the emotional stress they endured. This affected their physical health and their family and community relationships, and amplified financial pressures (Table 2). The emotional turmoil prompted some interviewees to approach decision-making processes as an antagonistic arena, where they sometimes regarded opponents as enemies.

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Table 2.   Issues and effects of valuation processes in the Marlborough Sounds

Issues raised by values-holders	Examples cited by interviewees
Personal costs	• Impact of stress on participants' physical health and family relationships • Participants incurred high financial costs • Participants intimidated by formal processes (e.g. number of lawyers, cross-examination techniques)
Unequal access to resources	• Large companies more able to fund lawyers and expert witnesses • Independent public science not accessible • Residents had to rely on volunteers and retired professionals • Cost blowout for industry • Onerous evidence requirements • Insufficient time to study and respond to evidence
Privileging different types of knowledge and authority	• Lawyers and expert witnesses (e.g. scientists) privileged over locals' knowledge and experience • Māori cultural and economic well-being given less weight than European values • Emotional arguments and 'amenity issues' given less weight than economics- or science-based ones
Influence of arenas	• Professionals and their legal and scientific arguments privileged in formal arenas • Formal arenas, e.g. cross-examination, exacerbated antagonisms and tensions • In situ 'arenas' allow expression of intangible values through direct experience (e.g. history of place, appreciation of local industry) • Alternative arenas (e.g. local marae) more neutral and welcoming for some (but not all)

4.2.2. Unequal access to resources in valuation processes

Interviewees considered many aspects of the decision-making processes to be intimidating, such as their formality, the number of lawyers and the extensive cross-examination of some parties (notably at the New Zealand King Salmon case that involved a Board of Inquiry). Some submitters incurred extreme financial hardship. They considered that the reliance on lawyers and experts put individuals and community groups at a disadvantage compared to well-resourced applicants. One interviewee commented:

> In the last few years one of our biggest costs has been legal and we are gasping for air on it and also time to just carry on with it. It's very hard when the opposition have got four fulltime advocates just with lawyers backing them up… If we didn't have friendly lawyers who are working for us, retired and working for nothing, we wouldn't be in the game—nobody would!

Other forms of inequality that interviewees experienced included the onerous amount of evidence that applicants and submitters were required to produce as part of formal hearings, and similarly the pressure of responding to large amounts of information in short time frames. One interviewee argued strongly for independent public science that is accessible to the public without cost, asserting that "science as the neutral arbiter" is a basic right of democracy that has been eroded in New Zealand. See Table 2.

4.2.3. Whose and what knowledge counts?

Interviewees felt that expert witnesses' evidence was privileged over local expertise built up over lifetimes spent working and recreating in the Marlborough Sounds. One interviewee explained that for his first-hand knowledge of the marine environment to be received by decision-makers, it would be better that he relayed it to a scientist who could then repackage that knowledge into a scientific model. Others also perceived that Māori cultural and spiritual knowledge was similarly not given the same weight as scientific evidence. Some Māori interviewees felt that they had to promote the physical arguments of a case, rather than cultural or even economic arguments, as one interviewee explained:

> If we win anything in court—and we don't win very often—it's because of the physical arguments or the resource management arguments that we put forward. It's never for the cultural reasons or the economic impact [on our iwi]. It's more about the European sense of aesthetics or values…

Different types of knowledge are evident in decision-making processes. One interviewee explained that residents were severely limited in what they could present as a legitimate and defensible argument from the perspective of a layman. Because only qualified witnesses could make claim to scientific and other areas of specialised expertise, locals were essentially silenced on those issues. How knowledge was presented was a cause of frustration: one interviewee claimed that valuation processes allowed for too many emotional appeals rather than requiring submitters to stick to the facts. Conversely, another argued that amenity issues and "matters of the heart" were not given enough weight. See summary in Table 2.

4.2.4. The influence of arenas on value articulation

Through the interviews, we were made aware of how the arena in which valuation processes took place affected people's ability to express their values and feel empowered. Formal courtrooms were intimidating for some, and others remarked that some council buildings were alienating. Others preferred cultural arenas, such as a marae or community hall, although this also had other ramifications depending on the iwi and their relationships and positions with respect to each other. Notably, values-holders said they were able to communicate effectively when decision-makers came into the environment where values could be experienced first-hand and in context.

This reflection influenced our decision as a research team to go on a hīkoi by boat on Pelorus Sound / Te Hoiere in the Marlborough Sounds, guided and accompanied by iwi members. See Table 2.

4.2.5. Implications for democracy

Another common theme emerging from the interviews concerned the use of economic and political power, and the location of that power in areas outside of the Marlborough Sounds. There was a sense of disempowerment for some local community members, who reported that they had less say in marine decisions that affected them greatly than ministers and government departments located in Wellington. One interviewee argued that the commons are owned by the community and suggested that the role of government should be one of a caretaker. The change to the Resource Management Act that gave the Minister of Aquaculture new powers was cited by more than one interviewee as a weakening of democratic rights for communities.

The emotional strain, experienced personally and throughout community relationships, underpinned the experience of valuation processes for some as conflict-riven and destructive. In some cases, the accumulation of such experiences led the interviewee to question the legitimacy of democracy, which is the very foundation of New Zealand. A corrosive effect of these experiences is demoralisation and a sense of cynicism resulting from perceptions of collusion between big business and government. One interviewee suggested that valuation processes are systemically corrupt and getting more difficult for individuals or community groups:

> I had been campaigning for 20 years and I noticed that every year it got harder and harder. What we seem to be doing was just being in battle with bloody multinational companies or powerful entities and they just got better and better at learning the game [of] how to screw us over.

See Table 2 for a summary of all of these effects of formal valuation processes.

5. PŌWHIRI AND HĪKOI ON TE HOIERE

5.1. Tangata whenua of the Marlborough Sounds

Before holding a workshop to discuss what people had told us in the interviews, we decided to engage directly with the tangata whenua of the Marlborough Sounds. There are four main iwi with historical and ongoing connections to the Marlborough Sounds, with overlapping territorial interests: Ngāti Kuia, Ngāti Koata, Te Ātiawa o Te Waka-a-Māui and Rangitāne o Wairau. A fifth iwi, Ngāti Toa Rangatira, also has interests in the area. The territorial interests of respective iwi are complex and still a matter of some contestation, even though formal claims of these iwi under the Treaty of Waitangi were settled in 2014 (Finlayson 2014).

We asked tangata whenua representatives to guide us on a boat trip on Pelorus Sound / Te Hoiere and to host us at a traditional meeting house. We did this to acknowledge the role of iwi Māori as Treaty partners with the government of New Zealand. We also considered that some Māori might find that structured workshops constrained their ability to express their views about values and decision-making, and so wanted to provide them with other opportunities.

5.2. Pōwhiri and hīkoi

The day of the hīkoi started with a pōwhiri on to Te Hora marae of Ngāti Kuia at Canvastown (see Figure 1). This ceremony was an opportunity for the researchers to show we were coming to the rohe of Ngāti Kuia with peaceful and beneficial intent, and for the iwi to accept us.

Ngāti Kuia welcomed us and shared food with us during this ceremony, after which the research team drove to Havelock and boarded a small launch, accompanied by representatives of Ngāti Kuia, Ngāti Koata and Te Ātiawa, as well as a kaiāwhina from Cawthron Institute. Another iwi, Rangitāne, was invited but unable to attend.

The hīkoi started at the Havelock marina at the shallow southern end of Pelorus Sound / Te Hoiere and headed north to the proposed relocation site of one of the salmon farms. Along the journey, we observed standing and clear-felled pine forests, farmland, mussel farms and salmon farms, holiday homes, birdlife and seals. Through conversations with our hosts, we learned about iwi perspectives on the past and present uses of the marine environment of the Sounds and how iwi are no longer able to harvest ample supplies of fish and shellfish owing to degraded habitats and commercial harvest of fish stocks. Our iwi guides expressed particular concern about land clearance going back many decades and ongoing sedimentation of marine habitats from present-day farming and forestry practices.

Figure 1 shows the route of the hīkoi. Figures 2-5 are other scenes from the hīkoi.
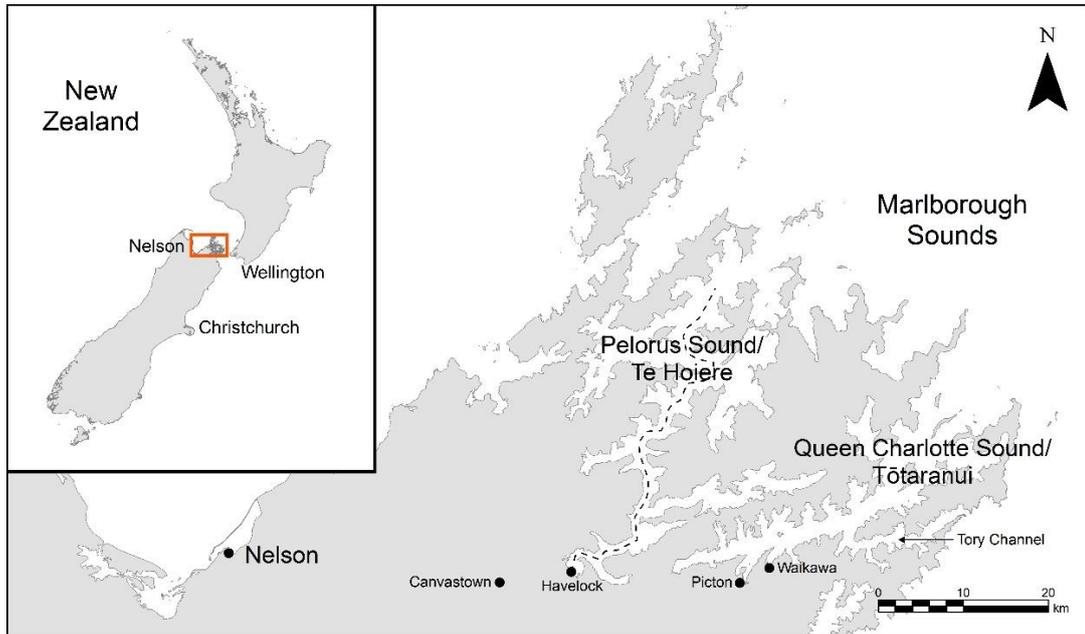
Figure 1.   The Marlborough Sounds in the South Island of New Zealand, with the boat journey shown by the dashed line.

Figure 2.   Multiple uses of Pelorus Sound: mussel farm in foreground; holiday homes surrounded by native trees, pine forest and pasture. Photo: Jim Sinner.

Figure 3.   Forestry in Pelorus Sound. Photo: Jim Sinner.

Figure 4.   Salmon farm at Waitata Reach in Pelorus Sound. Photo: Jim Sinner.

Figure 5.   New Zealand fur seal on mussel buoy in Pelorus Sound. Photo: Jim Sinner.

After the hīkoi, we travelled to Waikawa, where Te Ātiawa welcomed us onto their marae. Elders of Te Ātiawa explained the design and carvings in the wharenui, where we slept in a communal setting that night.

6. PICTON WORKSHOP

We held a workshop in Picton on 23 March 2017 to consider material from the interviews and to discuss how to improve the ways that values are identified and considered in statutory decision-making about the marine environment. Participants included 11 representatives from iwi and various stakeholder interests, 12 researchers (including two international experts) and an independent facilitator. See Appendix 1.

6.1. Highlights from interviews

During the first part of the workshop, we presented a selection of quotes from the interviews, starting with a quote from each interviewee about why the Marlborough Sounds was important to them or their organisation. This was followed by quotes about what we termed '**process issues**'—that is, people's experiences in decision-making processes—followed by what we called '**evidential issues**' (i.e. presenting evidence about values) that respondents raised during their interviews.

Comments about process issues included:

- the onerous amount of evidence and the burden this places on submitters with limited resources
- short timeframes for responding to a large amount of often complex technical material
- formality of the decision-making processes, which some found intimidating, especially cross-examination by lawyers
- high cost of the decision-making processes and reduced access to financial support for submitters
- emotional impact and stress on both applicants and submitters.

Comments from interviewees about evidential issues included:

- legal arguments should be based on scientific facts, not emotions
- need for complete data, covering all users not just commercial users
- the importance of local knowledge acquired over decades
- the need for access to independent public science
- the weakening of democratic rights of communities through intervention from central government
- failure to consider cumulative effects
- the difficulty of assessing the effects of land-based activities, e.g. the relative contributions of historical land clearance vs modern forest harvesting
- statutory recognition of the Treaty of Waitangi and improved involvement of Māori in decision-making
- improved relationships between some iwi and commercial operators
- the importance of consultation and due process to recognise iwi rights and interests.

Finally, the research team presented suggestions from interviewees about how to improve the consideration of values in marine decision-making:

- more open process and less 'patch protection'
- having the 'right people'—decision-makers with a good understanding of the issues
- integrated management between all agencies and interests—collaboration and commitment
- proper, structured meetings with decisions recorded by agency officials
- iwi as decision-makers.

6.2. Sharing views on decision-making processes

From the presentation and from their own personal experiences, workshop participants were asked to write down things that worked well to enable the inclusion and consideration of people's values in decision-making. They then wrote down things they would change and areas for improvement. The responses to the second question are shown in Figure 6; responses to both questions (in typed form) can be found in Appendix 2.
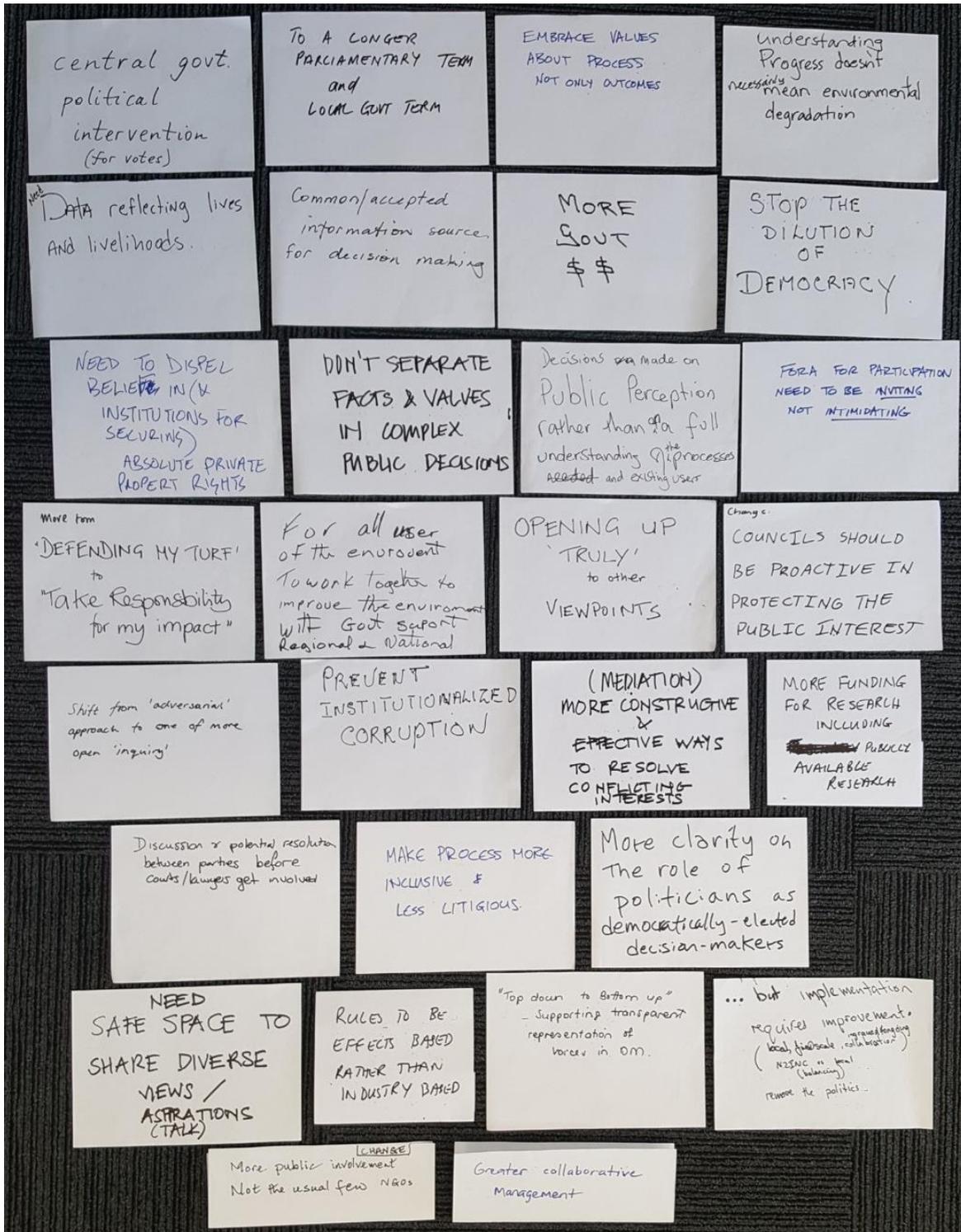
Figure 6.   Responses to the question, 'What would you change to improve inclusion and consideration of people's values?' See Appendix 2 for the actual wording (typed).

6.3. Observations about values from international visitors

The workshop received presentations from two visiting researchers, Kai Chan of the University of British Columbia (Canada) and Kevin St. Martin of Rutgers University (USA). Kai Chan talked about research on the ecological role of sea otters in Canada's Pacific Northwest, on ecosystem services in Costa Rica and on perceptions of wind farms. The many points Kai made included.

- Values cannot always be added up. If people refuse to participate in an exercise that quantifies or puts boundaries around their values, this should not be treated as 'no data'.

- Not all values are individual and utilitarian. Some are virtues, principles about what is right, and others are relational, i.e. can be understood only in terms of relationships between people or between people and a place.

- Decisions about development are driven by us as consumers and by laws about corporate behaviour; we all have a responsibility.

- Proposals are too often presented as having only Yes/No responses, and not often enough as a search for alternative ways to achieve community aspirations.

Kevin St. Martin drew on his experience with fishing communities. He focused on a project to map the fishing grounds that each of several communities were connected to, followed by interviews in these communities conducted by local women. Kevin noted that.

- Providing maps and data on fishing communities enabled these matters to be included in the initial dataset considered by fisheries managers, putting communities at the 'front end' of decision-making rather than the tail end.

- The maps have the effect of projecting the communities into the marine environment. Fishing grounds become not just places where fish and other species live, but also places that are connected to fishers, their families and their communities. The environment and community could no longer be separated.

- Data showing that fishing effort had moved north to follow fish stocks affected by climate change can now be used to show which communities could be adversely affected in relatively short timeframes.

- Whereas the values of individual stakeholders are 'cut out' from community and presented as competing, communities consist of people with a wide range of stakes, so identifying 'community' elicits relationships, negotiation and compromise.

- The interviews were not so much an assessment of local knowledge and histories and concerns about parts of the ocean, as a creation of these things through the interviews. The local interviewers, who had limited knowledge of the local fishery, gained care and concern for fishing communities through the research.

6.4. Ideas for improving decision-making processes

Returning to the earlier discussion, the facilitator and project leader grouped the areas for improvement into five themes, as follows.

- Politics and democracy
- Property rights and responsibilities
- Collaboration
- Information and data
- More open and inviting process

Each theme was discussed by a small group of four or five participants, and each group then reported back to the full workshop a summary of their suggestions for improving the consideration of values in marine decision-making. The Treaty of Waitangi featured in several of the themes. Box 1 records the notes from each group, the key points of which are summarised here.

Under the theme *politics and democracy*, there were suggestions of constitutional reform, such as a set of guidelines to protect democratic principles and co-governance arrangements to give effect to the Treaty of Waitangi. Under the second theme, *rights and responsibilities*, participants noted that property rights come with responsibilities and should reflect the Treaty. They also wanted more proactive manifestations of responsibility by both consumers and producers, rather than waiting for blame to be assigned before action is taken to protect the environment.

Collaboration, the third theme, was seen as a way to build relationships and to secure outcomes by getting all interests aligned, without which politicians might reject stakeholders' advice. But participants also wanted assurance that collaborative agreements would be reflected in decisions.

Discussion on *information and data* centred on ways to build public confidence in science and make science more accessible. The group also suggested producing knowledge about community to help people relate to each other more sympathetically. In discussing a *more open and inviting process,* participants suggested more informal engagement between development proponents and affected parties and more acknowledgement of local knowledge.

After further discussion of these ideas, the entire group shared reflections about the focus of the day's workshop. There was considerable agreement about what could be done better. One attendee said that it was great to be in the room with so much knowledge and passion. They hoped that what had been discussed at the workshop would start to change things to bring more balance into decision-making: "we only have two or three decades to avoid a catastrophe". This was echoed by another who said that "we are past the age of 'there is a big ocean out there'"—i.e. we have exploited all of the resources and have to change our attitudes toward the oceans.

More than one person commented on the strong sense of responsibility and reciprocity that was evident during the workshop. It was noted that stories are a powerful way to communicate values. Another commented that more communication and discussion is important to improve decision-making, but decisions have to be made or everything will come to a halt. Finally, it was said that a lot of things are going the right way—various industries are trying hard to be sustainable, wanting to involve the community to get consensus. Iwi are entering a new age of being involved, and iwi young people have real promise and a conviction to make a difference.

Reflections on engagements in Marlborough Sounds

Box 1. Summary points (verbatim) from small breakout groups, by theme

Politics and democracy
- Te Tiriti o Waitangi (TOW)
- Bill of Rights?
- Set of guidelines to protect democracy and TOW
- Rights of nature, e.g. Whanganui River
- Sovereignty (TOW)
- Constitutional reform?
- Co-governance—Treaty partner, tino rangatiratanga

(Property) rights and responsibility
How do you want things to change with respect to rights and responsibilities?
- More of an integrative approach to management, towards true co-management and co-governance
- Need to align responsibilities with property rights (including customary rights)
- Rights and responsibilities to reflect what is stated in the TOW
- Governance that reflects constituents and stakeholders, not only vested interests
- Enable consumers etc. to express responsibilities (beyond/not only via certification)
- Clarify responsibilities and de-couple from blame/guilt (don't need to show guilt before responsibility applies)
- Better mechanisms for recognising positive actions; proactive taking of responsibility

Collaboration
- Why collaborate? Gift today, for the environment and future generations
- Building relationships: because if you don't represent the interests of all, then minister will reject your advice; need to have the support of the regional council
- So what? The results of collaboration have got to be reflected in the final decision

Information and data
- Need shared/common source of authoritative information
- How to make private information public and reliable?
- Trust building needed around information infrastructure
- Can use collaborative science production to build new understandings of shared dependence and relationships – position ourselves as members of complicated community
- What kind of information is needed? How can we produce knowledge about 'community' to help us relate to each other in more sympathetic ways?

More open and inviting process
- Early process of engagement between applicant and affected parties
  - This is the place for passion; being acknowledged for your efforts
  - For consenting and plan-making
- Avoid win-lose battle between experts and acknowledge local knowledge, e.g. in caucusing, more user-friendly
- Friend of submitter/independent mediator or facilitator

The research team met in Nelson on the day after the workshop to discuss what we had learned. Each team member shared some reflections on the hīkoi, marae visits and workshop. All said that they found these to be stimulating, rewarding and at times powerful experiences.

Several comprehensive valuation frameworks have already been developed by others, some after years of work by large research teams. The original contribution that we can make from our work in the Marlborough Sounds is to reveal the complex realities of what happens to people and their values in actual decision-making processes. This can help us to recommend principles that guide the practice of eliciting values and doing valuation, and indicate the strengths and limitations of various frameworks.

As highlighted in section 1.2, valuation encompasses far more than the practice of estimating the financial value of marine developments and associated changes. It extends to almost any socio-political process in which local actors, by describing what matters about their places and environments, seek to shape the development of these places. While valuation is intended as a way of improving decision-making, it can also have negative effects because the antagonism that is generated can undermine people's confidence in, and willingness to participate in, democratic institutions.

Embedded experiences in local arenas, such as hīkoi and community workshops, provide alternative spaces where some values-holders may feel comfortable with articulating values that are incommensurable, intangible and relational. Rather than forcing values-holders to demonstrate and prove their values through externally-dictated formats and criteria, those who organise valuation processes should make the processes welcoming of diverse values. Recognising that every approach to valuation privileges some interests over others would be a significant step towards embracing multiple and complementary methods for eliciting and receiving values and towards legitimising local and traditional environmental knowledge.

7. INTERVIEWS WITH DECISION-MAKERS

In the interviews of decision-makers, we asked what types of values were considered in decisions-making, how the relative importance of values was determined and what criteria, if any, were applied. This section describes the themes that we identified from these interviews, illustrated with quotes from the interviewees.

7.1. Eliciting values

One set of themes related to how values are identified.

7.1.1. Methods for identifying different types of values

According to those interviewed, biophysical aspects of environmental values tend to be presented in technical reports and more recently through mapping devices, whereas community and social values (and values 'of place') are revealed through consultation processes and presented in summaries of submissions. Economic values, when mentioned, were defined narrowly as 'financial' or 'commercial'. Modelling is sometimes done to estimate economic costs of policy options and their impact on jobs.

Cultural values were mentioned by some interviewees, who described them in a more anecdotal fashion and said they can come across as disjointed and even opposing, because they are often presented by multiple spokespeople.

Mapping was mentioned by three interviewees as a technique for documenting values. One respondent noted that a lot of work on values can be discredited by one community member picking out a small detail that is incorrect and dismissing the whole thing.

There is a lot of variation in how amenity values are assessed and the quality of the information that results. Work is being done to develop a consistent methodology.

> That certainty that people are looking for isn't available if you've got a vague description or a very generic description of the values that are present in those places and that you need to make an informed decision about the effects on those values (VFR24).

7.1.2. Public consultation

Public consultation is widely used in decision-making processes, under both the Resource Management Act (RMA) and the Fisheries Act. For example, referring to decisions on measures to protect dolphins, a fisheries official said that public consultation is a way to ascertain the values of the 'main users' of marine biodiversity.

A regional council officer commented that, as far as possible, a decision-maker should hear from people in their own voices:

> When we put that into words on paper, you lose a sense of experience in that because you're not there seeing or touching it. One thing that we've learnt … is that we can never describe things like that better than the people themselves. We've got to be careful how we use these values, because what ends up happening is then we make a judgement call about how do we balance all of these values … (VFR14).

Nonetheless, officials must decide which submissions to highlight in their analysis:

> The minister needs to hear the voices. You're providing that conduit. ... [T]here will be key submissions, from NGOs for example, from fishing companies and fishers who are affected. Those are placed to give context to the minister (VFR22).

7.2. Assessing values

A second set of themes we identified from the interviews concerned how values, once identified, are then assessed in decision-making.

7.2.1. Frameworks

We asked decision-makers what framework, if any, they used to assess values. While respondents said they had formal systems for reporting information, these were not 'values frameworks'.

> I have to say even though there was a system of reporting information back to the council there wasn't a systematic values framework that we used (VFR20).

> You can have the most beautiful framework, but if you've got a group of people who are saying 'yeah but that's contrary to our historical rights here, you're infringing upon our mana', it's really quite difficult to figure out how to deal with that (VFR17).

One regional planner said that some decisions about where aquaculture should be allowed were approached in an ad hoc manner.

> At a broad level we were just engaging with the community to say, these things are important to us, aquaculture might conflict with those. That was the idea, to try and hone in on those areas which were 'controversial' and those areas which might be easier to allow aquaculture to proceed … I guess taking almost a seat-of-the-pants approach saying, ok here's where the industry

wants to go, let's learn as much we can about the area and how it is used by the community and adding that other layer of ecological values then making a judgement based on that … (VFR20).

We asked decision-makers if their approach used the concept of ecosystem services as the basis of a framework. No one had used it as an explicit framework, and one said that some stakeholders were suspicious of the concept.

> So [ecosystem services] was one of the ideas … [to] reconcile the values and start to talk about them. It was decided that that was not what they were going to do. There were various concerns around the table, the environmental groups thought that some of these things had intrinsic values that ecosystem services couldn't capture and that it wasn't a fair representation of reality, some of the industry groups were concerned that ecosystem services overvalues the environment. So there were a lot of different views around the table and it was decided that that was not the way they were going to go (VFR24).

One official conflated the concept of ecosystem services with ecosystem-based management:

> In the Fisheries Act, it is kind of in there. It's not called ecosystem-based, but you are looking at the effects on fisheries and sustainability of fisheries in the environment in the Act which touches on, language that touches on the ecosystem services. And so when you have decisions on stocks and things, it gets picked up here or there but it's too ad hoc, I believe (VFR22).

7.2.2. Mapping and MSP

Marine spatial planning (MSP) is seen as a framework for organising values but still requires a social process of weighing up the different values, for example, when councils are allocating space for aquaculture.

> [Marine spatial planning] has been identified as one of the more appropriate ways to allocate space to certain types of things within the marine space, because it takes a lot of things into account all at the same time and multiple values which is what you are interested in (VFR17).

> We learnt a lot … it's really hard, it takes a lot of effort' … [Competing values were reconciled by] the science being socialised and going through a social process of weighing up the different values dependent on what the society and people want (VFR17).

These comments show that the reconciliation of competing values remains a subjective process undertaken by decision-makers, in this case a collaborative group.

7.2.3. Science

Scientific evidence has implications for values and vice versa. Although RMA and the Fisheries Act decision-making processes differ in detail, under both statutes, officials assess and summarise the scientific evidence for decision-makers. Under the RMA, scientific evidence can be challenged and further tested in formal hearings, while under the Fisheries Act, there are written submissions summarised by officials. Decision-makers (e.g. hearing commissioners) then have to decide how much to rely on each piece of evidence.

Respondents said that scientific reports need to be "socialised" with affected parties in order to be accepted by them. Stories about what coastal and marine ecosystems were like in times past can help to reinforce the significance of scientific reports:

> So those understandings about why things have happened, they shared stories about my grandfather and that was quite important, about the history of the site. That back in the day we used to be able to catch this many snapper and those kind of things, were things that they understood and they had personal experience of potentially. … so their personal experiences aligning with what we were telling them with the science was important (VFR24).

7.2.4. Tangata whenua

Officials in regional councils said that the decision-making landscape had changed significantly over the past decade with respect to involvement of Māori. Under the RMA, officials now have to demonstrate that feedback from Māori has been taken into account, although consultation is not always done well.

> I do think in terms of the impact of decision making, Treaty settlement and rights of iwi, what we begin to hear coming through the Waitangi Tribunal is a different landscape than it was 10 or 15 years ago, where iwi are now having much more influence than what's happening in our environment (VFR14).

> …there was also quite a lot of concern from the local hapū … where the zone was going in. The Ministry never went and spoke to them directly so that caused some angst, that was a pretty rookie mistake to make (VFR16).

7.2.5. Property rights

Property rights, perceived or real, can dominate decision-making about marine space:

> The one that astounded us was the fact that all these very, experienced boaties and yachties were very vociferous and anti-marine farming, almost

totally against it … it was never about ecological issues it was always about these would take away their recreational playground (VFR18).

Also, we don't have the mechanisms where we compensate or even rec fishers could buy quota to do that, to buy out to shift or government assist that. I've seen that done in other jurisdictions (VFR22).

7.3. Making Decisions

7.3.1. Legal criteria

Decisions must be made according to criteria in legislation. This provides certainty and protection for people affected. A fisheries official explained:

One way it's always done in government and it needs to be done a) for public record and also because the open right to legal challenge of judicial review, is you have to set it out in a very legal way about the rights and powers of the Act on what you're doing. …all those decisions required before they can be promulgated—[including] a regulatory impact statement, which is required by law and Treasury oversees it, and that's the costs and benefits (VFR22).

Although the Fisheries Act does not refer to weighing up costs and benefits, that is how this official described it, as "a balancing decision":

It's very much a cost and benefit paper, but very importantly it must set out for the Minister the summary of submissions. We always ensure the Minister gets access to all the submissions although … It certainly is not a voting exercise, it's a cost and benefit trade off, a balancing decision if you will (VFR22).

Legislation sometimes precludes decision-makers from considering relevant factors:

If we're planning for a particular thing like freshwater management it's not just about freshwater management, it's about how do we manage … is it the land use? Is it the type of activities that are occurring in and around other activities and in and around the water body? A whole raft of things … for example we can't go into the coastal marine area. We've got the Maketu Estuary at the bottom of the Kaituna and we can't link the two because the NPS [national policy statement] is only dealing with freshwater. Now to me that's a silly way of looking at things (VFR14).

7.3.2. Politics

Although decisions need to follow legal criteria, respondents commented on several ways that politics affects decision-making for the marine environment.

Ministers are politicians. … depending on … their individual personalities but also where they are in their career. You could have a very mature minister who has been a long time in office and they're far more robust and used to making very decisive decisions to do the right thing. We've seen some very decisive decisions made for example on foreign charter vessels, the blue cod closure and that kind of thing. And then you'll get ministers and they've made promises to get in power and they're quite compromised to make the harder decisions. (VFR22)

…our councillors put their hands up and said well if the industry isn't that keen on it then we're not going to fight too hard on their behalf (VFR15).

7.3.3. Considering multiple criteria

The RMA requires decision-makers to promote sustainable management, enabling people and communities to meet their needs while, among other things, safe-guarding the life-supporting capacity of the environment. The Fisheries Act directs decision-makers to provide for the utilisation of fisheries resources while ensuring sustainability. For both Acts, decision-makers need to consider scientific evidence in light of submissions received from various parties. Specific frameworks can provide increased clarity and a wealth of information, but do not necessarily create a 'common ground' for decision-making.

In our planning approach it was about also taking into account other users of the marine environment and their views and privileges in the marine environment. That was one thing and we did modelling on that covering just three scenarios using the wellbeing as the quadruple-bottom line (social, cultural, economic and environmental, multi-criteria analysis) (VFR14).

…the idea there [MCA] was well can we place all of these quadruple bottom lines—environmental, social, cultural and economic—can we sort of whack everything together and create some sort of a framework that allows you to compare things … it was quite difficult to do that in a way that didn't sort of end up being so loose that it didn't really tell you an awful lot in the end... (VFR17).

Decisions require weighing up competing values and interests:

Like any decision-making you have to weigh up the evidence that's put in front of you, the information that backs it up and I suppose you have to establish the truth or not. Now a lot of lay people come along with lots of emotion on either side of the argument and they'll say all sorts of things… (VFR18).

Are the environmental layers as important as the social layers or are the social layers twice as important? Or are the environmental layers twice as

important? Relative weighting becomes a political nightmare, it's really tricky (VFR17).

One process used explicit criteria with weighted attributes:

> … we agreed with government that we would use a weighted attribute process. The idea being is that we didn't want first in, first served. Because at the end of the day we want the zone to be utilised by the best people, that were best in terms of growing fin fishing from a management and biosecurity perspective, but also best in terms of regional benefits (VFR21).

Another decision-maker acknowledged that, ultimately, it is a matter of judgement:

> It's a judgement call, at the end of the day it's a judgement. Obviously, you're influenced by the direction given to you by the RMA and national policy and even regional policy statement. That gives you the playing field or umbrella that you've got to work under. There's certain requirements there but otherwise it comes down to purely a judgement call because it cannot be anything else, you're weighing up quite different types of values (VFR15).

Sometimes no decision was reached.

> The short answer is we didn't come to a decision, we've kind of left things hanging … we did … use that information to hone down to those 19 areas which might be feasible, but really left it to the industry to apply for the consent for that area. We really rely on the consent process to determine exactly whether things should proceed or not (VFR20).

> …in the end we just gave up, we just stopped working on it, we just parked the whole thing (VFR16).

7.3.4. Collaborative approaches

Several of the interviewees were familiar with, and commented on, the Hauraki Gulf collaborative multi-stakeholder process, which sought to develop a marine spatial plan for the shared waters of the Gulf. There was some tension concerning the role of agencies in the process:

> … they [community, industry and NGO representatives] wanted it to be very, very strongly stakeholder driven, as opposed to being quite strongly controlled by the agencies … They wanted this to be their project and that's what happened. We supported it, we provided all of the framework, the structure, the dollars etc. but they were definitely the ones who were trying to run it. It was their discussions, their information that was provided to them by experts and so on (VFR17).

Values were generally agreed, often after a considerable amount of time and discussion. The difficulty was in prioritising values and deciding how much impact one activity could have on other values. This is where 'science meets the social aspect':

> When science meets the social aspect … then the personal, industrial, political agendas that each one of them brought to the table would come into play and then it became once the science was understood and socialised you had this next social process of "well, what are the trade-offs? What is good for me and my family? What is good for my community? What is good for the region and what is good for New Zealand?" All of those levels of concern played out in that discussion (VFR24).

> When you get to these collaborative groups you've got to identify where they're likely to win, what's in it for me? Why am I here? What am I going to get out of this process? (VFR21).

7.4. Key messages from decision-makers

From the interviews with decision-makers, some key points emerge. Not unexpectedly, legal criteria and constructs dominate decision-making, but politics still has a strong influence. Weighing up competing interests is usually a matter of judgement, with no clear conceptual frameworks used to assist decision-makers. Property rights, both perceived and real, feature in discussions about use of marine space, with some users described as taking a 'not in my backyard' stance on aquaculture, for example. It was suggested that some politicians, though not all, are cautious about making decisions that will cost them votes at the next election. In some cases, no decisions are made.

When asked about ecosystem services, some commented favourably on this concept but said it was viewed with suspicion by some stakeholders. One official conflated this framework with ecosystem-based management, which suggests that one or both concepts suffer from a lack of clarity for at least some decision-makers.

Collaborative decision-making was seen as a way of socialising both the science and the balancing of competing values and interests. This does not remove the scope for stakeholders to take positions based on narrowly defined interests, and in fact might exacerbate it. Notwithstanding shortcomings, collaborative decision-making does provide a semi-transparent mechanism for competing values and interests to be resolved, something that other processes lack.

8. WĀNANGA WITH MĀORI EXPERTS

8.1. Background

On 15 February 2018, Cawthron convened a wānanga with five Māori practitioners involved in resource and/or fisheries management in Te Tau Ihu o Te Waka a Māui (the top of the South Island). Also attending were three members of the research team (one of whom is Māori) and the same facilitator who assisted with the Picton workshop. Participants are listed in Appendix 1.

The project leader explained that the aim of this Sustainable Seas research project is to investigate how to improve the ways that values are considered in marine management. For the purposes of the project, values are defined as 'things that matter', which could be a taonga species or wāhi tapu, or could be a general value about 'how things are done', such as kaitiakitanga or whanaungatanga.

The specific aim of the wānanga was to identify tentative principles, e.g. drawing from tikanga or mātauranga Māori, for how Māori values should be considered in coastal and marine management. The plan is to trial some of these principles during a case study of ecosystem-based management (EBM) in Tasman Bay / Te Tai-o-Aoere and Golden Bay / Mohua.

The wānanga sought participants' professional views and experience; they were not asked to represent the views of the iwi or other organisation that they work for. Therefore, this document should not be taken as representing the views of local iwi.

Notes from the wānanga were circulated to all participants, who were invited to add to or correct what was summarised, or to identify anything that is sensitive and should not be used publicly. Feedback on the notes was positive and no changes were requested.

8.2. Decision-making processes for marine management

Two exercises prompted participants to think about how Māori values are considered in decision-making processes for marine management:

- **Wave exercise** – this exercise was used to identify and reflect on features of Māori participation in marine management decision-making processes across a historical continuum from the past, through the present, to emerging themes and ideas for a 'radical future'.

- **'Sticky board'** workshopping method – this exercise was used to generate ideas on how Māori would like to be more involved in marine resource management decision-making.

8.3. Wave exercise

Participants were asked to reflect on Māori values and participation in marine decision-making processes in the pre-colonial period ('past') and on how this is experienced and understood now ('present'), and then to identify new waves as 'emerging themes' and possibilities for a 'radical future'. Key words and ideas were written individually by participants on sticky notes and then placed by the participants onto the wave poster at the appropriate point on the timeline (see Figure 7). Table 3 records the notes that were generated from the 'wave exercise'.

Figure 7.   Wave exercise relating a trajectory of experiences of Māori in marine decision-making processes.

Table 3.   Text on sticky notes from Wave exercise. Comments contributed by non-Māori participants are denoted by an asterisk (*).

Past

- People stand in their own mana
- Tino rangatiratanga, kaitiakitanga
- Wasn't a need to protect fisheries
- Tangaroa, wairua
- Tikanga
- Māori rohe clearly defined*
- Kai harvest
- Majority of population
- Iwi collaboration, e.g. heke south from Kawhia
- Colonial pressure + influence forced big change. Māori pressured to adopt new methods, e.g. earning a wage, shifting locations

- Hierarchy of Māori society, e.g. atua, rangatira, tautauhea, taurekaraka
- Customary processes, e.g. rāhui
- Manawhenua, whakapapa
- Tapu and noa
- Tūpuna, mātauranga
- Fishing for whānau sustenance versus fishing for money
- Rāhui and tapu – processes that put the mauri first*

Now / current

- Settler Government / military might
- Colonisation—settlers making all the decisions about marine management
- Misunderstanding or no attempt to understand different cultural worldviews*
- Te Tiriti o Waitangi
- Moana ora, mana moana
- 'Consultation' is flawed
- $$$$
- Taiāpure—decision-making role in local fisheries
- The Fisheries Settlement and other pieces of legislation obstruct iwi participation
- Iwi in the Environment Court, e.g. King Salmon water space

- Legislation policy / settlement legislation
- Raupatu—seizure of land and other assets
- Racism
- Māori concepts, words, engagement more accepted—but is it really understood?*
- Treaty principles
- Advocating for Te Ao Māori
- Māori are 'consulted', but Pākehā institutions make decisions*
- Customary practices, e.g. taiāpure, are not upheld
- Māori as quota holders in fisheries management role*
- Mokopuna
- Immigration policy

Emerging

- Redefining our tikanga and values in a modern-day context
- Collaborative decision-making—Treaty of Waitangi role not always clear*
- Rise of ministerial powers
- Post-Treaty settlement—new organisations, political alliances, statutory obligations*
- $$$$
- Indigeneity
- Threat of international trade agreements to sovereignty
- Media propaganda
- Kaitiakitanga a buzz word—how is it implemented?
- Kaitiaki roles defining
- Iwi-led research, co-design, co-management, co-governance

- Global and Māori economy affecting Māori in decision-making
- Partnership as envisaged in Treaty shared power
- Ignoring settlement obligations
- Willingness from some organisations to whakamana iwi
- "It's broken"; can iwi help fix?
- Recognition of UNDRIP (United Nations Declaration on the Rights of Indigenous Peoples)
- Social media
- Kaitiakitanga—increasing interest as a concept to address failures of western management*
- Iwi values considered as current issues start to peak e.g. climate change, seabird life in decline
- Early age healthy environment education

- Māori experts on the rise—education
  influences change

Radical future
- Consider mauri of all species   - Zero negative pollution   - Kaitiakitanga over-rules marine management   - Commercial interests of few <u>do not</u> dictate marine management   - Iwi are in Council   - Iwi Māori at the table   - Iwi involvement is honoured and actioned beyond a token effort   - Mauri of te taiao first—people align with that*   - Rāhui on polluted areas a legal obligation   - Let the mauri of indigenous fauna take precedence over profit   - Constitutional change   - Two houses of Parliament—upper house including iwi   - Crown provide funds for iwi to engage

8.4. Sticky board exercise

The second exercise in the wānanga employed a 'sticky board' workshopping method to generate ideas on how Māori would like to be more involved in marine resource management decision-making (see Figure 8). Participants' views were placed on a large sticky sheet visible to everyone. This collection was later used by participants to elaborate with further explanation and examples.
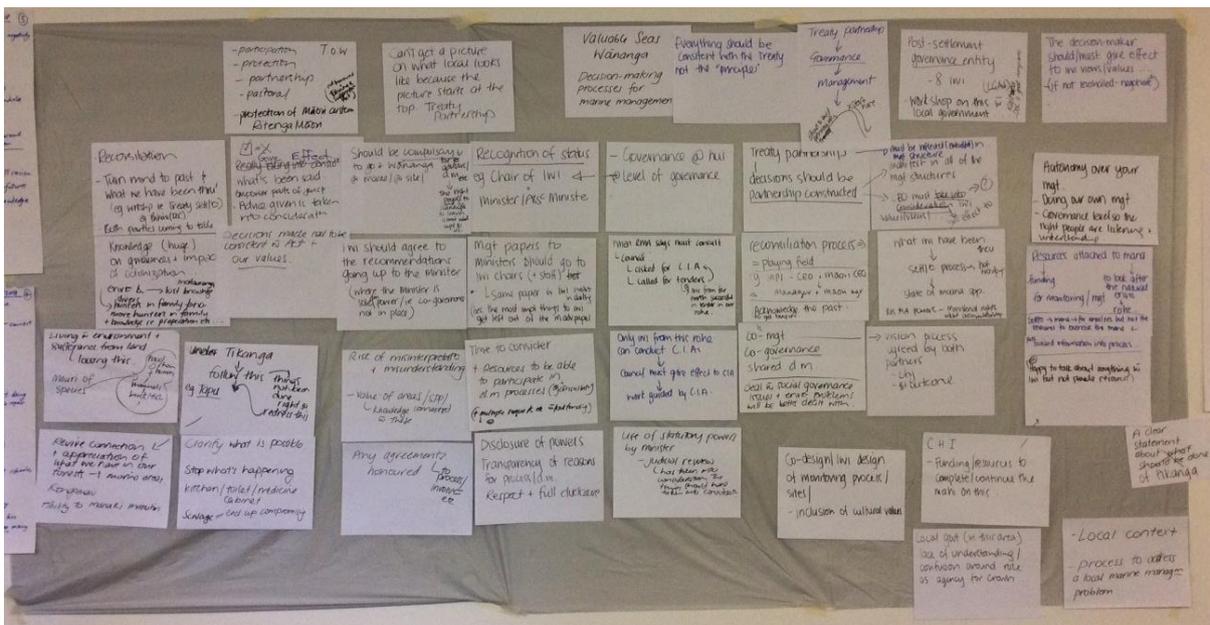
Figure 8.   Sticky board of ideas on how Māori would like to be more involved in decision-making for marine resource management.

Notes generated from the 'sticky board' exercise were later grouped into these themes.

- Treaty partnership, governance and management
- Māori worldview of environment: understand tikanga and local history
- Process characteristics: funding, resources, timing

- Inclusion through the entire decision-making process

The following sections document the contributions for each theme.

8.4.1. Treaty partnership, governance and management

The suggestions under this theme are listed below.

- Everything should be consistent with the Treaty itself, not the 'principles'
- The four Ps of the Treaty of Waitangi: Participation, Protection, Partnership and Pastoral—but the latter was not honoured, i.e. The Tohunga Suppression Act 1907.
- Protection of Māori custom: ritenga Māori.
- Needs to be at the governance level so the right people are listening and understanding.
- Treaty partnership must be reflected (embedded) in management structure.
- Decisions should be partnership constructed: manifest in all management structures; CEO must give effect to iwi values and views.
- Reconciliation process—a level playing field and recognition of status, e.g. Chair of iwi + Minister; Ministry CEO + Māori CEO; department manager + Māori manager (i.e. equivalent positions at different hierarchal levels).
- Co-management and co-governance in shared decision-making: vision and process agreed by both partners for objectives and outcomes.
- Co-design/iwi design of monitoring process/sites/inclusion of cultural values.
- Deal with social and governance issues and then environmental problems will be better dealt with.
- Post-settlement governance entity: eight iwi in Te Tau Ihu.
- Finally, one of the cards had this diagram:
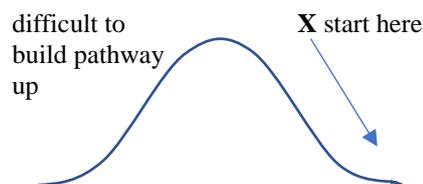
8.4.2. Māori worldview of environment: understand tikanga and local history

The following suggestions were grouped under a theme concerning understanding Māori perspectives: worldview, tikanga and local history.

- Knowledge about grievances and the impacts of colonisation: local history.
- Reconciliation: involves both parties coming to the table.

- Turn mind to past and what we have been through, e.g. workshop regarding Treaty settlement in Te Tau Ihu (example/template of a successful workshop with DOC).
- Should be compulsory for advisers/decision-makers to go to wānanga at marae and on-site to learn about what's important to us.
- Local government (in this area)—lack of understanding/confusion around role as agency for the Crown.
- Only iwi from this rohe can conduct Cultural Impact Assessments (CIAs)— Council must give effect to the CIA and work guided by it.
- Follow tikanga: when things not being done right then redress this, e.g. tapu.
- Stop what is happening: treating the kitchen/medicine cabinet as a toilet, e.g. sewage disposal.
- Mauri of species—food chain of humans, mammals and birds/fish.
- Revive connection with what we have in our forests and marine areas, e.g. rongoā.
- Ability to manaaki manuhiri: living with the environment and sustenance from the land.
- We're losing valuable skills: divers and hunters in the family—knowledge about preparing food from the sea and bush.

8.4.3. Process characteristics: funding, resources, timing

Several suggestions addressed issues of process and resources.

- Influences on iwi and hapū involvement in decision-making processes for marine management.
- A clear statement about what should be done, e.g. tikanga.
- Local context—process to address a local marine management problem
- [Government] happy to talk about anything with iwi but not provide resources.
- Resources/funding attached to mana to look after the natural environment and rohe—for monitoring/management.
- Time to consider and resources to be able to participate in decision-making processes, e.g. 'consultants' (multiple requests etc without funding).
- Cultural Health Indices-funding/resources to complete/continue the mahi on this.

8.4.4. Inclusion through the entire decision-making process

There were also suggestions that directly concerned how Māori are involved in the actual decision-making.

- The decision-maker must 'give effect to' iwi views and values: if not reconciled, then negotiate.
- Decisions made need to be consistent with the Act and iwi values.
- Advice given needs to be taken into consideration.
- Iwi should agree to the recommendations going up to the Minister (where the Minister is sole decision-making power, i.e. co-governance not in place).
- There should be a disclosure of powers and transparency of reasons for the process and decision.
- Management papers to ministers should go to iwi chairs (+ staff).
- Same paper with iwi involvement in drafting because the most important things to iwi get left out of the ministerial advisory papers.

8.5. Open discussion

The general discussion that followed elaborated on the two exercises, drawing from the participants' experiences. The statements were subsequently grouped into themes by the researchers and checked with participants.

The environmental 'norm' has changed and keeps changing
- In the past, when kaumātua were 'consulted', they weren't really consulted but were told what not to do. We live with that legacy. We are still at the mercy of others if they choose to ignore or disregard our advice. The consultation box can be 'ticked', but are we really listened to?
- The Crown allocated people to take care of management roles. Kaitiaki role is handed down through generations.
- It's important for us to look to lessons of the past. The norm has changed and keeps changing: the condition of the moana continues to deteriorate from generation to generation. How do we know what it was like before? Today the coast/moana is treated as prime real estate.

In the old days, making decisions was based on manawhenua, rangatira and rangatiratanga
- In the past, disagreements were settled by a clear decision-making process. Today, it's hazy. Treaty of Waitangi versus land claim/settlement.
- Problems: Treaty of Waitangi never honoured
- Beginning: who holds manawhenua?
- Sovereignty? Māori either have it or they don't. Successive governments have struggled with that.
- 1980s Treaty principles imply something less than being a Treaty partner.

Settlement legislation is ignored

- Governments ignore Treaty of Waitangi settlements, e.g. aquaculture settlement—the minister changed the quota weighting (e.g. decreased commercial snapper quota, increased recreational rights) without talking to iwi—hence, effectively ignoring iwi rights. An MPI report on which that decision was made has gone missing.

Iwi are victims of media

- Iwi are victims of mainstream media—negative focus, racist perceptions, stereotypes reinforced, victims of propaganda.
- E.g. strategic placement of iwi news near court reports or negative stories, and Māori/Pākehā politicians are given unequal attention in the newspaper. This results in a perception that Māori are dishonest, so don't deserve settlement money—a contrived and manipulated view.
- We seldom see positive stories on Māori success, such as business ventures and international partnerships.

Challenges and renewed focus

- Focus on inter-generational equity: focus on mokopuna
- Whole community involvement in decision-making processes
- Focus on indigeneity
- The challenge of profit-focused and profit-maximised entities versus intergenerational rights, the dominant neo-liberal agenda—an imbalance of power.
- The challenge from institutional racism
- The challenge from new immigrants, different perspectives, social engineering—removal of social housing: where was the role of iwi in this kaupapa of immigration?

Future models for decision-making

- Upper house in Parliament required to recognise iwi rights; iwi representatives in upper house have right to veto legislation in the lower house; all iwi would have a seat in the upper house and this would include eminent members of the community: honest, governance-focused.
- It should be an iwi right to vote on legislation as it comes through, otherwise iwi will always be a 'political ball in a political game'. Today we are forced to be reactionary.
- Need change in political structure at the top, then flow on from there.

8.6. Conclusions from the wānanga

The project leader summarised some of the key themes that he had heard during the day, as follows.

- The Treaty of Waitangi is the over-arching framework within which EBM should sit, not the other way around.
- Decision processes should reflect the Treaty partnership—decisions should 'give effect to' and not just 'consider' iwi views. If Treaty partners do not agree, they should talk further.
- Iwi should be recognised at a governance level, kanohi ki te kanohi (face to face).
- Co-governance and co-management should be properly resourced. It is not a true partnership if one party controls all resources.
- Decisions and decision-making processes should:
    - recognise past abundance as a goal for the future
    - recognise that people are part of the food chain—if te taiao is not healthy, people are not healthy
    - recognise and maintain mātauranga about living from the land and the sea.

The wānanga agreed that this summary should be presented the following day to the workshop with wider stakeholders, noting that these key themes were to be reported to iwi before being further discussed in a wider context.

9. WORKSHOP ON FRAMEWORKS AND PRINCIPLES

9.1. Introduction

On 16 February 2018, Cawthron convened a workshop with diverse interests from the top of the South Island. The aim for the workshop was to consider some tentative principles and frameworks that have emerged from the project thus far and then consider the implications of trying to apply some of these in real life management contexts. Participation at the workshop, by sector, is shown in Table 4. See Appendix 1 for names and affiliations of participants.

Table 4.   Participation in a workshop on valuation frameworks and principles, by sector, February 2018

Central government	5
Community	1
Environment	4
Industry	4
Local government	3
Tourism & recreation	3
Research	9
Facilitator	1
Total	30

The workshop began with a brief background to the Sustainable Seas Science Challenge and to the project Developing Valuation Frameworks and Principles.

Values are complex. The project leader noted that the term 'values' has multiple meanings, and that many types of values are intangible and difficult, if not impossible, to quantify meaningfully (Sinner et al. 2014a; Tadaki et al. 2017). Valuation involves identifying values (i.e. things that matter) and considering these in decision-making.

For this project, principles and frameworks are defined as follows.

> A **principle** is a fundamental assumption or guideline that serves as a basis for reasoning or action. A principle should be a complete sentence that makes a clear statement about what should be done (like this sentence). In this definition, a principle is not binding—otherwise it would be a rule or a requirement—but it should be followed unless there are strong and transparent reasons for not doing do, e.g. a conflict with another principle or with a legal requirement.

> A **framework** is a structured way of organising and considering information, in this case, to guide decision-making.

The project leader summarised the work leading up to this workshop, and cited key messages emerging from the work so far.

- Valuation encompasses far more than the practice of estimating the financial value of environmental services and changes. It encompasses any process in which people seek to shape the development of their places and environments by describing what matters about these places.
- Statutory decision-making processes, e.g. planning decisions under the RMA, are a form of valuation; they collect evidence about what is important and then produce a decision based on interpretations of that evidence.
- Valuation for decision-making can create a destructive path through communities.
- There is no perfect method for collecting and considering values.
- Valuation and decision-making practices should be transparent, democratic and open to new ways to receive values.
- Experiences in the environment with values-holders can be an effective way to receive intangible values.

9.2. Tentative principles and frameworks

9.2.1. Principles

From the case study in the Marlborough Sounds and subsequent analysis, the research team identified a series of questions about decision-making and, from these, drafted some tentative principles. These are presented in Table 5.

Table 5.   Questions and tentative principles about decision-making

Questions	Principles
Who will make the decision? What information is required?	A good decision-making process should… a) Make clear to all participants who will make the decision and how it will be made. b) Incorporate participants' views on what information is required to inform the decision.
How can existing opposition and conflict be overcome to generate a situation where alternatives can be explored objectively?	A good decision-making process should… Enable people with competing interests and/or values to see that they have many values and objectives in common, e.g. by co-designing a vision for the place of value including mana whenua values.
How can values be expressed with more ease, openness and inclusiveness?	A good decision-making process should... a) Provide multiple ways for people to express their values, and be open to ways that are culturally meaningful to the values-holders. b) Consider experiencing values 'in place' through shared experiences with values-holders.
How can decision-making occur so that all values are acknowledged and considered throughout the decision-making process?	A good decision-making process should... Use a clear and transparent framework for organising and considering information about values
How should a group who would benefit from a proposed activity treat other people who would be adversely affected, especially if the values affected are deeply held spiritual or cultural values?	A good decision-making process should… a) Find an approach that treats people fairly and is seen to be fair, e.g. by finding 'something for everyone' wherever possible. b) Maintain confidence in democratic institutions (everyone's rights are respected).

9.2.2. Frameworks

At the workshop, we presented frameworks that represent three broad approaches to assessing values for decision-making: cost-benefit analysis (based on economics), assessment of ecosystem services (based on ecology) and structured decision-making (based on multi-criteria analysis that accommodates mixed value types). The

obvious omission is the lack of a cultural framework; this will need to be addressed in the next stage of the project (see section 10.2 of this report). The following overview expands on the information presented at the workshop.

Cost-benefit analysis

Cost-benefit analysis (CBA) is a method for identifying, valuing and comparing costs and benefits of alternative options (e.g. projects, policies), where costs and benefits are typically described in economic or financial terms (Buncle et al. 2013).

Costs and benefits are defined as changes in value relative to a counterfactual situation. Thus, by definition, CBA considers marginal values rather than total value of a system. The CBA framework is based on the principles of welfare economics and enables the inclusion of all kinds of costs and benefits. Where these can be quantified in financial terms, it is possible to estimate the net benefits (or costs) of a project or policy in today's dollars. CBA follows a logical and systematic sequence while allowing flexibility in choice of tools.

In some cases, estimation of the monetary value of non-market goods and services is not appropriate or not feasible owing to resource constraints, or to philosophical objections. Instead, the relevant costs and benefits are described as precisely as possible in other quantitative terms, e.g. how many people, hectares, kilometres of streams, animals, plants etc. would be affected in a certain way. A decision-maker can then decide if the non-monetised costs and benefits are sufficiently large to outweigh any difference in the net benefits estimated in monetary terms (Sinner et al. 2014a).

Assessment of ecosystem services

Ecosystem services (ES) are "the direct and indirect contributions of ecosystems to human well-being" (de Groot et al. 2010, p25). The concept of ecosystem services offers a framework for identifying and classifying values. It is anthropocentric—it concerns benefits to humans. The ES framework aims to identify ecosystem functions that underpin human life and our social, economic and cultural well-being, yet are often take for granted and overlooked.

The ES framework used by the Millennium Ecosystem Assessment (2003) is among the most commonly used. It has four categories of services.

- *Provisioning services*: products obtained from ecosystems, including food, fresh water, fuel wood, fibre, biochemicals and genetic resources
- *Regulating services*: benefits gained from regulation of ecosystems processes, e.g. climate regulation, disease regulation, water regulation and water purification
- *Cultural services*: non-material benefits obtained from ecosystems

- *Supporting services*: services necessary for the production of all other ecosystem services, e.g. soil formation, nutrient cycling and primary production (i.e. photosynthesis) (MEA 2003, p 5).

The Millennium Ecosystem Assessment (2003, p 38) cautions that "These categories overlap extensively, and the purpose is not to establish a taxonomy but rather to ensure that the analysis addresses the entire range of services." If the intent is to measure and value the ES from an ecosystem or area, supporting services should be recognised but not separately valued, because their value would be included in the value of the other services (Sinner et al. 2014a).

A more recent work, The Economics of Ecosystems and Biodiversity (TEEB), adopts a similar classification system. However, in this system, 'supporting services' are considered a subset of ecological processes and are replaced with 'habitat services' such as maintenance of life cycles of migratory species and maintenance of genetic diversity (de Groot et al. 2010).

Structured decision-making

Structured Decision-Making (SDM), a form of multi-criteria analysis, is a methodology for organising and analysing diverse information for decision-making with multiple objectives. It is a distillation of principles and practices that constitute sound policy analysis. Gregory et al. (2012) provide a detailed guide while Sinner et al. (2014b) provide a short overview and a New Zealand example.

An SDM process treats all values as equally legitimate; it does not require agreement on how values should be ranked or prioritised. As such, SDM is primarily a mechanism for developing clear criteria and assessments so that each participant can see how well each option would meet their objectives. Alternatively, explicit weightings can be given to the values or objectives to explore what values respond best to the different options. Either way, the methodology facilitates creative attempts to find a solution that everyone can accept (Sinner et al. 2014a).

SDM can require a lot of time and information, but it can also be done quickly by a few people based on existing knowledge and expert opinion. Like any decision analysis, the amount of time one spends on it is determined by how important the decision is, how much information people require to be convinced and how concerned the ultimate decision-maker is about having all participants in agreement.

9.3. Group discussion

The opening presentation spurred discussion that ranged across several topics. The following summary was compiled after the workshop based on notes recorded by the facilitator on flip charts.

9.3.1. Decision process

Many of the comments concerned matters of process.

- The 'moment of consent' is not the only moment of decision. A series of decisions are made throughout a process that influence the final outcome.
- Communities want transparency and commitment, e.g. that decisions and plans made through a community process will be respected by central government.
- Process is important. People may not like a decision but should feel that they have been treated fairly and be able to understand the reasons for the decision.
- Plans are an impediment. We need a more live (i.e. flexible, dynamic) process; a counter-argument to that is that some want certainty.
- Processes should have independent facilitators and provide for more 'real' conversations that are less adversarial. It is difficult for councils to initiate these conversations – the facilitator should be someone without a stake in the outcome.
- To work well, a process needs access to relevant knowledge.
- Conversations driven by legal requirements often have to follow an adversarial process; this is costly and an impediment to good decisions.
- Who is 'the community' that should be involved in any given decision?

9.3.2. Winners and losers

Some comments were made about who gains and who loses from decisions.

- In a world with limited resources, not everyone will gain from a decision; some will lose. Can we learn anything from the practice of restorative justice?
- The notion of 'gifts and gains' (practiced in Te Korowai and in Fiordland) is about gifts to the environment, the whole, so that everyone will ultimately gain.
- Any trade-offs should be made transparently.

9.3.3. Decision criteria

Comments about decision criteria included the following.

- Who and what is decision-making for?
- We cannot put a value on the environment because there is only one environment, which we need to survive. We should ask, 'what does a place need to function properly?'
- Case law affects decision-making.

- We should have an outcomes-based principle, e.g. First, do no harm to the sea. In a freshwater context, the first right of water is to the river, everything after that is a gift.
- The objective of the Sustainable Seas Science Challenge could be the outcome.
- We need more understanding of how everything fits together, e.g. a use/demand focus vs a sustainability focus. Which comes first?
- Consensus based on 'win/win' could be a principle for decision-making.

9.3.4. Who makes the decision?

Concerns were expressed about who is authorised and empowered to make decisions.

- Who should make which decisions?
- What is the role of the Treaty partner in local decisions? In national decisions?

9.3.5. Politics and democracy

Politics also featured frequently in the discussion.

- Political ideology influences decision-makers; decisions are not 'value-free'.
- How do we deal with decisions when things are changing—information, markets etc?
- Taking decisions to a national level opens them up to bigger chequebooks vs keeping the decisions at a community level.
- How to overcome or avoid people feeling disenfranchised by decision-making?
- A decision-making framework should be transparent and include values, with a clear process for how values will be used.
- What does it mean for a decision process to be 'democratic'? Is it majority rule? Is this positive or negative? There may be winners and losers.
- Collaborative processes are not necessarily democratic. What are the consequences?

9.3.6. Values

Values came up often in a variety of ways, including in these remarks.

- People need space to tell their stories.
- Get values identified "way, way before" the decision point; however, values can still get captured and the parties end up in court.
- Culture also affects decision-making processes, because people make choices about how to do something; it isn't all about the statutory framework.
- Incorporate environmental accounting in valuation frameworks. There is economic gain in an ecosystems approach.

- Most decision-making processes are human-centric. How do we incorporate intrinsic values?
- Is the suggested principle on common values (in the project leader's presentation) needed?
- Tradable rights indicate the value of the right to the resources; however, the commons (including the sea) doesn't have defined rights: private vs public good.

9.3.7. Issues of scale

Issues of scale surfaced frequently in the discussion.

- Every decision needs a system boundary, which defines the community, values and effects that are relevant. Assumptions of scale need to be transparent.
- People think at a range of scales, as do decision-makers. How to address this in decision-making frameworks?
- Even place-based issues have multiple scales, e.g. a rock in an estuary that connects to the ocean.
- Temporal scales are also important. Are dynamics considered over a period of days, months, years, decades or centuries?
- Governance and management also have scales—local, regional, national. How does this affect decision-making processes?

9.3.8. Management strategies

Some comments referred to suggested management strategies.

- Management should seek to modify behaviour to get better outcomes for the environment and people.
- Management should be research-based and follow 'best environmental principles'.
- Management should provide space for innovation and compromise, and focus on the long term.
- Management should provide incentives for different interests to work together, based on a common understanding and vision for a place.

9.3.9. Frameworks

Comments on frameworks included the following.

- A regional plan (under the RMA) is made using a defined process and provides a decision-making framework for resource consents.
- Can we learn lessons from implementing the framework of the National Policy Statement on Freshwater Management?

- Tradable rights provide a free market framework.
- Look at Social Process Frameworks, which acknowledge that social expectations have a huge effect on what people do.
- Cultural frameworks are also relevant.
- Choose a decision pathway or process that is relevant to the context; don't get trapped in a single approach.
- Capital Accounting (CA) should be considered, and thought given on how to implement it for marine management purposes (see Appendix 3 for more detail).

9.4. Small group discussion of frameworks and principles

Each participant joined a small group to discuss one of the frameworks and principles (not all were discussed). The participants were asked to comment on the following questions: 1) why did you come to the discussion about this principle or framework? 2) How could we implement this principle or framework? 3) What are the barriers to implementation and how could we overcome these?

As is often the case, the discussions ranged beyond the questions posed and most groups touched on only some of the questions. Notes from the groups follow.

9.4.1. Principle: Provide multiple ways to express values

Decision-making processes often exclude from consideration some of the values that exist in a particular environment, e.g. the RMA identifies categories of value in Part II. Only some people have the capacity and willingness to get involved in decision-making processes, but this does not mean that others' values are any less important. To capture these other values may require a wider range of approaches than are currently used (i.e. mainly submissions and hearings), including being proactive about reaching out to other values-holders. Many people have multiple roles, each of which may reflect a different value set, i.e. a single individual may simultaneously hold multiple (and possibly conflicting) values. Another issue is that people may have different values depending on the scale under consideration (e.g. local vs national) and the timeframes under consideration (e.g. short term vs long term).

Implementing this principle ("Provide multiple ways to express values") would involve multiple approaches to value elicitation and expression, starting well before undertaking a formal process. Some values can be identified in existing documents (e.g. district plans, iwi management plans) but other more locally specific values may need to be elicited directly from the members of the community.

The group made several suggestions for implementing the principle.
- Go out to potential value-holders rather than expecting them to find time and courage to be involved

- Engage with value-holders 'in place'
- Recognise that people's values may not be internally consistent
- Clarify public vs private goods in relation to a proposal
- Document values in relation to their spatial and temporal aspects, and recognise that values may change over time
- Bring together multiple parties to co-design solutions that can be broadly supported, led by an independent facilitator, to avoid ending up in warring 'camps'
- Use methods that enable people to 'swap hats' and thereby appreciate other points of view (and/or look at it from a child's perspective).

Barriers and risks identified included the following
- Time and cost of more exhaustive value-gathering and collaborative events
- Engagement fatigue, especially if there are a lot of proposals to respond to in a short period of time
- Not all values will be able to be given effect to; some will miss out
- If people feel their values have been trampled on, they may not want to be engaged the next time
- In some situations, compromise might not be the best solution for long-term ecosystem health.

Opportunities exist to trial this approach in (a) the case study on ecosystem-based management in Tasman and Golden Bays; (b) actual proposals for private, iwi or public proposals in the marine environment, with enough lead time to allow early engagement as outlined above; and (c) when new provisions are proposed for district and regional plans.

9.4.2. Principle: Treat everyone fairly

The group distinguished between fairness of process and fairness of outcome. Government agencies are required to consult with interested parties before making decisions. They strive for processes that treat everyone fairly, and in which people are heard. Not everyone will agree that an outcome or decision is fair but might acknowledge that they had a fair opportunity to have their views considered.

The group made some suggestions for implementing this principle.

- Make sure all parties are properly resourced
- Educate decision-makers to understand what they have heard
- Allow for open questioning to enhance understanding
- Distinguish between scientific fact and emotional arguments.

In discussing barriers to this following this principle, it was suggested that the health of the natural environment should be the top priority, rather than 'fairness' per se.

Unequal access was also cited as a barrier, as was legislation that constrains consultation and/or decision-making.

The group noted that to give effect to the principle, it must be clear whether the principle refers to fairness of process or fairness of outcome, and how 'environmental bottom lines' should be taken into account. They noted that fairness is difficult to codify—expectations of fairness need to be spelled out if the principle is going to be used.

9.4.3. Framework: Cost-benefit analysis

Cost-benefit analysis (CBA), described briefly in section 9.2.2, is often used as a framework to evaluate options or scenarios. CBA can provide a common language to compare cost and benefits of options and is popular in health economics, for example. The discount rate[2] and the timeframe over which the options are to be analysed are important choices in analysis.

The group made several suggestions for implementing CBA
- Define the questions to be answered and frame the decision-making context through a stakeholder group
- Define variables to be used in analysis
- Review any recent changes in values and valuation approaches in the literature
- Seek information on valuation and, if necessary, undertake primary valuation studies
- Run the model and test for key variables in a sensitivity analysis
- Report findings back to the stakeholder group and allow for a discussion of findings.

The group identified the following barriers to CBA
- Intrinsic values are difficult, but not impossible, to value
- CBA generates a black and white decision, which is not easy to overturn
- Commercial interests could be favoured by CBA
- It is not clear how to reflect the magnitude and importance of cultural values.

In considering how to overcome barriers and minimise risk, the group offered the following suggestions
- Make clear how environmental values are to be reflected in the CBA
- Allow a discussion about ethical and cultural values, and how to include or reflect these in the CBA.

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[2] The discount rate is a percentage rate that is meant to reflect how much the decision-maker, or society more generally, would prefer to have a dollar today compared to receiving a dollar one year later. The choice of discount rate can have a large influence on CBA results for options that have costs or benefits that occur well into the future. See also Appendix 3 for a discussion of capital accounting.

9.4.4. Framework: Structured decision-making

In a small group to discuss structured decision-making (SDM), comments included the following.

- SDM could be used to make decisions on resource management plans or consents; it is similar to a good RMA, Section 32 process.
- Decision-making principles could be incorporated in how SDM is used.
- SDM provides a useful framework for consultation, e.g. checking whether people agree with the information and options used in the analysis.
- "I use multicriteria analysis in my work, and SDM appears to be a useful way of putting some structure around that."
- A form of SDM is used in managing the rock lobster fishery. Decision rules specify what management action will be taken under specific circumstances, e.g. higher or lower catch rates.
- SDM can incorporate a wide range of other tools; it is a framework for bringing other information together.
- SDM could be workable and effective if it is flexible and transparent, and if ecosystems come first.

Participants also noted perceived barriers and risks. They said that SDM:

- requires a good structure and criteria to work well
- is time and resource hungry—we don't have all of information required
- is subject to advocacy; it needs objective participation
- requires that people have time and skills to engage in the process
- needs clear, delegated authority for the decision-making process.

9.4.5. Framework: Ecosystem services

Another small group discussed ecosystem services (ES). They said that the concept of ecosystem services should underpin decision-making. It is talked about a lot but not used much. They considered that the ES concept encompasses interest in and knowledge gained from the environment, not just the benefits humans gain directly from it. The ES concept was seen as helping to explain intrinsic worth[3] and to educate the public about how ecosystems work.

The group identified some concerns about the use of ES for valuation.

- It is not clear how to use the ES framework or interpret its results
- We are data-poor so most ES will need to be modelled
- There is doubt about the accuracy of ES estimates
- ES methodology is often overtaken by economists wanting to convert everything to monetary terms

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[3] Actually, ES is defined in terms of benefits to humans, so it explicitly excludes notions of intrinsic worth. The person who made this comment perhaps defines intrinsic value differently or is not aware of the anthropogenic nature of ecosystem services.

- Conversely, if there is no conversion to common units, there is no way compare monetary and non-monetary services.

The group cited the following barriers to implementation of ES methods.
- Lack of understanding what ES are or how to interpret them
- Legislation (RMA, Fisheries Act, New Zealand Coastal Policy Statement) doesn't mention ES although there is mention of "life-supporting capacity". There are no national standards for how to apply ES methods.
- If rankings are used to merge or compare ES, then we need to realise that ES and their rankings are relative to the issue and the location.

The group summarised its three most important points as follows.
- ES are good but should not be used by themselves
- The information on ES is presently poor
- Various ES are of differing importance to different people, so ES methods are not an overall solution to valuation—complementary methods are required.

9.5. Workshop wrap-up and next steps

The research team plans to test some of the principles and frameworks further in a Sustainable Seas case study in Tasman and Golden Bays. That case study was the focus of the afternoon portion of the workshop.

In closing, the facilitator noted that some issues needed further discussion when iwi representatives were present, especially who the decision-maker should be for marine management, i.e. what is the role of the Treaty Partner? Cultural frameworks for identifying and assessing values should also be considered with iwi representatives who can explain the context of tikanga Māori, within which such frameworks might be used.

10. TENTATIVE FRAMEWORKS AND PRINCIPLES

10.1. Principles for further consideration

Based on our work to date, and specifically the tentative principles presented and discussed at the workshop in February 2018, we have identified the following principles for decision-making processes for the marine environment. These principles reflect governance values about how decision-making processes should be undertaken.

To give due consideration to diverse values and values-holders, and to maintain confidence in democratic institutions, decision-making processes for coastal and marine management should:

a) make clear to all participants how and by whom the decision will be made, including any scope for co-governance or collaborative decision-making
b) incorporate participants' views on what information is required to inform the decision, especially for collaborative decision-making
c) enable people with competing interests and/or values to see that they have many values and objectives in common, e.g. by co-designing a vision for the place of value that includes mana whenua values
d) provide multiple ways for people to express their values, including ways that are culturally meaningful to the values-holders
e) where possible, use shared experiences with values-holders, to understand values 'in place'
f) use a clear and transparent framework for organising and considering information about values
g) give all parties a fair chance to be heard and allow discussion to enhance understanding.

The wānanga with Māori resource management professionals emphasised that the Treaty of Waitangi is the over-arching framework within which EBM should sit. They suggested the following principles.

a) Decision processes should reflect the Treaty partnership—decisions should 'give effect to' and not just 'consider' iwi views. If Treaty partners do not agree, they should talk further.
b) Iwi should be recognised at a governance level.
c) Co-governance and co-management should be properly resourced. It is not a true partnership if one party controls all resources
d) Decisions and decision-making processes should:
    o recognise past abundance as a goal for the future
    o recognise that people are part of the food chain—if te taiao is not healthy, people are not healthy

o recognise and maintain mātauranga about living from the land and the sea.

Such principles are easy to state but are often difficult to implement. In the next phase of our research, we will work with councils, tangata whenua and stakeholders to recommend how these principles could be implemented in EBM for the marine environment.

10.2. Frameworks for further consideration

One of the above principles states that a decision-making process should use a clear and transparent framework for organising and considering information about values. Based on selected approaches from different disciplines, we have begun to explore possible frameworks (see section 9.2.2 of this report), though more work is needed.

We have not yet explored Māori cultural values frameworks. One example of an approach founded on Māori values is Whakamāramatia ngā Pou Herenga, part of a larger Treaty-based framework for central and local government to develop freshwater management policy (Harmsworth et al. 2013). This approach recognises, among other things, that Māori values can be represented in many forms, including: as places or sites of significance; as iconic species that are the basis for taonga (treasures), such as mahinga kai; and in the language through relationships between people or organisations or through cultural principles of human behaviour (ibid.). Other frameworks based on mātauranga Māori have been developed and applied in environmental decision-making, such as the Mauri model (Morgan 2006, 2010).

Another approach, called the Cultural Values Framework, might be used to understand cultural values shared by any group or community, and classifies these as forms, relationships and practices (Stephenson 2008). Forms consist of physical, tangible and measurable aspects of landscapes or space. Relationships encompass values generated by people–people interactions in the landscape, by people–landscape interactions and even by ecological interactions where there is little or no human involvement. Practices include: past and present actions, traditions and events; ecological and natural processes; and those practices/processes that incorporate both human and natural elements. Other models for understanding environmental values at landscape scales have similar components (Stephenson 2008).

There are other tools and methods that could be useful as part of valuation processes. For example, social network analysis could be used to show which people have values in common, or which values tend to be shared by the same people, and which values are in conflict. This could assist decision-makers in identifying who will benefit from or be harmed by different options (Borgatti et al. 2009). A number of other methods are described in Sinner et al (2014a).

Further engagement with Māori and others is needed to identify frameworks and principles that would give them confidence in decision-making for marine management. Māori have expressed that the Treaty of Waitangi is the over-arching framework within which EBM should sit. Among other things, they want to discuss who is the decision-maker in different situations. This same question was raised by other values-holders at the stakeholder workshop in February 2018.

11. CONCLUSION

This report describes our work to date on identifying valuation frameworks and principles that can improve the inclusion and consideration of values in making decisions about the marine environment.

Valuation frameworks are ways to organise information about assigned values, that is, aspects of environments or places and their importance to people. Using a given framework typically involves making assumptions about the types of values that are relevant to decision-making and about how these values can and should be understood and considered. To address the assumptions inherent in some of these frameworks, we suggest several principles to reflect governance values about how the decision-making process should be undertaken.

In the next phase of our research, we will work with councils, tangata whenua and stakeholders to further develop principles and frameworks for use in ecosystem-based management for the marine environment.

12. ACKNOWLEDGEMENTS

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14. APPENDICES

Appendix 1: Participants at workshops and wānanga

Picton workshop 23 March 2017

Values-holders	Affiliation
David Baker	PāuaMAC7
Pete Beech	Guardians of the Sounds
Mark Gillard	New Zealand King Salmon
Vern Harris	Marlborough Forest Industry Association
Andrew John	NZ Royal Forest and Bird Protection Society
Eric Jorgensen	Marlborough Sounds Integrated Management Trust
Archdeacon Harvey Ruru	Te Ātiawa Iwi Trust Board
Glenice Paine	Te Ātiawa Iwi Trust Board
Carol Scott	Southern Inshore Finfish Management Company
Lionel Solly	Department of Conservation
Brendon Whitley	Marlborough Forest Industry Association
Research team	**Affiliation**
Jim Sinner	Cawthron Institute
Shaun Awatere	Landcare Research Ltd.
Annabelle Giorgetti	Enveco Ltd.
Bruce Glavovic	Massey University
Judi Hewitt	NIWA
Nick Lewis	University of Auckland
Janet Stephenson	University of Otago
Charlotte Šunde	Cawthron Institute
Marc Tadaki	Cawthron & University of British Columbia, Canada
Aneika Young	Cawthron Institute
Kai Chan	University of British Columbia, Canada
Kevin St. Martin	Rutgers University, USA

Wānanga with Māori Resource Management Professionals

Māori experts	Affiliation
Frank Hippolite	General Manager, Tiakina Te Taiao
Archdeacon Harvey Ruru	Chair, Te Ātiawa Iwi Trust Board
Daren Horne	Cultural advisor, Te Ātiawa
Mel McColgan	Waimāori Streamcare programme
Aneika Young	Resource management consultant, Tiakina Te Taiao and Kaiāwhina/Māori Cultural Advisor, Cawthron

Research team	Affiliation
Jim Sinner	Cawthron Institute (project leader)
Shaun Awatere	Landcare Research Ltd.
Charlotte Šunde	Cawthron Institute

Nelson workshop 16 February 2018

Participants	Affiliation
Andrew Baxter	Department of Conservation (DOC)
Andrew Karalus	Nelson Forests
Angela Johnston	Federated Farmers
Constance Nutsford	Ministry for the Environment (MfE)
Debs Martin	Royal Forest and Bird New Zealand
Eric Jorgensen	Marlborough Marine Futures
Fraenzi Furigo	Royal Forest and Bird New Zealand
Geoff Rowling	Our Fishing Future
Gillian Bishop	Waimea Inlet Forum/Tasman Environmental Trust
Jo Martin	Nelson City Council (NCC)
Lisa McGlinchey	Tasman District Council (TDC)
Mike Arbuckle	Challenger Scallop Co.
Paul Creswell	Ministry for Primary Industries (MPI)
Peter Lawless	Top of the South Marine Biosecurity Partnership
Rachel Somervell	Ministry for Primary Industries (MPI)
Rich Ford	Ministry for Primary Industries (MPI)
Rob Greenaway	Tourism and recreation consultant
Rosalind Squire	Tasman District Council (TDC)
Ross Macdonald	Nelson Underwater Club
Zane Charman (Sanford)	Sanford
Research team	**Affiliation**
Jim Sinner	Cawthron Institute
Charlotte Šunde	Cawthron Institute
Janet Stephenson	University of Otago
Nick Lewis	University of Auckland
Annabelle Giorgetti	Enveco Ltd
Chris Cornelisen	Cawthron Institute
Judi Hewitt	NIWA
Linda Faulkner	Tūtaio Ltd
Graeme Inglis	NIWA

Appendix 2: Participant suggestions at Picton workshop

Boxes 1 and 2 below document individual participant responses to questions posed at the Picton workshop in March 2017. See section 6.2 for more information.

Box 1. Question 1: What is working well to enable inclusion and consideration of people's values in decision-making?

- Consider tangata whenua views and perspectives
- Science used to assess risk—community involved in deciding what risks they will take
- Maps—connecting values and concerns to places
- Collaborative process—where people can bring their knowledge and represent/negotiate their own values
- RMA is not a bad piece of legislation… (has potential)
- Information input from fishers
- Hearings on marae
- Requirement to consult with iwi has opened space for engagement, regardless of how efficient/effective
- Individual willingness in decision-making processes
- Community value and passion for their places to live, work, play and pray
- Consideration of diverse and creative alternatives
- Silos being broken down | improving focus on water issues
- Te Tiriti o Waitangi
- Potential for progress through trust and knowledge
- People's willingness to engage
- Passion
- Marine Mammal Protection Act—clear rules, no debate
- People with a passion and knowledge to raise concerns re the environment
- Talking mediation
- Recognising Iwi/hapū as partners

Box 2. Question 2: What would you change to improve inclusion and consideration of people's values?

- Central government political intervention
- To a longer Parliamentary term and local government term
- Embrace values about process, not only outcome
- Understanding progress doesn't necessarily mean environmental degradation
- Data reflecting lives and livelihoods
- Common/accepted information source for decision-making
- More government funding
- Stop the dilution of democracy
- Need to dispel belief in (and institutions for securing) absolute property rights
- Don't separate facts and values in complex public decisions
- Decisions made on public perception rather than a full understanding of the processes and existing users
- Fora for participation need to be <u>inviting</u>, not <u>intimidating</u>
- 'Defending my turf' to 'Take responsibility for my impact'
- For all users of the environment to work together to improve the environment with government support – regional and national
- Opening up 'truly' to others
- Councils should be proactive in protecting the public interest
- Shift from 'adversarial' approach to one of more open enquiry
- Prevent institutionalised corruption
- (Mediation) more constructive and effective ways to resolve conflicting interests
- More funding for research including publicly available research
- Discussion and potential resolution between parties before courts/lawyers get involved
- Make process more inclusive and less litigious
- More clarity on the role of politicians as democratically elected decision-makers
- Need safe space to share diverse views/aspirations (talk)
- Rules to be effects based rather than industry based
- "Top down to bottom up"—supporting transparent representation of voices in decision-making
- (RMA)… implementation requires improvement (local, fine scale, collaboration, NZ Inc.) – remove the politics
- More public involvement, not the usual few NGOs
- Greater collaborative management

Appendix 3: Capital Accounting

Capital Accounting (CA) was developed by the World Bank as a methodology to estimate a nation's wealth to complement measurement of national income, i.e. Gross Domestic Project (GDP). In CA, wealth is defined to include different types of capital, including produced capital, natural capital and human capital (Lange et al. 2018).

The logic of wealth reporting was explained in a recent report:

> … income in any given year can always be made to look good by selling off assets, but liquidating assets undermines the ability to generate income in the future; the true picture of economic health requires looking at both income and wealth. The economic performance of countries, however, is only evaluated based on national income; wealth has typically been ignored.
> ... Wealth, by its nature, concerns the future—the flow of income that each asset can generate over its lifetime. … GDP indicates whether a country's income is growing; wealth indicates the prospects for maintaining that income and its growth over the long term. They are complementary indicators (Lange et al. 2018, p 3).

In the World Bank's capital accounting (CA) framework, a nation's wealth is estimated as the sum of four asset classes:

- *Produced capital and urban land*—machinery, buildings, equipment, and residential and non-residential urban land, measured at market prices.
- *Natural capital*—energy (oil, gas, hard and soft coal) and minerals, agricultural land (cropland and pastureland), forests (timber and some nontimber forest products), and protected areas. Natural capital is measured as the discounted sum of the value of rents generated over the lifetime of the asset.
- *Human capital*—the value of skills, experience, and effort by the working population over their lifetimes. Human capital is measured as the discounted value of earnings over a person's lifetime.
- *Net foreign assets*—the sum of a country's external assets and liabilities; for example, foreign direct investment and reserve assets (Lange et al. 2018, p 28).

For natural capital, CA uses the System of Environmental-Economic Accounting (SEEA), which was adopted by the United Nations Statistical Commission in 2012 (United Nations et al. 2014). The SEEA framework follows a similar accounting structure as the System of National Accounts (SNA) used for GDP reporting.

The use of market prices to estimate asset values is a strength because data are more likely to be available on land rent (for natural capital) and wages (for human capital) than for things like soil organic matter and the strength of social networks.

However, CA does not account for the value of some ecosystem services, such as carbon sequestration by land or effects on the spiritual well-being of people if seafood is no longer plentiful for customary harvest and manaakitanga (hosting of visitors).

While SEEA and CA methodologies were developed primarily for application at national scales, they could be applied to policy and project analysis, i.e. used as a framework to assess how values would be affected by a new policy or project. To do this, one would identify those assets or income flows that could be affected by an option under consideration and estimate the amount of possible effects. For example, a project to restore a fishery might involve forgoing income in the short term to rebuild fish stocks for greater harvests in the future. This would be presented as an increase in the value of the fishery asset and added to changes in other assets to get total effects on wealth of a given option, for comparison with other options. In practice, a very similar analysis would be undertaken using benefit-cost analysis that incorporates costs and benefits into the future.