Non-market valuation: usage and impacts in environmental policy and management in Australia

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Short title: Non-market valuation use in environmental policy

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Abstract

An extensive literature exists on environmental non-market valuation research. It appears that results from these studies should be useful inputs to decision making about environmental policy or management. Here, we investigate the extent to which this occurs in practice in Australian environmental management bodies. Non-market valuation experts were surveyed about their studies that they believed to have influenced policy. Then, decision makers in environmental bodies were interviewed about the level of influence non-market valuation has had on their decisions. We find that researchers' perceptions of the influence that non-market valuation has on decision making are overly optimistic. Interviews with decision makers suggest that non-market valuation is little used in decision making. Indeed, the majority of them are unfamiliar with non-market valuation techniques. Nevertheless, once the concept was explained to them, many decision makers believed it could benefit environmental policy. Researchers' perceptions of the reasons for low usage of non-market valuation are largely inaccurate. We suggest a range of strategies that economists can use to promote the use of non-market valuation in environmental policy and management decisions, including ways to improve communication and engagement with decision makers, and strategies to increase the capacity for decision makers to use non-market valuation results.

Keywords: Non-market valuation, environmental policy, decision making.

JEL codes: Q51; Q58; Z18

1. Introduction

Non-market valuation (NMV) has been a major area of research in environmental economics (e.g. Adamowicz 2004; Bennett 2011; Carson 2012). From 2000 to 2012, more than 70 articles were published in this Journal that employed one or more NMV methods. However, anecdotal evidence suggests that use of NMV in environmental policy and management in Australia is very limited. In this paper we aim to provide stronger evidence on this issue through a survey of researchers and consultants who conduct NMV studies, and through interviews with environmental policy makers and managers.

Non-market valuation has a troubled legacy in Australia, dating back to the 1990 contingent valuation (CV) study estimating willingness to pay for protection of the Kakadu Conservation Zone (Carson *et al.* 1994). That study was strongly criticised within the economics discipline (Bennett 1996) and ridiculed in the public debate. This, no doubt, signalled uncertainty with respect to the validity of using NMV to inform policy, which may subsequently have influenced environmental managers and policy makers. The debate within economics continues, and is well documented. Articles in a recent issue of the *Journal of Economic Perspectives* reviewed current positions on the critique of CV. Kling *et al.* (2012, p.23) concluded that "Some carefully constructed number ... [is] more useful than no number...", while Hausman (2012, p.54) concluded that "... 'no number' is still better than a contingent valuation estimate".

In the academic literature, the role of environmental valuation as a component within benefit-cost analysis (BCA) is acknowledged (e.g. Turner 2007; Pearce and Seccombe-Hett 2000), and this justification for the deployment of NMV studies is routinely raised (e.g. Hanley and Barbier 2009). However, published valuation studies seldom make explicit the relationship between the valuation and any real policy outcome. In an extensive review, Laurans *et al.* (2013) found very few papers that explicitly linked the valuation process reported to a role in a decision (they found 8 out of 313 valuation studies published in the journal *Ecological Economics*). They concluded, "for the most part, UESV

[use of environmental service valuation] receives no more than a cursory reference in the form of an expected, proposed or desired use" (p. 214). Liu *et al.* (2010) review the practice of ecosystem services valuation (ESV), and conclude that "the contribution of ESV to ecosystem management has not been as large as hoped nor as clear as imagined" (p. 73). In a study related to hydropower, Gowan *et al.* (2006, p. 521) conclude that there is "very little evidence that public policy participants require monetization of nature's services to make tradeoffs and choices". Fisher *et al*. (2008) surveyed authors of 34 valuation papers, covering a range of international applications, to identify the level of policy engagement at all levels of the process, including any *ex post* evaluations of impact. From the 14 responses, "authors' perceptions of how their research interacted with the policy realm ranged from 'no interaction' all the way to 'influencing federal policy design' " (p. 2064). An issue of course is the degree to which the authors' perceptions align with the reality of the actual decision process. Results of a survey by List (2005) suggested that US environmental policy makers recognise the value of CV in quantifying certain values, but are generally cautious in their use of stated preference methods.

In the Australian policy context, and according to its *Best Practice Regulation Handbook*, "The Australian Government is committed to the use of cost-benefit analysis to assess regulatory proposals to encourage better decision making" (Australian Government 2010, p.61). While one might expect this commitment to prompt the use of NMV in analyses of environmental regulatory proposals, using NMV is not a requirement within the Government's *Cost-Benefit Analysis Handbook* (Australian Government 2006). Analysts may choose to estimate the break-even level of non-market benefits required for total benefits to at least match total costs, and then "leave it to the political process to resolve whether or not the expected benefits equal or exceed the threshold value" (Australian Government 2006, p.29). Our experience in discussing Regulatory Impact Statements with officers in environmental agencies indicates that they tend to use this simple break-even approach. In any case, the Government's commitment to BCA only applies at the level of major programs, not to the

numerous individual investment projects within those programs. Thus, there is in practice no requirement for environmental managers or policy makers in Australia to use NMV for any purpose.

The absence of such a requirement is unlikely to be the sole reason why environmental decision makers choose not to use information from NMV studies. In addition to the academic controversies already mentioned, there may be various other reasons. Following Dehnhardt (2013), we hypothesise that influential factors may include: (i) conceptual issues, for example, a prejudice against use of economic information or against the idea of monetising environmental values; (ii) methodological problems, for example, difficulties in defining the good or the validity of the estimates; (iii) lack of scope for valuation information to be considered within existing metrics and decision processes; (iv) excessive financial costs, or time delays in generating the information; and, to which we would add, (v) a preference for valuation judgements to be made by decision makers themselves; and (vi) judgements that the benefits of NMV information in terms of improved decisions are outweighed by the costs of acquiring that information (which is a more nuanced version of excessive cost).

In this study, the approach we take is to directly survey individuals on both the supply and demand side of environmental valuation. We will investigate: (a) the extent to which NMV results are used by decision makers in environmental programs; (b) reasons for the use or non-use of NMV; and (c) differences in perceptions about these matters between NMV specialists and environmental decision makers. We discuss strategies that may increase the usage of NMV in environmental programs. The study builds on discussions at a mini-symposium held at the 2012 Annual Conference of the Australian Agricultural and Resource Economics Society.

In considering the usage of NMV in policy decision making, we recognise that there may be a variety of objectives from any particular policy intervention and many different types of information needed for decision making about policy. Any particular NMV study is likely to be relevant to some objectives but not others, and to be insufficient on its own for most decisions. Indeed, Nyborg (2012) promotes the belief that economic tools such as NMV and BCA should primarily be used to provide

systematic descriptions of projects to democratic decision making processes, and that the selection of the project that is most socially beneficial should be decided in accordance with the decision maker's normative ethical and political views. Nevertheless, we believe that most environmental policy decisions do affect the levels of non-market values, and that information about those effects is one important type of information needed for sound decision making.

The paper proceeds as follows. The next section describes the methods used, consisting of a survey of NMV experts and interviews with environmental decision makers. Thereafter, results are described and differences between the two sets of respondents identified. In the last section, results are discussed, and potential future strategies identified.

2. Method

We conducted an online survey of NMV researchers, including academics and consultants, from Australia and New Zealand, between February and May 2012. Although the focus of this study is on the Australian policy context, individuals from both Australia and New Zealand were included in the researcher survey given that many collaborate on NMV studies in both countries. We examined whether there were substantial differences between survey responses from Australian and New Zealand researchers, but found none.

The questionnaire was created in the Qualtrics online survey platform (Qualtrics 2013). Potential respondents were identified from academic publications on NMV, and from publically available consultancy reports. The online survey aimed to elicit researchers' perceptions about, and experiences with, the use of NMV in environmental policy making. Non-market valuation was defined to include CV, discrete choice experiments (DCEs), benefit transfer (BT), hedonic pricing, and the travel cost method. The survey consisted of four main sections. Respondents were first asked questions about their area of research, and their experience in using NMV techniques. The second section focussed on the respondent's personal experiences with the use or non-use of NMV in Australia or New Zealand in guiding environmental policies. Respondents were asked to provide details of up to

three NMV studies that they believed had influenced policy. Questions aimed to elicit how the described studies had influenced policy recommendations or decisions, and what evidence exists for that influence. Finally, respondents were asked to rate which factors facilitated NMV research being used in policy decisions on a scale from 1 (Not a factor at all) to 5 (Very important factor).

Questions were also asked about NMV studies that were intended to influence or had potential to influence policy, but did not have any influence. An important question in this third section of the survey concerned the factors preventing NMV research being used in policy decisions, which researchers again were asked to rate on a scale from 1 to 5. Questions in the final section of the survey asked about socio-demographic characteristics of the respondent.

Subsequently, semi-structured telephone interviews with decision makers in Australian environmental organisations and agencies were conducted in November and December 2012. Potential respondents were identified from government websites, consultancy reports, answers provided in the survey of researchers, or were drawn from our networks. The sample included decision makers who were either involved in making decisions themselves, or who provided advice to higher-level decision makers. Respondents were questioned about how values of environmental impacts are accounted for in the decision making processes in which they are involved; their general familiarity with NMV techniques; and whether they have ever used NMV in decision making. Particular attention was paid to quizzing respondents about the factors that can facilitate the use of non-market values, or that limit the use of NMV study results.

3. Results

3.1 Researcher survey

Invitations were sent to approximately 70 researchers[1], of whom 33 responded and 18 completed the questionnaire in full. The majority of respondents worked at educational or research institutions (72%)

[1] Additional, generic, invitations were sent to consultancy firms to be circulated amongst staff. The exact number of consultants receiving this invitation can therefore not be determined.

and 12 respondents were engaged in research as consultants. The NMV techniques that were used most widely were CV (26 respondents), DCEs (23 respondents), and the travel cost method (23 respondents). In all cases, respondents used NMV for applied research, with about one-third also targeting theoretical, econometric or methodological advancement of the techniques.

Researchers provided a list of 49 studies that they believed have influenced policy. Discrete choice experiments were the most commonly applied NMV technique of these studies. Of the 49 influential studies, details were provided for 44 of them regarding the perceived difference they made to policy, evidence of that difference, and the perceived factors that facilitated use of the information in decision making.

Some evidence of impact was provided in only 20 per cent of cases (9 studies), where the research results were used in a formal, documented process (e.g. BCA or calculation of net present value) through which researchers claimed to have made a difference. One respondent stated that "*The projects [that were] found by the BCA to improve economic efficiency were recommended for approval"*. However, in the majority of cases, there was weak or no evidence that the NMV study had made a difference on a policy decision. For example, 36 per cent claimed that their study had, *"Led to land use change in the region"; "Informed decision-making on possible program and policy design"*, or that *"[Dollar] values supported ... expenditures on [environment]"*, but did not provide tangible supporting evidence for these statements.

Interestingly, once respondents were asked for details and evidence about the studies they had put forward as being impactful, 32 per cent of respondents stated that the studies they had provided had not made a clear difference. It is striking and surprising that almost a third of the studies that were initially put forward were subsequently reconsidered and reported as having made no difference.

3.2 Decision maker interview results

Email invitations for the decision makers' interviews were sent to 188 potential respondents in Government and NRM organisations. Interviews were conducted with 38 decision makers (26 at NRM

organisations; 13 at Government departments) from all Australian States and Territories except the Northern Territory.

Most decision makers attempted to quantify the environmental impacts of projects in some way when determining whether a project should go ahead. However, only a minority of respondents attempted to quantify impacts in monetary terms. About 37 per cent of the interviewed decision makers reported that they had used NMV as an input into decision making at least once. The most commonly used techniques were DCEs (57%) and BT (36%). These results were reasonably consistent with the perceptions of researcher respondents, of whom 29 and 24 per cent respectively perceived DCEs and BT to be the techniques most likely to be used by decision makers.

Interviewees were asked to identify a particular environmental project about which they had recently made a recommendation or decision. Eight respondents stated that NMV had been used in some way in the decision-making process. Of these eight cases, respondents stated that the NMV had been influential, leading to a change in the recommendation made about the project in six cases, and that the changed recommendation had been accepted by decision makers in four cases.

Many interviewed decision makers were unfamiliar with the concept of NMV, and about two-thirds of the respondents could not name any NMV techniques. Approximately 40 per cent of respondents were still not familiar with NMV even after the techniques had been described to them. In addition, five per cent of potential respondents contacted declined to be part of the interview because they are unfamiliar with NMV. A further 11 per cent declined due to time restraints. Of the 64 per cent who did not respond to the invitation to participate we have no information, but we might hypothesise that awareness of NMV would be even lower than for respondents.

Despite the lack of familiarity with NMV, after describing the techniques to environmental decision makers there was a general perception that NMV could potentially be a useful decision tool (approximately 76% of interviewees). Specifically, 58 per cent perceived NMV to be useful; 19 per cent considered it potentially useful; 13 per cent thought it was not useful; and 11 per cent were unsure.

There is a parallel here with the finding of Dehnhardt (2013) who surveyed members of German water management authorities and found a contradiction between a generally positive attitude towards valuation and its relatively low uptake in decision processes.

Reasons why NMV was considered potentially useful by our interviewees included that it offers an evidence-based approach for decision making, and that it can put an order of magnitude on benefits and costs of environmental projects. One particularly positive respondent stated that "*I'm increasingly impressed by the value in undertaking these studies. It's really good evidence for us to help influence decision makers*", suggesting that there may be decision makers who are keen to incorporate non-market values in their policy processes.

3.3 Insights from both sets of respondents

3.3.1 In what ways are non-market values used?

The researchers' survey and decision makers' interviews suggest that NMV is mostly used to support decisions that have already been made, rather than to *inform* the decision making process. For example, high (low) non-market value estimates might support an existing decision (not) to fund a project. Researchers provided open-ended responses to questions about the difference their (perceived) influential studies had on decisions, and evidence of that difference. For example, researchers stated that their results (emphasis added):

*"… were used to **justify** additional expenditure on protecting native species…"*

*"... helped to **support** limits on water allocations…"*

The second use for NMV identified or envisaged by the decision maker interviewees is to provide support when lobbying for environment funds, especially when competing against other sectors that can (more easily) put monetary values on their benefits (e.g. agricultural production). For example, interviewees commented that NMV:

"…is critical for securing on-going funding [of the existing project]…"

"…would be useful as a tool for convincing people who hold the purse-strings [that my project is worthwhile] …"

If used for this purpose, NMV information may be influential on higher-level decision makers. However, we note that implicit in this use is a perception by those doing the lobbying that their area is worthy of continued or increased funding. One may wonder how they would respond if the NMV information indicated that it was not. We conjecture that the information would not be used. If that is true, then use of NMV for this purpose has a biased influence.

As economists, we would like to see NMV information used in a balanced way to inform decisions about program funding, levels of funding, and project priorities. However, we found very little evidence in the survey or interviews that NMV has been used for these purposes. At the program level, we note that decisions about funding for environmental programs are usually made at the political level, and that there appears to be little scope for information about non-market values to be considered in that process. Decisions about individual environmental projects are usually made by officers working for environmental organisations, and one might have expected non-market values to be considered more often in this context, but it seems that they usually are not.

3.3.2 What facilitates uptake of NMVs?

Researchers were asked to reflect on the factors that facilitated their NMV research being used in environmental policy recommendations or management decisions. 'Communication' was reported as an important factor (mentioned 16 times out of 44 cases). Some researchers referred to communication in terms of engagement with the decision body throughout the course of the research, or by presenting results of the study to decision makers. In approximately one third of the 16 cases, the reported form of communication thought to have helped facilitate use of the research was through peer-reviewed publications. Typical responses included:

"*… publication in refereed journal with subsequent high citation rates …"*

"… robust, peer-reviewed study …"

"… published in high-quality journal …"

Respondents were also asked to rate a number of factors that could potentially facilitate the use of NMV in environmental decision making in general (i.e. not specifically related to the studies they had named). The two most important factors that researchers perceived to facilitate uptake of NMV research in decision making processes were: (1) employees within the decision making body advocating for the inclusion of NMV results, and (2) the results of the study support an existing decision (Table I). The former point is consistent with observations elsewhere that internal "champions" are important for progressing reforms to policies or processes (e.g. Jacobs 2002; Pannell and Roberts 2009).

[INSERT TABLE I ABOUT HERE]

3.3.3 What prevents uptake of NMVs?

When asked for reasons that may contribute to limiting the uptake of NMV by decision makers, the two most important barriers perceived by researchers were: (1) the decision body having concerns about the limitations or validity of NMV techniques, or (2) the decision body objecting to assigning monetary values to the environment (Table II). However, it seems clear from our interviews with environmental decision makers that their general lack of awareness and understanding of NMV is likely to be a much greater impediment. While 37 per cent had been exposed to NMV, the remaining 63 per cent were not able to name any NMV techniques. Many interviewees said they could not comment on the comparative usefulness of individual NMV techniques for decision making, with 18 per cent of respondents citing 'lack of awareness' as a direct reason why NMV is not used in project decisions.

[INSERT TABLE II ABOUT HERE]

A second impediment, according to environmental decision makers, is lack of time and resources. This was mentioned by 29 per cent of respondents. For example, "*We just haven't had the capacity. Whilst useful it hasn't seemed that important to us to date. … I'm sure if we did it as a matter*

of course and we had the capacity so that it wasn't overwhelming for us, we'd probably use it to help inform decision making." And, "*It's easiest to have an equation, a process to use that's been tailored to the [local] circumstances [rather than NMVs]*."

A third impediment was a general opposition to the use of economic studies, rather than opposition to NMV in particular. For example, interviewees stated that "*many people within environmental agencies are highly sceptical of the value of economic studies*", and "*People within the environment agency, and that's quite senior people, just laugh at us when we say we could use economics to advise on these things. When they laugh, they actually do laugh.*". Reinforcing these sentiments, Table III shows that around 50 per cent of environmental decision makers have never used any type of economic model.

[INSERT TABLE III ABOUT HERE]

Fourthly, the environmental decision makers do agree to some extent with the impediments suggested by the researchers (concerns about NMV validity, objections to monetisation). However, these issues are not nearly as important to decision makers as researchers perceived them to be.

3.3.4 Are commissioned studies more influential?

One may hypothesise that NMV results will influence policy decisions if the relevant decision body commissions the research. Indeed, about half of the 49 studies that researchers named as influential had been commissioned by a public decision body. However, out of the 15 studies that had been carried out with the explicit intent of informing policy, but that were subsequently not used in the decision process, six studies had been commissioned by public or private decision bodies. Thus, being commissioned is no guarantee that a study will be influential. In fact, even for (claimed) influential studies that were commissioned by a public body, researchers generally could not readily provide tangible evidence (beyond general assertions) that the results had made a difference to environmental decisions. For studies commissioned by a private body, the evidence was only slightly more tangible. Most commonly, values were incorporated in BCA or other formal calculations (in 4 out of 8 cases).

4. Discussion

The study revealed little evidence of NMV studies making a difference to environmental decision making in Australia. The great majority of decisions in this sector are made without the use of information from NMV studies. The majority of environmental NMV studies do not get used by decision makers. Where they are used, they tend not to be used to make decisions, but rather to justify existing decisions. While using NMV for this purpose is, perhaps, appreciated by policy officers, the social benefits generated are likely to be very small. Even where NMV results are used to inform a policy recommendation, they may not change the policy decision.

We are not suggesting that NMV results should necessarily lead to changes in every policy decision. The results may not be very different from the existing perspectives of decision makers, or they may not be as important as other information in determining the decision. However, given the very low current usage of NMV in environmental decision making, it seems clear that there is potential for improved decision making, leading to more valuable environmental outcomes, through increased usage.

The results highlight a lack of knowledge on both sides of the researcher-policy divide. Many of the decision makers interviewed had a profound lack of knowledge about NMV. Most could not name a single NMV technique, and only 37 per cent said that they had ever been exposed to NMV in the course of making environmental decisions. This accords with the hypothesis of Laurans *et al*. (2013) that decision makers may have insufficient training in economics to be confident in using NMV to support decisions.

Researchers also demonstrated important knowledge gaps. They reported only modest impacts on policy decisions from NMV results, but the responses of decision makers suggested that the actual impacts are lower still.

Researchers misperceive the main reasons for low usage. They nominated concerns about the limitations/validity of the NMV techniques used as the most important reason, but it seems clear that

most environmental decision makers have too little awareness of NMV for such concerns to even be possible. It appears that these researchers may be assuming that the continuing debate about NMV within economics (e.g., Kline *et al.* 2012; Hausman 2012) may be affecting the attitudes of environmental decision makers, which is a suggestion that has been made before in the literature (e.g. Driml, 1997; Laurans *et al.*, 2013). However, we found little evidence for this.

Researchers nominated objections to monetisation of the environment as the second most important factor limiting use of NMV, but most decision makers indicated positive attitudes about the potential use of monetised values, once the concept was explained to them.

It appears that many of the researchers who responded are somewhat disconnected from, and ignorant of, the policy process. One striking illustration of this was that peer-reviewed publication was a commonly reported form of communication thought to influence usage of NMV. In reality, academic papers in peer reviewed journals are rarely read by policy decision makers (Gibbons *et al*. 2008). Rather, information flows within policy spheres occur primarily by verbal communication and by brief non-academic documents.

The observed lack of mutual knowledge and understanding between researchers and staff in policy agencies is, perhaps, not surprising. Research and policy differ greatly in their cultures, time frames, language, working methods, values and incentives, as has been well documented (e.g., Briggs 2006; Feldman *et al*. 2001).

There are also well documented strategies for researchers to use to engage more effectively with policy (e.g., Clark *et al.* 1998; Feldman *et al.* 2001; Gregich 2003; Nutley 2003; Pannell 2004; Pannell and Roberts 2009). Here we draw selectively from this literature to suggest strategies that NMV researchers could consider adopting if they wish to increase the real-world impacts of their work. The first three strategies relate to economists improving their understanding of the policy world.

(a) Understand the policy maker's perspective, so that information can be provided in a form and language that fits their needs.

(b) Develop knowledge of the key policy players, the policy process, and current policy developments, in order to be aware of good opportunities for input.

(c) Pay attention to transaction costs. Appreciate that policy decision makers need to consider the costs and benefits of obtaining information. For example, one decision maker suggested that original NMV studies may be worthwhile for large projects, but that BT would be better for small projects: "*[There are] issues of scale and costs associated with doing that [an original valuation study]. [I] couldn't justify that with the transactional costs*". This suggests an important role for BT if non-market values are to be widely used (although Laurans *et al.* (2013) note that the increased imprecision associated with BT may reduce acceptability). It may be worthwhile for NMV researchers to give attention to conducting studies needed to fill important gaps for BT, to create a larger database of values suitable for BT, and to develop systems to ease the BT process for decision makers. Although international databases exist (e.g. EVRI), none of the decision makers in our interviews mentioned them. It may be valuable to promote the EVRI database to Australian decision makers, and update the collation of Australian studies.

The following points relate to researchers' behaviour and strategies when attempting to influence policy.

(d) Excellent communication is needed. Requirements include clarity, brevity, simplicity, and avoidance of jargon and technical issues.

(e) Develop relationships with officers in policy agencies. If possible involve them in the research from an early stage. Build networks and seek support for change amongst both policy makers and interest groups.

(f) Be pragmatic about what is realistically possible in policy. Be patient and persistent. Be resilient in the face of setbacks or criticisms.

(g) Timeliness is important. Be prepared to respond quickly if needed for a policy decision. It is better to compromise on the quality of information provided than to be excluded from the process. Get in early if possible. Once policy positions are established, they are more difficult to change.

Finally, and similarly to the suggestions of Laurans *et al*. (2013), there are a number of points that relate to increasing the capacities of environmental decision makers to use NMV results.

(h) Offer training and support to environmental decision makers to raise their awareness and knowledge about NMV and BCA. Making efforts to include relevant economics in undergraduate environmental science degrees might also be a worthwhile long-term strategy.

(i) Often, environmental decision makers do not know how to use economic information because there is no place for it in the decision processes used. Provision of simplified decision systems or tools that can incorporate NMV results may help to overcome this barrier. An example of an attempt to do this is INFFER (Investment Framework for Environmental Resources – Pannell *et al.* 2012).

These potential strategies would, of course, take time, effort, and skills. NMV researchers may or may not be willing to devote some of their human resources to these ends. Growing recognition of the importance of real-world impact in research evaluation processes may create incentives for researchers to do so. Such recognition is mooted for the Australian Research Council's Excellence In Research for Australia process, and is already in place in the UK Research Excellence Framework, for commencement in 2014.

There may also be policy makers or policy advisors who wish to increase the usage of NMV and BCA in decision making. Relative to the literature providing advice for researchers about linking research to policy, there is much less written for the policy side of the relationship. Pannell's (2008) advice includes: to actively engage with researchers; to be clear about the information needs of policy

and communicate them clearly; to invest in the necessary research well in advance of it being needed; to engage the most appropriate, most skilled researchers for your information needs, not the most familiar or locally handy; and to support efforts to get researchers and information users working together.

Given our earlier observation that use of NMV in policy is not required, and even that use of BCA is not required except when evaluating whole policy programs, an obvious question is, "should they be?" Laurans *et al.* (2013) propose that increased policy requirements for formal BCA, including NMV, may increase uptake, although they note that even where this occurs, implementation may not be satisfactory. Our view is that BCA and NMV should be encouraged, supported and, where feasible, rewarded, but not made compulsory. In our experience, compulsory use of decision tools or frameworks has a high risk of leading to cynical usage, with inputs manipulated to generate desired results.

Perhaps the most encouraging result of our study is that the interviewed decision makers do generally have a positive attitude towards the concept of NMV, which may improve with increased awareness of the methodology. In the decision maker interviews, 46 per cent of respondents stated that their attitude towards the usefulness of NMV had improved over time (although a significant share of these respondents could still not name any NMV technique). Most of these respondents (63% of them) indicated that their perceptions had improved, largely because their awareness had increased and they could now see the added rigour that NMV can bring to decision making. As one respondent stated "*the [decision makers'] understanding and appreciation for these techniques continues to increase*".

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Table I. Importance of factors that may facilitate use of NMV research in environmental policy or decisions, based on researchers' general experience (n=19).

Factor	Average rating†
Employees within the policy or decision-making body advocated for the inclusion of NMV results in decision processes	4.7
Results of the study support the existing agenda of the relevant body, or reinforce a decision that has already been made	4.1
Stakeholders outside the policy or decision-making body advocating for the inclusion of NMV results in decision processes	3.8
Consideration of NMV results are part of the body's standard operating procedures	3.6
Researchers approaching the policy or decision-making body to make them aware of the research	3.4

† Ratings calculated from a 5-point Likert scale where 1 = not at all important; 5 = very important.

Table II. Importance of reasons that may contribute to NMV research not being used in environmental policy or decisions, based on researchers' general experience (n=9).

Factor	Average rating†
Decision body (or key persons within it) having concerns about the limitations / validity of the NMV techniques used	4.4
Decision body (or key persons within it) objecting to assigning monetary values to the environment	4.1
Decision body do not have the administrative process or capacity necessary to interpret and use the information provided	3.8
Decision body (or key persons within it) having concerns about the use of economic tools in general for decision making	3.8
Decision body (or key persons within it) are satisfied with existing processes or methods that account for non-market values in some other way	3.4

† Ratings calculated from a 5-point Likert scale where 1 = not at all important; 5 = very important.

Table III. Decision makers' use of economic models in decision making processes (n=36).

Type of model	Number of respondents
No economic models used	17 (47%)
Cost Benefit Analysis	9 (25%)
Multi-Criteria Analysis	6 (17%)
INFFER (Pannell *et al*., 2012)	2 (6%)
Other types of economic models	2 (6%)