

'It's not like any survey I've ever seen before': Discrete Choice Experiments as a Valuation Technology'

Vicki Macknight and Fabien Medvecky

Abstract

This paper unpacks what happened when members of the local community were invited to design and test a valuation tool – specifically a discrete choice experiment – to find a valuation for New Zealand's Otago Peninsula. We argue that the assumptions that lie within a discrete choice experiment are revealed when we look closely at *how* community participants react to the discrete choice experiment survey they have helped design. These assumptions, usually unnoticed, include the necessity of making trade-offs; what actions are possible; the 'reality' of one's preference structures; the need for abstraction; and the importance of big picture patterns. We also argue that how these assumptions are negotiated in practice depends on complex power relationships between researchers, participants, and the technology itself. While we might seek to 'empower' the community with knowledge of economic processes and valuation practices, this might not be the empowerment they seek. Participants find ways to be active negotiators in the face of valuation technologies.

Keywords: discrete choice experiment; Otago Peninsula; biodiversity management; environmental valuation; making economics public

Vicki Macknight, Centre for Science Communication, University of Otago, New Zealand, vicki.macknight@otago.ac.nz

Fabien Medvecky, Centre for Science Communication, University of Otago, New Zealand, fabien.medvecky@otago.ac.nz

© 2021 The authors



This work is licensed under a [Creative Commons Attribution-NonCommercial 4.0 International License](https://creativecommons.org/licenses/by-nc/4.0/).

<https://doi.org/10.3384/VS.2001-5992.2021.8.1.7-31>

Hosted by [Linköping University Electronic press](http://www.linkingup.se/)

<http://valuationstudies.liu.se>

Introduction

I move along the back of the semi-circle of seats, giving out departmental iPads and paper for comments. Fabien is showing a slide of the list of choice attributes we have developed from this group's discussion two nights ago.

- Pest management
- Weed control
- Marine park
- Native ecosystems
- Support for private landowners
- Price.

The group look up at the screen, attentive but baffled. They are trying to understand; they know they are about to use this information as they test the survey. The software is already open on each iPad, ready for them to start trying it out. In practice, there are difficulties. The program keeps stalling, screens jump back to the iPad home and need to be set back to the survey. I wander around, sympathising and helping. Once they are settled, I sit again and watch the group. Lydia, an older woman heavily involved in community volunteering, is sitting back with her arms crossed defensively across her chest. Janet, a landowner and conservationist, has her hand on her head, fingers entwining her hair, deep in thought. Brian, sometime volunteer for the Department of Conservation, is frowning. Richard snorts as he reads; Karen purses her lips.¹

They are filling in a discrete choice survey (a stated preference valuation technique) about environmental management on the Otago Peninsula in the South Island of New Zealand. The Otago Peninsula is a narrow strip of land between harbour and ocean, boasting albatross, seals, penguins and scenic beauty, and plagued by introduced plant and animal pests. We have spent two hours on a previous evening with this group, attempting to give them a taste of environmental economics and the ways economists try to measure the value of environments and environmental outcomes. We have introduced some fundamental concepts in economics (such as trade-offs) and some techniques for assessing value (such as revealed preferences, contingent valuation methods and discrete choice models). We workshopped what they would like a valuation to do and what attributes would be important to ask about in a valuation survey. This was an attempt to make a genuinely community-based valuation tool to assess the value of the Otago Peninsula's biodiversity and its management.

Earlier that day, Fabien and I had sat down together with the discrete choice survey our group are currently filling in, which he had put together using software called 1000minds designed in the

¹All names have been changed to preserve the privacy of participants.

economics department of our university (Hansen and Ombler 2008).² This software has been highly successful both in New Zealand and internationally, used, for example, by the World Health Organisation to identify the most dangerous antibiotic resistant global diseases, as well as by major organisations and corporations including Google.³ I tried it out while Fabien timed me. I gave answers without too much thought, finding as I did so that my choices tended to emphasise the creation of a marine park and de-emphasise support for private landowners. I kept an eye on the completion bar. It seemed to stutter and go slowly at first as the program worked to put together a picture of my preferences, but as the picture clarified the bar filled itself in by leaps. Together we looked at the graphic the program had made of my preference structure, notably different from Fabien's preference structure. He, it turned out, cared about pests and not about marine parks. 'It's a really cool program', I said. 'And it makes the data so easy to analyse,' he agreed.

Why this story? Because it shows participants performing a valuation of the Otago Peninsula in a particular time and place, with particular computing technology, background knowledge and intention. More, it shows that what the group are filling in – a survey ultimately made by Fabien and me – has power to enable and constrain a specific set of responses. While we have 'empowered' citizens to participate in the ways Otago Peninsula nature is to be economically valued, we will suggest that 'empowerment' is not straightforward.

As has been shown, valuations are not only a thing, they are also a process (Helgesson and Muniesa 2013; Heuts and Mol 2013; Kjellberg et al. 2013; Vatin 2013). The valuation that our respondents come up with should not be thought of as simply a reflection of what they really think. Instead, it comes from the activity of filling in a survey, after sitting in a room being told about and discussing environmental valuation, and struggling with a particular and unfamiliar technology. As Peltola and Arpin (2017) have argued, 'Valuation studies have been argued to neglect the fact that values do not exist independently of valuation techniques but rather get formed, at least in part, during valuation processes' (Peltola and Arpin 2017: 19).

What we are interested in exploring here is how we can use the process of people doing a discrete choice experiment (DCE) to better understand the nature of DCE techniques and the resulting valuations. We ask: If we study the process of participants filling in a discrete choice experiment what is revealed about the assumptions of DCE

² <https://www.1000minds.com>, accessed 5 December 2011.

³ http://www.who.int/medicines/publications/WHO-PPL-Short_Summary_25Feb-ET_NM_WHO.pdf, accessed 11 December, 2017.

technology? What does studying the process tell us about how power is negotiated while doing valuation? (From now on, we'll simply refer to biodiversity management on the Otago Peninsula as the 'OP' as this is the aspect of the peninsula we are studying).

We need to ask these questions to do politically aware academic work. Knowing more about hidden aspects of particular valuation processes is important because valuations intervene in lives and environments. In effect, making a valuation for the OP means making two types of something that can impact the world. One is recognisable as a number inscribed in a report: it is the monetary value we find to apply to the OP (found for the OP, for example, by Tisdell 1988, 2007). Valuations presented only as numbers obscure the processes and assumptions involved in their making; but those numbers have power to change how people think and what people do. This number, and the report it is embedded in, might find their way into all sorts of circuits of knowledge and decision making, from city council to local media to volunteers' discussions while pulling weeds. We are concerned that valuation numbers intervene well; and part of this should be a concern about the commodification and economisation of nature.

The other type of intervention sits under the grandiose name of making economics public, something like an economics equivalent of the 'public engagement with science' movement. Our aim, broadly, is to 'empower' people by making economic tools accessible and showing how these are being used in the world around them. To do this we create a situation (the event of evaluating the OP), where interested people can learn about economics in practice by doing valuation. We hope to give them tools to speak into economics. These intentionally destabilise existing power relations and ask 'who has the right to say what things are worth and how that worth should be determined?'

When we watch how our participants fill in a DCE survey we are reminded that it is not the case that citizens are powerless until researchers empower them. Some citizens, at least, are already savvy about using tools in ways that are useful to their aims: in this case particular ways of protecting the OP.

We proceed as follows: first, in Section 1, we look at the sociological work done around valuing as a verb, as a process that involves particular technologies; in Section 2, we talk about DCE as a valuation technology, showing that it is widely used and trusted; then in Section 3 we describe our survey. In Section 4 we discuss our groups' responses to interacting with a DCE survey and what this reveals about the assumptions inherent in such valuation techniques. Section 5 closes the article, with an exploration of how our valuation intervenes in the future of the OP. Here we are interested in linking the local performance of DCE to broader theoretical themes around power relationships in environmental valuation.

Valuation technologies and environmental valuations

Marion Fourcade's 2011 paper 'Cents and Sensibility: Economic Valuation and the Nature of "Nature"' asks about the impact of valuation technologies upon the values given to natural environments. By comparing the valuation technologies used to decide compensation for two oil spills, one the 1978 sinking of the Amoco Cadiz off the coast of Brittany and the other the 1989 grounding of the Exxon Valdez in Alaska, she shows how what might seem to be dry economic tools for working out loss actually have major impacts on how we are able to value, maintain and manage natural environments. Whereas the calculation of 'how much profit did French fishermen miss out on' yielded a low number and a small compensation package, the calculation of 'how much would American people be willing to pay to know that the Alaskan wilderness has been restored to a pristine state' yielded a high number and a large compensation package. She asks 'How, and by which fantastic but very concrete operations, did people come to collapse different economies of worth applying to nature ... into dollars and cents' (Fourcade 2011: 1726).

Her work springs from a recognition that valuation is both a noun and a verb, a product of technologies and an ongoing social process. This perspective takes valuation away from only being about one (or multiple) already established value/s (often price), and towards questions of how values are negotiated, contested and come to rest. It is clear that noun and verb come together as people fill out contingent valuation surveys – Burrows et al. have shown that the price people choose is higher if a survey asks about higher prices (Burrows et al. 2017; McFadden and Train 2017). This suggests that people select a price in relation to what seems appropriate to survey designers rather than holding a predetermined price in their heads.

These scholars are demonstrating performativity. This term has come into social studies of economics with the work of Donald MacKenzie, Michel Callon and others, who use it to argue that economic ideas and theories are not reflections of the way the world is but actually work to remake the world (Callon 2007; MacKenzie 2008; Muniesa 2014). Here is how Ivan Boldyrev and Ekaterina Svetlova put it: 'economic ideas and models change, shape, and construct economic reality; they are both governing the behaviours of agents, and in many ways, conditioning the very existence of those behaviours' (Boldyrev and Svetlova 2016: 7). Often though, discussions of performativity are more about how economics is performed *upon* ordinary people by actors such the Chicago Board Options Exchange (MacKenzie and Millo 2003), wholesale electricity markets (Breslau 2013) or the New Zealand Reserve Bank (Holmes 2009, 2013). We argue that ordinary people too, perform economics,

and explicitly so when valuation devices such as DCE are placed in their hands.

A device is a tool built to achieve a specific purpose, and a valuation device is one that is meant to achieve certain valuation outcomes. But as it enters already active worlds where people are performing valuations, a device can become much more than intended. As Franck Cochoy argues, a supermarket trolley pushed past shelves becomes a tool for shopping by volume, not price; the end point of quality/price judgements; a space of negotiation between shopping partners; and a sign for self and others of one's identity and place in the world (Cochoy 2008). Like Cochoy, Amalie Hauge (2016) shows how valuation devices become embedded in an already active set of habits, needs and relationships. She discusses how a lean whiteboard works as a valuation device in the neonatal ward of a large hospital. We need to notice, she argues, how the lean whiteboard is used (and ignored) depending on the time frameworks, grammars, goals and tasks of users. It is a different type of valuation device for those who need to help a baby right now from those who want to check on the effect of administrative changes.

DCE is a valuation device too, a tool for achieving seemingly straightforward numerical valuations of complex entities like nature. But like shopping trolleys and whiteboards it enters an already active world. Things are already being performed as having value, and people are adroit at acting in relation to value. When we think of DCE as a valuation device we can easily see that it is a technical object – a mathematical and economic tool interacted with on a computer. But it is not only a technical device; it's an economic and social one too. As we see our participants struggling to do what they are being asked to do, we are seeing them temporarily enter the logic of DCE. They are acting in terms of trade-offs, in abstraction, in scarcity (and the particular scarcities that survey designers have specified); they are relating these concepts to the nature and society they live in; and they are actively questioning doing so.

Valuation is a focus of interest, and sometimes concern, for environmentalists. Valuation technologies, including DCEs, have come to play a large part in environmental and resource management research. However, this has not been without controversy, as Erik Gómez-Baggethun and Manuel Ruiz-Pérez (2011) argue, with some environmentalists seeing 'valuation and market solutions as core strategies to solve present environmental problems' while others reject the very idea of such utilitarian ways of considering the environment. However, how valuation devices are used and interpreted is a matter of power, of who can speak for 'nature' and how. 'We believe', conclude Gómez-Baggethun and Ruiz-Pérez, 'that economic framing of the environment and monetary valuation methods cannot be considered neutral tools' (2011: 614; see also Castree 2003; Redford and Adams

2009; Matulis 2014). DCEs, like other valuation devices, become part of political negotiations of how to think about and use 'nature'.

What does this look like in practice? We are interested in the ways DCEs are not neutral in their fantastic and concrete operations. The processes of doing DCEs has scarcely been wondered at. Rakotonarivo, Schaafsma and Hockley's comprehensive review of DCEs notes that while there was anecdotal evidence that some participants did not understand the task or found these surveys confusing, 'only one article used qualitative techniques' to study them (Rakotonarivo et al. 2016: 105). To begin to rectify this lack, we ask: what does the process of getting participants to take part in a DCE reveal about the assumptions of DCE technology? But first, an outline of what DCE actually is and how we used it.

Discrete choice experiments and environmental valuations

Techniques for assessing the economic value of non-market 'goods' (such as the environment and its management) fall into two main categories: revealed preferences and stated preferences. Revealed preferences methods derive the monetary value of an environment by looking at related market-traded goods, such as using tourism revenue to assess the value of a national park. On the other hand, stated preferences methods directly elicit a valuation from potentially affected citizens and other stake-holders, classically using a survey-based methodology (Medvecky 2014). As the name implies, one asks participants to state their preferences. Among the most commonly used stated preferences methods are the contingent valuation methods (CVM) and Discrete-Choice Experiments (DCE) (Freeman 2003). CVM allows for a 'whole system' valuation by directly asking participants about their willingness to pay (WTP) for a specific set of attributes or scenario of environmental output (hypothetical or real). For example, participants may be asked their willingness to pay for a defined marine park with a set number of species and a determined level of management. The specific attributes are set and the WTP is for the complete scenario: for example, how much extra would you be willing to pay in your rates for a 200-hectare marine park?

DCEs on the other hand look at the choices people make between various attributes of a non-market good, such as size of marine parks or the increase in yearly rates to residents or number of species protected. For example, a DCE may ask a series of questions: 'would you rather pay NZ\$50 per year extra on your rates and have a large marine park; OR pay NZ\$20 a year extra on your rates and have a small marine park?'; followed by 'would you rather pay NZ\$20 per year extra on your rates and protect three species; OR pay nothing extra on your rates and protect one species?'; and so on. By looking at the patterns in choices made by respondents, DCEs allow a ranking of

attributes relative to each other (Hoyos 2010). Incorporating a cost element as one of the attributes means a respondent's willingness to pay for each attribute can also be calibrated. The outcome of a DCE study provides decision makers with a measure of the economic value of the various attributes, which helps guide possible strategies and policy decisions – how much the community thinks undertaking a certain action is worth relative to other options – rather than provide an overall valuation. A DCE ranks people's preferences in order.

Historically, DCE – and its cousin, conjoint analysis – has been used in fields such as product development and marketing (to determine which attribute was deemed most desirable by consumers), health management and transport economics (Hanley et al. 1998; Alriksson and Öberg 2008a). DCE was first used in environmental economics by Adamowicz et al. (1994). Since then, DCE has been increasingly used in this space. The five most common environmental issues to have used DCE are recreational environmental uses, ecosystem management, environmental products, environmental valuations, and pollution. DCE has also been used for environmental issues around energy, land management, agriculture/forestry, waste management and risk management (Alriksson and Öberg 2008b). Due to an increasing number of issues raised about the methodological soundness of using other types of valuation devices (like CVM for WTP assessments) current economic assessments have increasingly moved towards using DCE (Johnston et al. 2017).

Our survey

We used a DCE to assess the economic value of various biodiversity management options for the OP, a particularly rich and beautiful stretch of land on the south-eastern end of New Zealand. 'We' are a pair working in a Science Communication department, one with a social science background and the other with a background in economics and philosophy. We share an interest in making economics more public, and a concern for doing so responsibly. We have particular vested interests, some that come from being employed under the umbrella of science communication (to communicate, to share, to 'empower'), and some that come from our own ethical frameworks (to slow down, to listen, to respect dissent). We wanted to both empower citizens with economic knowledge and shape our valuation device based on their opinions.

To do so, we ran two-workshops for members of the community to discuss environmental valuation. Our goal was to equip citizens with the skills to select an environmental valuation strategy (they chose DCE) and to determine the criteria the DCE would ask about. We used the first workshop to give participants an overview of environmental economics, including a review of the most common methods for valuing the environment in economics. Unlike standard practice with

focus groups who are only consulted for deciding attributes, we wanted to also engage our participants from the start in determining which valuation method we'd be using. For this, we drew on the ideas of public engagement with science, citizen/participatory science, and engaged research as a process (Irwin 1995; Grand 2015; Medvecky and Macknight 2017). This allowed our participants an opportunity to think about what could be counted as valuable and how we, as a group, might go about counting it. Following an open discussion, the participants came to a consensus for a DCE approach covering seven attributes (our preliminary review of the grey literature had identified most, but not all of these). Between the first and second workshop, we (the researchers) designed a draft survey based on the outcomes of the first workshop using a well-established DCE software, 1000minds. The 1000minds software is a choice modelling software that automatically creates question sets based on a preselected attribute (see Figure 1).

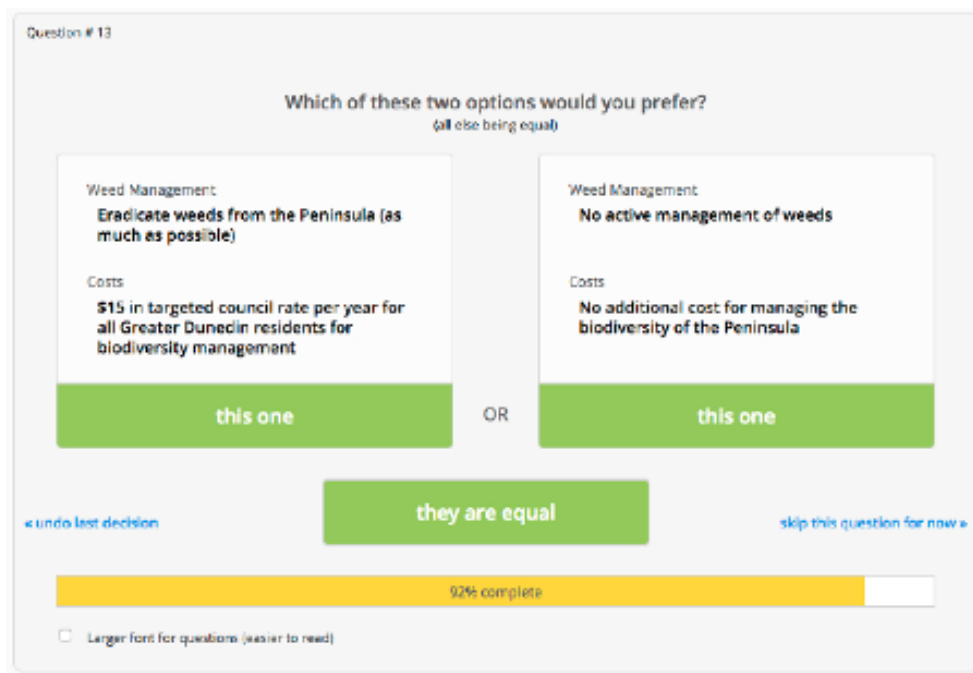


Figure 1: Example of 'decision' question generated by 1000minds software. This is an image from the actual survey that participants saw and responded to. Source: Authors' work.

The participants completed the draft survey at the beginning of the second workshop (as described in the story that opens this paper) and gave feedback on a number of issues, from wording of attributes to the levels and values used. The group settled on seven attributes, each with two to three levels (see Appendix A for full details). Based on this, the

1000minds survey was revised and refined before being sent out across the broader community.

Importantly, the participants' testing of the DCE in the second workshop allowed us to witness the experience of responding to a DCE, a process often done remotely through a web browser. It is these observations that form the basis of this paper, as well as the feedback and comments provided by participants about their experience of filling in the DCE survey.

Our groups' responses – and what they suggest about DCE

The DCE survey garnered a range of responses from our group. What is interesting about these various responses to the DCE survey is what they suggest about the underlying assumptions that drive this valuation technology. DCE has received little sociological analysis, presumably in part because it is considered to measure already known things about economics and about people. Responses from our participants suggest that things are not so straight-forward. (In cases where respondents do not feel challenged by the technology, such as the healthcare, government, business sectors in which DCE has previously been used, the very familiarity and acceptance of this economic model might be cause for concern in itself.)

In the responses of our participants we are able to see the ways DCE technology performs with participants. For them DCEs, if not the whole world of economic valuations, are a new way of thinking about nature. As the DCE performs its logic on them, they react, sometimes to capitulate and sometimes to resist. This shows how the performativity of valuations can be simultaneously held back and pushed forwards in the grounded negotiations of a particular technology: we see how the valuation of nature is shaped in practices of valuing.

Unfamiliarity and frustration – one prevalent opinion is captured by this email from a respondent not present at the workshops:

Dear Lydia,

Although I am an ardent supporter of STOP [Save the Otago Peninsula], the survey I received today is the worst one I have ever seen and I gave up after about 10 mins when only 35% through.

Basically I am all for eradicating pests, increasing biodiversity, getting rid of weeds and having some financial council support.

Sorry!

Sarah

Sarah's reaction is clarified by that of her friend, Lydia, who was a participant:

Obviously Sarah had the same reaction that I did to that survey – extreme frustration!

This reaction seems linked to those of others during the workshops who express their surprise at how unfamiliar this type of survey is:

It's not like any survey I've ever seen before.

Partly this response might stem from the experience of the survey platform itself. This theory is re-enforced when we look at the numbers of respondents from the broader community who stopped filling in the survey before they had even answered the first question (65 per cent stopped before answering even one question while 10 per cent stopped part-way through). We can guess that some people, faced with figuring out the meaning of this unfamiliar type of survey, how to use it and how to answer, simply gave up. For others giving up may signal a rejection of trade-off thinking or a frustration with economic theory. Non-response is an important issue in survey research (Massey and Tourangeau 2013; Peytchev 2013; Burns and Medvecky 2018). In this case we do not have data about why people stopped or didn't start.

But there is more to notice about their unfamiliarity. DCE technology assumes that people are already schooled in 'can't have everything' economics. This imagines people already believing that economic and other management decisions are about trade-offs in an inherently finite world. Scarcity is a foundational premise of economics (Hubbard et al. 2012). This technology assumes the universality of this and simply enables decision makers to know how to prioritise spending, and to decide which problems to leave by the wayside. It does not question the necessity of prioritising some issues and abandoning other issues because this is imagined as already accepted by respondents.

However, the frustration our respondents feel around the activity of making trade-off decisions suggests that this is not part of how they think about management decisions in their own lives or in the running of voluntary environmental management groups. As Sarah says, 'I am all for eradicating pests, increasing biodiversity, getting rid of weeds

and having some financial council support'.⁴ What she does not also say is what she would be willing to give up, what trade-offs she would be willing to make for all these things to happen. How does she rank her preferences? Would she give up weed management for pest control? Her preference patterns do not focus on what she wants less (or most), only what she wants, and perhaps it is being asked to give something up that makes this so hard or so infuriating for people.

Impossibility – a number of respondents grapple with what they see as the impossibility of trade-offs when considered from a practical standpoint. Whereas we have not noticed any (logically) impossible trade-offs in the survey, our participants working as they do on practical management of the OP environment object to what they see as pragmatically impossible trade-offs.

One such impossibility comes in contestation between managing pests and supporting landowners. In practice, we are told by participants heavily involved in the actual trapping of possums, landowners often refuse to have traps laid on their land. Nor will they put down traps themselves. Supporting landowners and eradicating pests, it seems, do not go together in practice.

These contradictions serve to remind us of the already political character of DCE as a valuation device. Together with participants we decided upon categories of 'nature' to focus on: weeds, pests, native and invasive, biodiversity and ecosystems – all are human categorisations of the complex mesh of life. They are not only our terms, but ones performed by the policies of national and local government, and on-the-ground actors. When we include these in a DCE we are asking people to re-perform these categories as 'real'. The trade-offs they favour, as well as what they regard as possible and impossible, are products of the categories presented in the DCE. We write and fill in a DCE as if 'pest control' is possible, but sometimes it is not.

We could argue that the potential for finding impossibilities comes from the strength of DCE valuations. While willingness-to-pay can push us towards existence valuations for nature (we are willing to pay just to know it's there), and revealed preference valuations tend towards valuing what is already being paid for (by tourist dollars, for example), DCE valuations sit somewhere in-between, assuming that

⁴ We follow Sarah's lead in talking about some creatures as 'pests' (especially those that predate on NZ's indigenous birds, such as possums, rats and stoats). This is a term already used in conservation communities, both by experts and by local volunteers. It is a powerful word, making all members of these various species into the same thing: enemies. Its common usage reveals how comfortable we already are in abstracting certain species away from the ecosystems they are entangled with, making some good and some bad. As Fredriksen has argued, conservation biology itself is part of a performance of removing individual organisms from their lifeworlds in complex ecosystems to understand them instead as units in categories of life which can then be compared (Fredriksen 2017).

we are already and always interacting with 'nature' in complex ways. The challenge is not to let nature simply exist or to use it to attract more money, but to manage its usefulness as well as its problems. And this, especially when you ask people who interact with the 'nature' in question on a regular basis, can show up practical contradictions. These contradictions, it might turn out, are not issues with 'nature' itself, but with the categories we use to talk about it – in the DCE and beyond.

Uncertainty about what results 'really' say – a particularly interesting response is a fear of self-revelation. This is expressed twice during workshops, with importantly different nuances. Amber is worried that she is going to find out something about herself from the trade-off choices she enters. 'It feels funny to do,' she says, 'because you feel like it's going to tell you that you think something that you don't know you think.' For her, these revelations will be true, and disturbing because of it. For Janet by contrast, this feeling that one is being assessed by the trade-off choices you make is not so frightening because it won't be saying anything actually true. She compares it to a questionnaire that had been doing the rounds on social media meant to tell you who to vote for given the opinions you enter (the 2017 New Zealand national election was weeks away). She's worried because just as that questionnaire got wrong who she was planning to vote for, so this survey could likewise 'get wrong' what her true preferences were. The difference, of course, is that she retained the autonomy to vote as she wanted to, whereas by filling in a DCE survey her 'un-true' preferences were stabilised as data.

These participant responses led us to question the notion that people are comfortable with the idea that their 'true' preferences are revealed in their choices. This is an assumption that we also see in markets – the invisible hand is exactly the operation of hidden preferences aggregated up and supplied by a responsive producer. However, being confronted with a technology that itself performs people's preferences, sometimes in ways they have not previously been conscious of (and sometimes 'getting it wrong') leads to discomfort. Some might think, 'is that really who I am, a person who values that?' Others might think, 'is that really what I want to say, that this is valuable?'

Equal and neither – a further source of frustration discussed by the group is that while you can pick 'these are equal' many say that this does not express what they really feel – 'I'd prefer neither'. While logically these two are equivalent (neither just means 'the options are equally undesirable'), to respondents there is an important difference. With an 'equal' you tacitly endorse both, with a 'neither' answer you do not. While some surveys do give a 'neither' option, ours does not, and we found that this could not be changed in the software.

The supposed equivalence of ‘these are equal’ and ‘I’d prefer neither’ by software designers suggests a difference in the way economic and other analytic thinking performs preferences from the way more everyday thinking does. In economic thinking, equality can be negative or positive, and it doesn't matter much when ranking whether they are positive or negative because their standing will be worked out as part of the bigger picture. For respondents, however, it matters whether for each particular pair they are committing themselves to a positive or a negative stance because they are thinking about the concrete particulars not the big picture. For some it is frustrating to be given no choice about the way the choice is formatted. People thinking with economic logic are interested in the overall order of preferences produced by the preselected categories of the DCE, others are interested in expressing true feelings about real choices. A DCE hides these attitudes towards categories; order is important not feelings about each item.

Limits to context/detail – there are discussions also about the amount of information given in each choice. The methodology encourages setting each attribute at a few levels (commonly 2 or 3, with fairly brief descriptors such as high, medium and low). Amber tells me that she wants to be given more information about what high and low actually mean – what is high support for landowners as a dollar amount? Brian, sitting next to her, agrees. He wants more of the choices put into context. Not only should ‘high’ and ‘low’ be clarified, but these amounts should be framed in terms of what the Peninsula environment is already like – how much land is privately owned? Which weeds are problematic? Do we mean pest eradication or pest control, because the two are very different in practice?

Fabien and I talk about these issues later. Can we write more at the beginning to provide context? Can we give dollar amounts? The conclusion we come to is no. It is difficult to add a contextualising blurb at the start, and it is likely no one will read it. Adding context to each question makes the whole set-up dauntingly wordy. Being less vague than ‘high’/‘low’, or ‘manage’/‘eradicate’ (if fitting) would face us with the problem of how to work out reasonable amounts for each attribute that we would then have problems justifying.

Revealed by participants’ desire for more context lies a further gap between the thinking of researchers and their public. For researchers, it is normal that a certain amount of abstraction is necessary for data gathering. Too much context becomes messy and difficult to deal with (though a good case can be made for embracing that mess) (Law 2004). To add too much context would be problematic for the clarity of the survey. In this way of viewing the technology, it is not the specifics that matter but the overall picture of preferences. However, for participants the context is all-important – how do you know what you should claim to prefer if you don't have all the details? Here, the

informants' feeling is that the overall picture will be sullied if the details are not complete.

Respondents also react to the feeling that there are limited possibilities for answers. For each trade-off pair, there are only three possible answers – this one, that one, or equal. To some participants this seems too limiting. They would like to be able to give answers that show some more thought and nuance. What Daniel finds he is doing is picking each one that put high priority on pest management (something he is already heavily involved in) regardless of what the other part of the question asks. In other words, he feels driven to trade all other attributes off with little consideration because of his preference for high levels of pest control. Since he is a participant in a research group we are able to find this out – if he were just responding to this as an emailed survey we would not know. He reiterates this in a later email: 'I suspect there was a bias towards what would be good for my organization in the responses provided [by friends and colleagues]' In part, this is the DCE method working as it should because it is telling us that to him nothing matters as much as pests. However, for the other attributes this single-minded preference muddies the waters. We end up not really knowing how he feels about the other attributes, only that they are less important than pests.

Concern for results – politically savvy participants experience further concern in the unfamiliarity and performativity of the technology. Harrison comments that if he had to predict our motivation he would guess that we were pushing for higher support for landowners. This was not, in fact, our intention. Richard comments that he would like to see the results so that he 'could see what it's for.' Both these comments express a frustration at feeling that they do not really understand the role of the valuation technology in the context of environmental decision making. This matters when working out how to strategically fill in a valuation survey, depending on whether the aim is to inform government funding allocation or to help shape the strategic focus of a community group. This shows people are aware of themselves not just stating their values, but thinking about what they want a completed survey to tell others (council, funding bodies, researchers).

This reminds us that at least some participants are engaged in valuation as a political exercise, knowing that valuation technologies are not neutral tools, but unsure of how to best use them to send the message they want to send. This complex engagement is what we want to think about next.

Power – of valuation devices, methodologies and participants

In the previous section we explored some aspects of participants' actual experiences with DCE technology and suggested what these experiences tell us about the underlying assumptions of DCE. These ranged from expectations about the fundamentals of economics (we can't have everything); nature (some things are impossible in practice); markets (you might not know your own preferences but the market does); the reductionist tendency towards abstraction in research (not every detail can be included); and participants actively concerned with the messages they send (you need to understand the technology to make it come out as you want). Clearly DCE processes are not smooth, not neutral, but pulled by economic theory and practice, and by social, material and political flows.

In this section we want to link these concerns with wider questions of power. By this we mean the power of valuation devices to shape preferences and, in turn, 'nature.' We also mean the power of researchers to introduce valuation devices to publics, and the power the public have to react.

What troubles us is that the DCE carries with it a power that emanates from its source – the worlds of economics and universities. The DCE, and we, are attributed power by association with these institutional and discursive realms. When we carry that power into a social and research context, we researchers must accept that we have a responsibility for how our DCE shapes preference patterns and for what reports on these preferences might do in the world.

We acknowledge that part of our responsibility is to notice that methodology and power are intimately connected as they are performed. As Rodríguez-Labajos and Martínez-Alier put it: 'monetary valuation ... may be recognized as one legitimate perspective among several that reflects real power structures. But it is not the only legitimate perspective. Who then has the power to simplify complexity, imposing a particular standard and procedure of valuation?' (Rodríguez-Labajos and Martínez-Alier 2013: 340–341). Understanding that we had this power, we strove to use it responsibly. For us this meant taking two paths to reach our overall goal – to 'empower' citizens while making a valuation for the OP. This meant that we had two methodologies working in concert (and sometimes in tension): one aiming to find a preformed, technologically mediated valuation (as an economist might, and as is suitable for presentation to funding bodies) and the other aiming to engage with active participants and giving them new skills in the process of valorising and evaluating the OP (a goal more commonly aligned with anthropology, sociology or science and technology studies (STS) than economics). In this way we attempted to give participants a tool that would be useful for their future conservation work – a monetary valuation – while also giving

us and their skills to think about how valuations might be differently achieved.

In a more classic economic evaluation study it would be easy to group actors into two groups. On the one hand, you would have technology and researchers (this is our technology, our project: participants are one of our resources when they act as a focus group in first-round testing). And on the other you would have participants and nature (they live with nature, already value it and speak for it). This would obviously give much strength to researchers and technology, seemingly giving them the power to bring to light the latent preference structures of their nature-representing participants.

Researchers are paid to direct their time and energy this way; our participants are not (unless you count cups of tea, chocolate biscuits and enhanced skills in economics). In very practical terms, researchers and public are unequal in this sphere, and it would be an insult to those who give up valuable time and energy to claim otherwise. We want to empower citizens, but who says they want – or should want – to be empowered in this way?

'Empowerment' is a familiar trope, and usually signals good intentions: it is all too easy to say that we strove to 'empower' citizens with an enhanced knowledge of economic theory and economic valuation strategies. We have used this language in the paper, with scare quotes to show we are aware of its complexity. Because this language carries power relations within it, it implicitly puts researchers at the top, holders of valuable knowledge they can give to others. 'Nature', meanwhile, ends up at the bottom, an object just waiting for the tools of researchers, ready to be cut up into abstract categories.

But what if – as we notice when we look at the performances of DCE – citizens don't want the knowledge we claim to give? What if they resist the economic logic that is pulling in their much-loved OP? Or what if they don't much like it, but decide to play the game of economic valuation for the good of the volunteer organisations they work with?

This explains some of the quiet power negotiations that we see here. Sarah refuses to continue after she's done 35 per cent of the survey. Harrison tries to understand the consequences of each trade-off decision for the end results. Daniel notices that he trades everything off against pest control, a bias that is good for his volunteer pest control group.

Technology and power are intimately connected too, and it was also important for us to notice the power that our technology exerted upon participants. DCE exerts itself on participants by forcing them to choose one pre-framed good over another. It then tells them what their values are, making them into a person, say, who values native ecosystems over control of invasive species (Medvecky and Macknight 2018). Like a shopping trolley, the resulting preference graph holds up

a mirror to participants in which they may not recognise themselves. People are being pushed by a technology towards new ways of seeing themselves and their preferences that may fold into their future decision making (or just make them feel very uncomfortable with trade-off decisions). More, as they focus their eyes, hunch their shoulders and discipline their hands upon the devices supporting this technology, they are becoming interpellated into a regime of natural capital. They are called, by the technology itself, into the logic embedded within it, just as the man called by the policeman becomes embedded in the apparatus of the State (Law 2000, from Althusser). The technology forces them to accept the premises of the DCE and its trade-off logic (or at least pretend to) while they complete the survey.

Finally, the DCE exerts power on 'nature', by pulling it into a way of thinking that emphasises the finitism of our capacity to act, the time we have to act in, and the limits to money we have to help us. While we all know that time, energy and money are finite resources, DCE logic is based upon exactly this problem, asking people to 'trade-off' one good thing for another good thing. It embeds the trade-off choices that are supposedly possible, and which are not. The insight that life and resources are finite is a central tenet of economics, one of those that make it inherently dismal. However, it is not usually called upon so explicitly when people are considering whwhat, in their natural environment, they value. In this way, the OP, its attributes and the work they call for, are brought into this dismal but pragmatic and performative logic of economics. 'Pests', possums in particular, are performed as a greater scourge than weeds, and pest control work performed as more valuable than weed control work. We have the advantage of puzzled members of the public reacting in front of us and this serves to remind us that it is not 'natural' for people to believe that nature is fundamentally economic.

Luckily, though, people are not passive in the face of a valuation device like DCE but able to receive it in a range of ways. Some are pragmatic – willing to use the resulting DCE valuation if it seems useful to their conservation group. Others are cautious and questioning – they want more context (though the platform doesn't welcome it). Still others are resistant – 'I gave up after about 10 minutes.' It is an open question whether and how much the economic logic of the DCE valuation device embeds itself into their thinking when they are without its technological holder, the survey on the iPad.

Conclusion

At the start of this project we had the well-meaning belief that it is important for the public to engage with economic ideas, including about valuation, in order that they might choose whether to accept, debate or resist the encroachment of economics into yet more realms. By workshopping research design with participants, we hoped to bring

them closer not only to researchers but also to economic ideas and technologies. At the same time, we hoped to bring the nature they experience into the research. We wanted to give back to participants with a report written for volunteer environmental groups that showed how much the community values the OP.

Soon, we realised that these were more complex goals than we had anticipated. We learned to think about valuing as a verb as well as a noun. We learned to study this process with more thought to see what participants' responses could teach us about the assumptions of DCE as a valuation device. And we learned to think about the complex power relations that were embedded in the process between researchers and participants, participants and the DCE, and valuation devices and nature.

There were some ways in which our outcomes were simple: we produced a clean and competent report giving numerical values for various biodiversity management strategies. We gave this report to the local council and to volunteer groups working on the peninsula. Fabien presented this report to the Otago Peninsula Community Board, an arm of the Dunedin City Council, on 19 March 2019. The chairperson emailed, 'My thanks for coming to the Board meeting. I personally found your report very interesting and it will prove very helpful in the future' (pers. comm.). This was our valuation – as a noun – working in the community.

It is when we think about valuing as a verb that we begin to wonder about the meaning of the numbers we produced. If we watch and listen to participants while they fill in the DCE survey we are able to see them surprised, discomforted, frustrated, careful and wondering. These emotions were triggered by the ways the DCE technology exerted itself upon them, insisting that they perform their valuing of the OP biodiversity efforts in certain ways.

We have argued that their responses highlight the assumptions hiding within the DCE device: the necessity of making trade-offs; the actions that are possible; the 'reality' of one's preference structures; the need for abstraction; and the importance of big picture patterns. These are assumptions that drive economic thinking and much academic thinking too. Like shopping trolleys, lean whiteboards, and compensation calculations for oil spills, a DCE survey is a valuation device that exerts its logic on human users.

But like trolleys, whiteboards, and calculations, exactly how they are used by participants matters too. We argued that our participants were savvy in rejecting the assumptions of the DCE or in using the survey to further their own agendas: Daniel valued pest control above all, while Sarah gave up with only a third completed. Not only do these revelations impact how we should read valuation numbers, they also should remind us how complicated it can be to work out who can and should speak for nature.

Acknowledgment: We would like to thank all the participants and respondents in our study for giving us their time, their attention and their opinions. This paper also benefited substantially from thoughtful discussions from the SPIRAL group at University of Liege and from insightful comments from the reviewers and editors.

References

- Adamowicz, W., J. Louviere, and M. Williams. 1994. "Combining Revealed and Stated Preference Methods for Valuing Environmental Amenities." *Journal of Environmental Economics and Management* 26(3): 271–292, <https://doi.org/10.1006/jeem.1994.1017>, accessed 28 September 2020.
- Alriksson, S., and T. Öberg. 2008a. "Conjoint Analysis." *Environmental Science and Pollution Research* 15(2): 119–199, DOI 10.1065/espr2007.12.460.
- Alriksson, S., and T. Öberg. 2008b. "Conjoint Analysis for Environmental Evaluation." *Environmental Science and Pollution Research* 15(3): 224–257, DOI 10.1065/espr2008.02.479.
- Boldyrev, I. and E. Svetlova. 2016. "After the Turn: How the Performativity of Economics Matters." In *Enacting Dismal Science*, edited by I. Boldyrev, and E. Svetlova, 1–27. New York: Palgrave Macmillan.
- Breslau, Daniel. 2013. "Designing a Market-Like Entity: Economics in the Politics of Market Formation." *Social Studies of Science* 43(6): 829–851.
- Burns, M. and F. Medvecky. 2018. "The Disengaged in Science Communication: How Not To Count Audiences and Publics." *Public Understanding of Science* 27(2): 118–130, DOI 10.1177/0963662516678351.
- Burrows, J., P. Dixon, and H. M. Chan. 2017. "Response to Cost Prompts in Stated Preference Valuation of Environmental Goods." In *Contingent Valuation of Environmental Goods: A Comprehensive Critique*, edited by Daniel McFadden and Kenneth Train, 1–16. Cheltenham and Northampton, MA: Edward Elgar Publishing.
- Callon, M. 2007. "What Does It Mean to Say That Economics is Performative?" In *Do Economists Make Markets? On the Performativity of Economics*, edited by D. MacKenzie, F. Muniesa, and L. Siu, 311–357. Princeton, NJ: Princeton University Press.
- Castree, N. 2003. "Commodifying What Nature?" *Progress in Human Geography* 27(3): 273–297, <https://doi.org/10.1191/0309132503ph428oa>, accessed 28 September 2020.
- Cochoy, F. 2008. "Calculation, Qualculation, Calculation: Shopping Cart Arithmetic, Equipped Cognition and the Clustered Consumer." *Marketing Theory* 8(1): 15–44.
- Fourcade, M. 2011. "Cents and Sensibility: Economic Valuation and the Nature of 'Nature.'" *American Journal of Sociology* 116(6): 1721–1777. <https://doi.org/10.1086/659640>, accessed 28 September 2020.
- Freeman, A.M. 2003. *The Measurement of Environmental and Resource Values: Theory and Methods*. Washington, DC: Resources for the Future.

- Gómez-Baggethun, E. and M. Ruiz-Pérez. 2011. "Economic Valuation and the Commodification of Ecosystem Services." *Progress in Physical Geography* 35(5): 613–628, <https://doi.org/10.1177/0309133311421708>, accessed 28 September 2020.
- Fredriksen, A. 2017. "Valuing Species: The Continuities between Non-Market and Market Valuations in Biodiversity Conservation." *Valuation Studies* 5(1): 39–59.
- Hanley, N., R. E. Wright, and V. Adamowicz. 1998. "Using Choice Experiments to Value the Environment." *Environmental and Resource Economics* 11(3): 413–428. DOI 10.1023/a:1008287310583.
- Hansen, P. and F. Ombler. 2008. "A New Method for Scoring Additive Multi-Attribute Value Models Using Pairwise Rankings of Alternatives." *Journal of Multi-Criteria Decision Analysis* 15(3–4): 87–107.
- Hauge, A. 2016. "The Organizational Valuation of Valuation Devices: Putting Lean Whiteboard Management to Work in a Hospital Department." *Valuation Studies* 4(2): 125–151.
- Helgesson, C-F., and F. Muniesa. 2013. "For What It's Worth: An Introduction in Valuation Studies." *Valuation Studies* 1(1): 1–10. DOI 10.1016/j.njas.2016.03.004.
- Heuts, F., and A. Mol. 2013. "What Is a Good Tomato? A Case of Valuing in Practice." *Valuation Studies* 1(2): 125–146. <https://doi.org/10.3384/vs.2001-5992.1312125>, accessed 28 September 2020.
- Holmes, D.R. 2009. "Economy of Words." *Cultural Anthropology* 24(3): 381–419.
- Holmes, D.R. 2013. *Economy of Words: Communicative Imperatives in Central Banks*. Chicago, IL: University of Chicago Press.
- Hoyos, D. 2010. "The State of the Art of Environmental Valuation with Discrete Choice Experiments." *Ecological Economics* 69(8): 1595–1603, <https://doi.org/10.1016/j.ecolecon.2010.04.011>, accessed 28 September 2020.
- Hubbard, G., A. Garnett, and P. Lewis. 2012. *Essentials of Economics*. Melbourne, VIC: Pearson Higher Education
- Irwin, A. 1995. *Citizen Science: A Study of People, Expertise and Sustainable Development*. London: Routledge.
- Johnston, R., K. Boyle, W. Adamowicz, J. Bennett, J. Brouwer, T. Cameron, M. Hanemann, N. Hanley, M. Ryan, and R. Scarpa. 2017. "Contemporary Guidance for Stated Preference Studies." *Journal of the Association of Environmental and Resource Economists* 4(2): 319–405.
- Kjellberg, H., A. Mallard, D. Arjaliès, P. Aspers, S. Beljean, A. Bidet, A. Corsin, E. Didier, M. Fourcade, S. Geiger, K. Hoeyer, M. Lamont, D. MacKenzie, B. Maurer, J. Mouritsen, E. Sjögren, K. Tryggestad, F. Vatin, and S. Woolgar (main authors: H. Kjellberg and A. Mallard). 2013. "Valuation Studies? Our Collective Two Cents." *Valuation Studies* 1(1): 11–30, <https://doi.org/10.3384/vs.2001-5992.131111>, accessed 28 September 2020.

- Law, J. 2000. "On the Subject of the Object: Narrative, Technology, and Interpellation." *Configurations* 8(1): 1–29.
- Law, J. 2004. *After Method: Mess in Social Science Research*. London: Routledge.
- McFadden, D. and K. Train (eds) 2017. *Contingent Valuation of Environmental Goods: A Comprehensive Critique*. Cheltenham and Northampton, MA: Edward Elgar Publishing.
- MacKenzie, D. 2008. *An Engine, Not a Camera: How Financial Models Shape Markets*. Cambridge, MA: MIT Press.
- MacKenzie, D. and Yuval Millo. 2003. "Constructing a Market, Performing Theory: The Historical Sociology of a Financial Derivatives Exchange." *American Journal of Sociology* 109(1): 107–145.
- Massey, D. S., and R. Tourangeau. 2013. "Where Do We Go from Here? Nonresponse and Social Measurement." *The Annals of the American Academy of Political and Social Science* 645(1): 222–236.
- Matulis, B. 2014. "The Economic Valuation of Nature: A Question of Justice?" *Ecological Economics* 104: 155–157, <https://doi.org/10.1016/j.ecolecon.2014.04.010>, accessed 28 September 2020.
- Medvecky, F. 2014. "Valuing the Environment in Conservation Economics: Conceptual and Structural Barriers." *Ethics and the Environment* 19(2): 39–55.
- Medvecky, F. and V. Macknight. 2017. "Building the Economic-Public Relationship: Learning from Science Communication and Science Studies." *Journal of Science Communication* 16(2): 1–17.
- Medvecky, F., and V. Macknight. 2018. *What is it Worth? An Economic Assessment of Options for Managing the Otago Peninsula's Biodiversity*. Dunedin: Centre for Science Communication, University of Otago.
- Muniesa, F. 2014. *The Provoked Economy: Economic Reality and the Performative Turn*. Oxford: Routledge.
- Peltola, T., and I. Arpin. 2017. "How We Come to Value Nature? – A Pragmatist Perspective." *Ecological Economics* 142: 12–20, <https://doi.org/10.1016/j.ecolecon.2017.06.009> accessed 28 September 2020.
- Peytchev, A. 2013. "Consequences of Survey Nonresponse." *The Annals of the American Academy of Political and Social Science* 645(1): 88–111.
- Rakotonarivo, O. S., M. Schaafsma, and N. Hockley. 2016. "A Systematic Review of the Reliability and Validity of Discrete Choice Experiments in Valuing Non-Market Environmental Goods." *Journal of Environmental Management* 183: 98–109, <https://doi.org/10.1016/j.jenvman.2016.08.032>, accessed 28 September 2020.
- Redford, K., and W. Adams. 2009. "Society for Conservation Biology Payment for Ecosystem Services and the Challenge of Saving Nature." *Conservation Biology* 23(4): 785–787.
- Rodríguez-Labajos, B., and Martínez-Alier, J. 2013. "The Economics of Ecosystems and Biodiversity: Recent Instances for Debate." *Conservation and Society* 11: 326–342, <https://doi.org/10.4103/0972-4923.125744>, accessed 28 September 2020.

- Tisdell, C. 1988. "Economic Potential of Wildlife on the Otago Peninsula, Especially the Yellow-Eyed Penguin, for Tourism." Economic Discussion Papers. Dunedin: University of Otago.
- Tisdell, C. 2007. "Valuing the Otago Peninsula: The Economic Benefits of Conservation." Working Papers on Economics, Ecology and the Environment. Dunedin: University of Otago.
- Vatin, F. 2013. "Valuation as Evaluating and Valorizing." *Valuation Studies* 1(1): 31–50, <https://doi.org/10.3384/vs.2001-5992.131131>, accessed 28 September 2020.

Dr Vicki Macknight (corresponding author) has an abiding interest in how knowledges of all sorts are made in practice. She has written about how imagination is practised in primary schools, published in the book *Imagining Classrooms* (published by the wonderful open access Mattering Press in 2016). She has also published articles in *Social Epistemology*, *Science as Culture* and the *Journal of Science Communication*. She is currently working with Fabien Medvecky on a book length exploration of the impact of Google search on knowledge making.

Dr Fabien Medvecky studies the relationship between knowledge and society, wondering how social interactions shape, create and direct what counts as knowledge. Armed with a PhD in philosophy and a graduate degree in economics, he is especially interested in how values interact with knowledge, from ethics and justice issues (who gets to know what and who should get to know what; who gets a say and who should get a say; etc) to how economics (the discipline, not the economy) is made public, and how that interacts with other forms of knowledge and expertise.

Appendix A

Attribute	Levels
Pest management	No active management of pest
	Manage pests that affect biodiversity to maintain current levels
	Eradicate pests from the Peninsula (as much as possible)
Weed management	No active management of weeds
	Manage weeds that affect biodiversity to maintain current levels
	Eradicate weeds from the Peninsula (as much as possible)
Support for private landowners	No special financial support for private landowners to help manage biodiversity
	Offer private landowners financial support and incentives to help manage biodiversity on their property
Native ecosystem	No special attention given to native ecosystems in biodiversity management
	Manage to maintain current levels of native ecosystems on the Peninsula
	Focus biodiversity management efforts to increase native ecosystems on the Peninsula
Focus of biodiversity management	Efforts for biodiversity management focused on tourism-related biodiversity only
	A focus on all the biodiversity of the Peninsula
Marine reserve	No marine reserve on the Otago Peninsula
	A marine reserve along southern coast of the Peninsula

Costs	An additional council rate for all Greater Dunedin residents of NZ\$35 per year for biodiversity management
	NZ\$15 in targeted council rate per year for all Greater Dunedin residents for biodiversity management
	No additional cost for managing the biodiversity of the Peninsula