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What can deliberative approaches bring to the monetary valuation of ecosystem services? – A literature review

Authors: Lukas Bunse, Olivia Rendon, Sandra Luque

Abstract[1]**:** In response to extensive criticism of the monetary valuation of ecosystem services deliberative monetary valuation (DMV) has been proposed as an improved approach that combines the benefits of deliberative decision-making with the advantages of monetary values. In this study the body of literature that has developed in the field of deliberative monetary valuation is reviewed to assess the potential advantages and challenges that this approach can bring to the valuation of ecosystem services. The studies reviewed present a range of approaches to DMV based on different paradigms and methods. While studies that implemented DMV were primarily concerned with improving monetary values within the neoclassical economic paradigm, proposals for DMV in theoretical papers are challenging this paradigm and stress the potential for DMV to produce more democratic and equitable values. It was found that DMV still faces large practical and theoretical challenges, most notably the lack of a theoretical base for the interpretation of the monetary values produced. Before these challenges are addressed it is early days to assess the usefulness of DMV for the valuation of ecosystem services.

Keywords: deliberative monetary valuation, ecosystem services, citizen jury, value jury, market stall, stated preferences, environmental valuation

Abbreviations[1]

1. Introduction

All human beings are fundamentally dependent on the earth's ecosystems for their livelihood, may it be for food, social relations or spiritual fulfilment (Russell et al. 2013). These nature contributions that humans derive from ecosystems have been termed ecosystem services (Millennium Ecosystem Assessment 2005). It has also been shown that many important ecosystems around the world are being degraded by human activities. If pressures from human activities continue to increase along their current trajectory they will present a serious threat to the integrity of many ecosystems, its biodiversity and the supply of vital ecosystem services in the future (Cardinale et al. 2012; Pereira et al. 2010). The degradation of ecosystems has been attributed to the fact that they are either ignored or generally undervalued in decision-making (Daily et al. 2009).

As many ecosystem services are inherently 'free' and not marketed, including cognitive, emotional, and ethical preferences, needs, or demands expressed by people (De Groot et al. 2010; Chan et al. 2012; Castro et al. 2014), they are difficult to incorporate in financial institutions focused on monetary values and cost-benefit analysis (O'Neill & Spash 2000). In addition, the cost of degradation for many ecosystems falls on the society as a whole, which incentivises their overexploitation by human activities (Fisher et al. 2009). There is therefore a broad agreement that the value of the ecosystem services that people derive from ecosystems needs to be integrated into decision-making processes and territory planning (TEEB 2010; Fürst etal 2014). While it is emphasised that economic approaches, generally considered in monetary terms, do not necessarily capture all important values, it is argued that providing a monetary value makes the cost of ecosystem degradation explicit to decision-makers and therefore allows them to incorporate them easily into decision-making and to correct the failure of markets to ensure the efficient allocation of ecosystem services (Costanza et al. 1997).

Environmental economists have developed a range of methods for estimating economic values for non-marketed ecosystem services. Stated preference methods, which rely on survey-based elicitation of people's willingness to pay (WTP), are the most widely applicable and are consequently widely used (Christie et al. 2012). However, the use of monetary valuation in general and stated preference methods in particular has been subject to extensive criticism and its deficiencies are often contrasted with deliberative methods for environmental decision-making, such as citizens' juries or deliberative polling (Jacobs 1997; O'Neill & Spash 2000). This debate has led to the emergence of a body of literature that proposes the combination of deliberative approaches with stated preference methods (Spash 2008a). These approaches are argued to employ the strengths of both and address some of the flaws of the latter (Macmillan et al. 2002; Ward 1999).

So far there have been a few review-style papers on the still developing field of deliberative monetary valuation. For instance, Spash (2008) examined empirical uses of DMV for environmental changes in general, highlighting many issues such as multiple values, incommensurability and lexicographic preferences, social justice, fairness, and non-human values. Lo and Spash (2013) review DMV literature to discuss and categorise existing DMV practice into two approaches, preference economisation and preference moralisation, and propose a third, discourse-based approach. More recently studies are now explicitly focusing on the application of DMV techniques for the valuation of ecosystem services (e.g. Atkinson et al. 2012; Balderas Torres et al. 2012; Christie et al. 2012), as the ecosystem services approach has become mainstream (exemplified in initiatives like the Millennium Ecosystem Assessment and The Economics of Ecosystems and Biodiversity - TEEB). This paper distinguishes from previous studies by examining DMV literature to assess how deliberative approaches combined with monetary valuation methods have been utilised to explicitly determine the value of ecosystem services.

To pursue this aim, the following section (2) presents a brief background on the monetary valuation of ES, the basis and use of deliberative methods in environmental decision-making, and an introduction to deliberative monetary valuation. Section 3 describes the methodology followed for the selection of papers and their analysis. Section 4 presents the results focusing on the reasons for using DMV, the ecosystem services valued, the DMV methods used, and the WTP values generated. Section 5 highlights and discusses the main challenges and opportunities for the use of DMV for ES valuation. Finally section 6 offers the concluding remarks of this paper.

2. Background

2.1 Monetary valuation of ecosystem services

In neoclassical economic theory, market prices provide a measure for the relative strength of different goods to satisfy consumer preferences (Parks & Gowdy 2013). Market prices are exchange values that reflect the valuation of goods and services by individuals, but only on the margin. For example, the price of a cubic metre of water reflects what another cubic metre is worth to buyers. Individual preferences are based on several assumptions, particularly rational choice, which assumes that individuals can value changes in ecosystem services despite them being in the market or not (Hanley et al. 1997). While exchange values require markets, the social value of services is much broader and difficult to measure. Social values are what a society would be willing and able to pay for a service, WTP, or what it would be willing to accept to forego that service, WTA (Farber et al. 2002; Hanley et al. 1997).

Starting in the late 1960s, there has been a growing interest in the valuation of the benefits provided by ecosystems due to these benefits often being underestimated in decision-making (Hein et al. 2006). In order to understand how individuals perceive ecosystem services and

their changes, and how to value services that might never be used, the 'Total Economic Value' (TEV) framework was proposed following Krutilla (1967). This framework is based on individuals having both use and non-use values for ecosystem services (Pearce & Turner 1990; Hanley et al. 1997). Use values can be associated with private or quasi-private goods, for which market prices usually exist and non-use values are those values that do not involve direct or indirect uses of ecosystem service in question. Non-use values reflect the satisfaction that individuals derive from the knowledge that biodiversity and ecosystem services are maintained and that other people have or will have access to them (Kolstad, 2000). Ecosystem services do not always display the full range of values included in the TEV framework, as they depend on individuals' preferences, however this framework allows ecosystem services to be broadly grouped as provisioning, regulating and cultural services (Pascual et al. 2010).

Many ecosystem services do not qualify for market trading due to an array of market failures, such as being public goods. Three main valuation approaches have been used to establish the WTP or WTA for these services: indirect market valuation, revealed preferences and stated preferences (Farber et al. 2002; Hanley et al. 1997). Indirect valuation refers to obtaining individuals' WTP for ecosystem services by observing their behaviour in related markets. These approaches are divided into three main approaches: market price-based (most often used for provisioning services that are likely to be sold in markets), cost-based (the costs that would be incurred if ecosystem service benefits needed to be recreated through artificial means), and production functions (based on the contribution of ecosystem services to the enhancement of income or productivity; Pascual et al. 2010).

Revealed preference approaches are based on the observation of individual choices in existing markets that are related to the ecosystem service that is subject of valuation; the two main methods include travel cost and hedonic pricing. Revealed preferences methods can be distorted by market imperfections and policy failures, they are expensive and time-consuming, and are unable to estimate non-use values (Pascual et al. 2010). There are two main stated

preference methods that consist of questionnaire surveys with a hypothetical scenario asking individuals how much they would be willing to pay to achieve a positive environmental change or willing to accept as compensation for a negative environmental change. The first method, contingent valuation, presents a hypothetical scenario for one environmental change; while in the second method, choice experiments, participants are required to make decisions on several alternate scenarios (Bateman et al. 2002; Hanley et al. 2007, p.326).

Monetary valuation of ecosystem services has many potential uses, such as raising awareness and interest, specific policy analysis, land use planning, and payment for ES schemes (Costanza et al. 2014). Most valuation methods are only able to capture parts of the TEV and only stated preference methods, can elicit the whole range of values including non-use values (Christie et al. 2012). However, the reliance on stated preference methods for the valuation of ecosystem services has been extensively criticised both from within the field of environmental economics as well as by scholars who fundamentally challenge the underlying assumptions of neoclassical economics (Spangenberg & Settele 2010). Criticisms of the former kind include effects of embedding and insensitivity to scope (Kahneman & Knetsch 1992), the fact that preferences are not pre-formed and stable (Hanley & Shogren 2005) and the insufficient information and time that is available to participants to make complex choices (Hoehn & Randall 2002; Whitehead & Blomquist 1991; Whittington et al. 1992). Criticisms of the more fundamental nature include the intrinsic value of ecosystems, the incommensurability of different values assigned to ecosystem services (Clark et al. 2000; Martinez-Alier et al. 1998; Spash 2006), the strong influence of the institutional context on expressed preferences (Jacobs 1997; Sagoff 1998; Vatn 2009), the failure to account for social equity (Spash 2008b; Wilson & Howarth 2002) and the disregard of future generations (Blamey et al. 2000). More detailed reviews of these debates are provided by Carson et al. (2001) and Wegner & Pascual (2011).

2.2. Deliberative methods in environmental decision-making

Deliberative approaches are based on the theories of deliberative democracy which argue for more public participation in decision-making since they consider "public deliberation of free and equal citizen's [as] the core of legitimate political decision-making and self-government" (Bohman 1998, p.401). Jacobs (1997) asserted that due to the public nature of environmental goods an appropriate value articulating institution needs to include an element of open discussion before judgements are made. In general it is expected that deliberative approaches do not only increase the legitimacy of decisions but also induce participants to assume a longer-term and more socially-oriented position (Ward et al. 2003).

Formal and informal approaches to participatory deliberation have developed in a variety of ways, such as focus groups, citizens' juries, and consensus conferences (Niemeyer & Spash 2001). A key deliberative method that has been used in valuation of environmental change and decision-making is citizen juries. These juries were developed in the USA and Germany in the early 1970s, and brought to the UK in the 1990s. One of the main reasons citizen juries came about was out of concern for the low levels of participation in representative democracy (several in Ward 1999). Citizen juries (CJ) "aim to form a socially representative group of citizens to take a longer-term, better informed and more impartial view of significant social issues" (Ward 1999, p.76). Citizen juries are small groups of citizens, between 12 and 16, recruited using a combination of random and stratified sampling, to be broadly representative of their community and brought together to discuss a particular issue over a few days (Coote & Lenaghan 1997). These citizens are provided with information on the issue, hear witnesses presenting evidence on the issue, question these witnesses, discuss different aspects of the issue, and decide on a preferred course of action (Kenyon et al. 2001). Their conclusions need not be unanimous and their recommendations are advisory only (Lenaghan 1999).

There have been many approaches proposed from different fields to increase participation of the public in decision-making and valuation of environmental services. Back in the late 1980s, Burgess et al. (1988) reviewed the use of once-only group interviews in social and market research. Gregory and Keeney (1994) used stakeholder values as the basis for creating new policy alternatives in a controversial land-use debate. Schkade and Payne (1994) used a constructive preference approach as the basis for a verbal protocol analysis of respondents' willingness to pay for a proposed environmental regulation. McDaniels (1992) and Maguire and Servheen (1992) used decision analysis techniques in different settings (Gregory & Slovic 1997). These studies and many others can be broadly grouped into two intellectual currents. Deliberative experiments that are informed by behavioural science and decision analysis focus on human cognition barriers (Gregory 2000; Gregory et al. 1993); while political theorists appeal to democratic theories and accentuate fairness and institutional issues (Douai 2009; Jacobs 1997; Niemeyer & Spash 2001; Sagoff 1998; Lo 2011). This paper particularly focuses on the use of deliberative approaches for several reasons relevant to current debates on the valuation of ecosystem services. Deliberative approaches aim to achieve democracy, remove hierarchy (deliberative economics involves a critical discourse built upon a set of principles and norms to facilitate critical encounter and dialogue on equal footing), and means being more accepting of diverse values and beliefs (Lo & Spash 2013). These aspects of deliberation are key to enhancing fairness and forming preferences in monetary valuation.

2.3 Deliberative Monetary Valuation

In response to the numerous criticisms of the use of stated preference methods for the valuation of environmental goods the combination of deliberative methods with monetary valuation has been proposed as a way forward (e.g. Brown et al. 1995). Spash (2007, p.691) has termed approaches of this kind as “deliberative monetary valuation” which he defines as “the use of formal deliberation concerning an environmental impact to express value in monetary terms for policy purposes”. From the first discussions over deliberation and

economic valuation, in the 1990s, the method attracted attention from a range of disciplinary experts. These included not only those from economics (Brown et al. 1995; Spash 2001), but also from decision science (Gregory et al., 1993), politics, human geography (Clark et al. 2000) and applied philosophy (Sagoff 1998; O'Neill 2001). As a result, different perspectives on what constitutes DMV has led to some strongly divergent practice and conceptualization of these approaches. In this paper DMV will be used as an umbrella term for any initiative combining valuation methods and deliberative approaches, regardless of the discipline background of authors and the multiple labels ascribed to these approaches.

In DMV the deliberative components have mostly been modelled on the particular deliberative method of citizens' juries (CJ; Blamey et al. 2000). In the mid-1990s Brown et al. (1995), proposed the use of "value juries" (VJ) to aid environmental policy decisions (i.e. recommend an alternative) or provide values for damage payments based on a value that best reflects the interests of society at large, including future generations, instead of individual personal preferences. The jury approach involves randomly selecting citizens as jurors, taking the time to inform jurors adequately, and convened only if difficult-to-measure values, such as the value of a public good, is involved (Brown et al. 1995).

The first practical environmental valuation that incorporated a deliberative element was conducted by Macmillan et al. (2002). MacMillan et al. (2002) proposed market stalls, also evolved out of the application of citizen juries in environmental decision-making. The market stall approach involves between five and twelve participants attending two meetings. The meetings involve presenting relevant information about the proposed project, a detailed explanation of the valuation setting and payment vehicle, allowing for discussion and questions, and concluding with a WTP question, which respondents answer confidentially in writing. During the interval between meetings, participants are asked to complete a daily diary of their thoughts and questions and any relevant activities. The market stall approach provides

participants with more time and information to determine their WTP, an informal setting where in-depth discussions and the interval provides the opportunity for participants to re-evaluate their WTP (Macmillan et al. 2002; Lienhoop & MacMillan 2007b).

Overall it is the incorporation of deliberative elements, such as providing information and allowing time for discussion that makes DMV distinct from conventional methods of environmental valuation, such as stated preference methods, which generally rely on individual judgements. At the same time DMV distinguishes itself from other forms of deliberative environmental decision-making by the explicit goal of producing a monetary value. However, proposed and implemented approaches combining deliberative approaches and stated preference valuation methods vary widely in the methodologies and assumptions used, as the following sections will show.

3. Methods

To identify relevant studies for review a literature search of all indexed articles published up to the end of 2013 was conducted using the search engine SCOPUS (http://www.scopus.com/) and the search terms given in Table 1. In a second step only studies that explicitly performed or proposed a monetary valuation of some form of ecosystem services and included a deliberative element in the valuation were chosen from the search results. To limit the research to an appropriate scope the literature on what has been termed 'analytic-deliberative approaches' (Lo 2011), which has emerged mainly around the work of Gregory and colleagues (Gregory & Slovic 1997; Gregory & Wellman 2001; McDaniels et al. 2003), was excluded as a completely distinct intellectual current informed by behavioural science and decision analysis (focusing on human cognition barriers). In addition, some sources cited in Lo & Spash (2013) and Spash (2007; 2008a) were included in the review because they were considered relevant, even though they did not come up in the literature search.

Table 1. Search terms used to identify relevant articles for the review in this paper.

Search terms		
"valuation"	+ "deliberative"	+ "ecosystem service"
"valuation"	+ "deliberative"	+ "nature"
"valuation"	+ "deliberative"	
"valuation"	+ "market-stall"	
"valuation"	+ "group-based"	
"valuation"	+ "participatory"	

Overall 29 studies were included in the review which can be categorised in two groups (Table 2). The first group, referred to as theoretical papers, consists of papers which theoretically argue for the need of DMV, propose methods for its implementation or provide a review of DMV literature. For instance, studies by Spash and co-authors that review the literature on DMV are included in this first group. The second group, referred to as empirical papers, includes studies which have actually implemented DMV. To investigate the potential of DMV to contribute to the valuation of ecosystem services the 29 studies were assessed in terms of 1) the justifications given for the use of DMV, 2) the type of ecosystem services valued and the methods used (or proposed) and 3) the nature of the WTP values elicited through DMV.

For the purpose of our analysis we classify the ecosystem services treated in the papers according the TEEB (2010) framework. However, it should be acknowledged that several of the papers reviewed in this study were published before the framework of ecosystem services was widely employed. The terms employed for describing different approaches to DMV in this review refer to the terms used by the authors of themselves.

4. Results

4.1. Justifications for using DMV

The literature reviewed is characterised by a division between the theoretical and empirical papers in the justification that is given for integrating deliberative methods with monetary valuation. An overall summary of the reasons stated by the two paper categories is provided in Table 3. The justification given in empirical papers can generally be considered as

Table 2. Theoretical and review articles, and empirical articles that were reviewed in this paper.

Theoretical and review articles	**Empirical articles**	
Blamey et al. 2000	Álvarez-Farizo & Hanley 2006	(AFH06)
Brown et al. 1995	Álvarez-Farizo et al. 2007	(AF07)
Howarth & Wilson 2006	Álvarez-Farizo et al. 2009	(AF09)
Jacobs 1997	Balderas Torres et al. 2012	(BT12)
Lo & Spash 2013	Christie et al. 2006	(C06)
Niemeyer & Spash 2001	Dietz et al. 2009	(D09)
Sagoff 1998	Ito et al. 2009	(I09)
Spash 2007	Kenter et al. 2011	(K11)
Spash 2008a	Lienhoop & MacMillan 2007a	(LM07a)
Ward 1999	Lienhoop & MacMillan 2007b	(LM07b)
Wilson & Howarth 2002	Lienhoop & Fischer 2009	(LF09)
	Macmillan et al. 2002	(M02)
	MacMillan et al. 2006	(M06)
	Philip & MacMillan 2005	(PM05)
	Robinson et al. 2009	(R09)
	Szabó 2011	(S11)
	Urama & Hodge 2006	(UH06)
	Wätzold et al. 2008	(W08)

responding to the criticisms from within environmental economics. They mainly depart from standard neoclassical assumptions by considering that most people do not hold well-formed preferences for most ecosystem services and that conventional stated preference methods fails to facilitate the construction of well-informed and rational preferences (Álvarez-Farizo & Hanley 2006). The three main benefits of including a deliberative component are: (1) they allow information to be tailored to participants needs, (2) they give participants more time to think and the opportunity to ask questions, and (3) the deliberation with group members improves the understanding of the problem in question (Macmillan et al. 2002). Hence DMV is generally considered to be most useful for changes in ecosystem services that are complex or unfamiliar to participants. Supporting the cognitive task of participants to value ecosystem services is considered to reduce protest responses (Szabó 2011) and produce more valid WTP estimates (MacMillan et al. 2006; Lienhoop & MacMillan 2007a). The engagement with deliberative democratic theory in the empirical papers, if existent at all, is often reduced to a brief description of citizen juries (cf. Philip & MacMillan 2005; Urama & Hodge 2006). The approach used in all empirical papers therefore stays firmly within the paradigm of

neoclassical economics and deliberation is mainly seen as means to an end, namely producing better estimates of values for ecosystem services.

In contrast the theoretical papers reviewed engage with the fundamental challenges of stated preference methods. While they accept the practical use of monetary values they consider the paradigm of neoclassical economics as flawed (Wilson & Howarth 2002). Similar to the empirical papers they also consider the improved information for participants as a benefit of deliberation (Ward 1999). However, more emphasis is placed on the argument that ecosystem services are public goods and that their valuation is therefore inherently an ethical decision which has to be agreed on through open debate. As Jacobs (1997, p.212) states, "what is done to [the environment] can be discussed in terms, not simply of costs and benefits (whether private or public), but of right and wrong". The appropriate value articulating institution is therefore not the aggregation of individual values but a public forum in which participants discuss what is best for society at large (Sagoff 1998; Ward 1999). It is also argued that such a forum for valuation is better suited to consider rights of future generations and to address issues of fair distribution. For example Wilson & Howarth (2002, p.434) stress that, "when choosing between ecosystem goods and services, we cannot escape the need for addressing social equity". Furthermore Ward (1999) argues that juries employed for valuing ecosystem services would be able to take into account a wider range of values which normal stated preference methods do not consider. A prime example for this would be the intrinsic value that is often assigned to biodiversity. Thus, the approach advocated in the theoretical papers is therefore more firmly rooted in deliberative democratic theory. It actively challenges the neoclassical economic paradigm and attempts to make economic theory in general more deliberative (Zografos and Howarth 2008).

A differing view in the theoretical papers is that of Lo & Spash (2013) who criticise the approaches taken in both the empirical and the other theoretical studies as being in conflict

with the ideal of deliberative democracy. These authors argue that the theorists' appeal to impartiality aims at establishing a singular moral imperative instead of allowing for the expression of plural values. They claim that this characteristic and the still fundamentally utilitarian nature of the approach in the other theoretical papers make it equally restrictive to the approach in the empirical papers which is bound by the neoclassical economic paradigm. As an alternative they advocate a discursive approach to DMV that is not tied to a particular conception of value or philosophy but instead as provides a forum where "meaning is assigned to monetary values through a process of cooperative engagement" (Lo & Spash 2013, p.784).

Many of the empirical as well as theoretical papers highlight that DMV can provide rich and detailed information for decision-makers about the reasons underlying valuation decisions and about the ways in which context and individual values can shape preferences (Jacobs 1997, Macmillan et al. 2002, Philip and Macmillan 2005). However, only the paper by Philip & MacMillan (2005) records and explores this qualitative data in depth and their focus is mainly on providing internal validation for the quantitative findings instead of producing additional information to feed into the policy-making process.

4.2. Ecosystem Services valued and Methods used in DMV

The theoretical papers usually discuss DMV in the context of ecosystem services and environmental goods in general and do not refer to specific ecosystem services for which they propose the use of DMV. In the empirical papers DMV is applied to a range of specific ecosystem services (Table 4). Studies employing the market stall tend to focus on ecosystem services related biodiversity or habitat protection, although the study by Lienhoop & Macmillan (2007a; 2007b) also evaluates a range of other services related to the concept of wilderness and Balderas Torres et al. (2012) do not value any ecosystem services related to biodiversity. Most of the remaining studies tend to use DMV to value changes in several ecosystem services, for example in response to a river restoration project (Álvarez-Farizo &

Table 4. Classification of the empirical papers reviewed, by ecosystem services valued, and the deliberative component and valuation methods as described by the authors. Ecosystem services' categories and sub-categories are based on the TEEB classification; CV = contingent valuation, CE = choice experiment, MS = market stall, CJ = citizen jury, and other = e.g. focus group; see Table 2 for definition of article abbreviations.

ES Category	**ES Sub-category**	**Deliberation component + valuation method**				
		MS (+CV)	**MS (+ CE)**	**Other + CV**	**CJ + CE**	**Other + CE**
Mixed	Provisioning, regulating and cultural	LM07a; LM07b			AFH06; AF07; AF09	K11
Regulating	Water purification				R09	
	Erosion prevention					I09
	Climate regulation		BT12	D09		
	Biodiversity/ habitat protection	LF09; P05; W08; M02; M06		S11		
	several			UH11		C06

Hanley 2006; Álvarez-Farizo et al. 2007). Only a few studies target single regulating ecosystem services not related to biodiversity or habitat protection like carbon sequestration (Balderas Torres et al. 2012; Dietz et al. 2009) or water purification (Robinson et al. 2009). Provisional and cultural ecosystem services are explored much less then regulating services and only as part of mixed studies that include multiple ecosystem services. This pattern reflects the consideration of many authors in the empirical papers that DMV is especially useful for complex and unfamiliar ecosystem services. While the empirical papers cover a range of ecosystem services, there are still significant gaps in terms of cultural as well as regulating services to which DMV has not been applied.

The methods used in the empirical papers are generally based on the application of stated preference methods coupled with a deliberative component (Table 4). In most of the empirical studies this deliberative component is adapted from the citizens' juries described by Coote & Lenaghan (1997) and Aldred & Jacobs (2000). MacMillan et al. (2002) defines market stalls as the attempt to combine group techniques such as citizen juries with a form of economic

valuation. However, Álvarez-Farizo & Hanley (2006) define the market stall as a citizen's jury in a contingent valuation setting. Seven of the eight empirical papers using some form of market stall follow the latter and use contingent valuation. Furthermore, Álvarez-Farizo and Hanley (2006) define the specific combination of choice experiments and citizen juries as valuation workshops. Four of the empirical papers reviewed fit under this term, although Robinson et al. (2009) do not refer to their method as a valuation workshop. The rest of the papers, six of them, do not define their approaches as either market stall or valuation workshop; instead they describe the deliberative components of their methods using terms such as structured group discussions or deliberations, collective decision-making, focus groups or participatory workshops.

In all the empirical papers the participants are divided into several small groups that meet in either a single or multiple facilitated group sessions. If multiple sessions are used these can be consecutive or spread out over days. In the groups, participants discuss a specific environmental issue and after each of the sessions the WTP of participants is elicited using a conventional contingent valuation (e.g. Macmillan et al. 2002) or choice experiment survey (e.g. Álvarez-Farizo & Hanley 2006). Elements of the group sessions are often not laid out in detail but generally include the presentation of information, opportunities to answer questions and discussions among participants. While the discussions are unstructured in most empirical papers Dietz et al. (2009) specifically use the 'nominal group technique' to reduce problems that often arise in small group discussions. In this technique each participant writes down the factors that are important to them in decision-making and then these are discussed together in the group. This approach gives equal attention to all participants' considerations and ensures that information is shared.

Beyond the general format described above the empirical papers varied substantially in research design (Table 5). For instance some studies based on the market stall approach used two group sessions spaced a week apart (Macmillan et al. 2002; Macmillan et al. 2006) while

Table 5. Characteristics of the deliberative components for the different categories of methods used in the DMV papers (classification as described by the authors); the total range of values is presented for each characteristic and each category; for the total number of participants the median value of all the studies in the category is also given in parentheses; if more than half the papers in a category did not specify values for the a characteristic it is reported as NS (not specified); CV = contingent valuation, CE = choice experiment, MS = market stall, CJ = citizen jury, and other = e.g. focus group

ES Category	**Deliberation component + valuation method**				
	MS (+CV)	**MS (+ CE)**	**Other + CV**	**CJ + CE**	**Other + CE**
total number of participants	52-109 (64)	332	72-108 (80)	23-42 (24)	36-447 (53)
number of groups	6-9	NS	8-16	1-2	6-46
participants per group	6-20	8-10	5-16	12-25	6-10
number of group sessions	2 or 1+call	1	1-5	1-3	1-3
time between group sessions	7 days	-	0-7 days	0-7 days	-
length of sessions	1-2 h	NS	NS	3h - 2 days	NS
witnesses presented	no	no	no	2 out of 4 studies	no

other replaced the second session with a follow-up phone call (Lienhoop & Fischer 2009; Lienhoop & MacMillan 2007b; Lienhoop & MacMillan 2007a; Philip & MacMillan 2005; Wätzold et al. 2008) or dropped it altogether (Balderas Torres et al. 2012). Group sessions in most empirical studies did not last longer than a few hours and where therefore generally much shorter than the 2-3 days associated with citizens' juries as defined by Coote & Lenaghan (1997) and Aldred & Jacobs (2000). Except for two reviewed papers (Álvarez-Farizo et al. 2009; Robinson et al. 2009) the participants are not given the opportunity to questions witnesses. The only empirical paper reviewed, whose deliberative component closely resembles the citizens' juries (as defined by e.g. Aldred & Jacobs 2000) is Robinson et al. (2009). Their citizens' jury lasted two days and included the questioning of expert witnesses. The preferred way for choosing participants in most papers was a quota sampling procedure based on socio-economic variables.

The theoretical papers vary in their recommendations on how DMV should be conducted. They generally agreed that deliberation is best conducted in facilitated small groups and that procedural rules will need to be in place to ensure a fair and open discussion. Blamey et al.

(2000), Brown et al. (1995) and Ward (1999) envision a process that is closely modelled on the model of the citizens' jury (i.e. value juries), lasting for hours to days and including the questioning of witnesses. The other theoretical authors do not specify a specific format for the deliberative component. Deliberative processes in general are not reliant on statistical representativeness but it is not agreed how participants should be chosen. How decisions in deliberative groups are to be reached is also contested. Since Wilson & Howarth (2002, p.436) consider it the purpose of discourse-based methods "to reach agreement on what should be valued by or on behalf of society as a whole" they propose that deliberative group valuation should strive for consensus. Others, however, consider that practically this agreement can also be reached by voting (Brown et al. 1995; Jacobs 1997; Sagoff 1998) and Ward (1999) warns that emphasizing consensus as an outcome might even be counterproductive as the failure to reach consensus can be very useful information.

4.3 WTP values produced by DMV

According to a framework proposed by Spash (2007;2008a) the WTP values produced by DMV can be divided into four categories depending on who specifies the value (individuals or the group as a whole) and in what terms the value is specified (amount paid by an individual or by society as a whole). This framework was considered useful to discuss the nature of the WTP values produced by DMV approaches.

In line with conventional stated preference methods most of the empirical papers reviewed here obtain WTP values by asking each individual how much they would be willing to pay. This follows their aim of seeking WTP values for ecosystem services consistent with the framework of welfare economics. For example, MacMillan et al. (2002, p.57) are actively concerned that "participants may use additional time and information to calculate a 'fair' donation rather than their maximum WTP" and they consider that every effort has to be taken to avoid this and other strategic behaviour. In other papers, however, it was contested whether the nature of

the values obtained from individuals actually correspond to the assumptions of welfare economic theory. Spash (2008a) considers these values as actually representing charitable contributions based on ethical considerations about the worthiness of a cause rather than on the personal gains obtained from the ecosystem services. Reaching a different conclusion Dietz et al. (2009) suggest that the deliberation induces participants to take on the role of a policy analyst when specifying WTP values. This role is characterised through a focus on public rather than individual values and "concerns with side costs and benefits and with feasibility and efficiency of implementation" (Dietz et al. 2009, p.344). Yet another empirical paper, Szabó (2011) differs from the above by asking participants individually for an assessment of a "fair price" to be paid by everybody. Thus, the empirical papers reviewed evidence that the nature of the estimated WTP values is contested and might conflict with the values envisioned in general welfare economic theory.

In contrast, the monetary values produced by the group as a whole, whether specified as individual fair prices or socially aggregated values, do not fit easily into welfare economic theory (Niemeyer & Spash 2001). Only three empirical studies utilise group decision-making to produce WTP values. This includes the study described Álvarez-Farizo and co-authors (Álvarez-Farizo & Hanley 2006; Álvarez-Farizo et al. 2007) as well as the studies by Kenter et al. (2011) and Ito et al. (2009). In all three of these studies WTP values were determined using choice experiments and are specified as values to be paid by individuals rather than socially aggregated values. However, in none of the studies the authors elaborate on the theoretical implications and seem to regard these values as similar to the values obtained from conventional choice experiments. In Kenter et al. (2011) the DMV values estimated for a provisioning ecosystem service corresponds closely with its real market price.

As described in the previous section the theoretical papers are much less concerned with producing values that are consistent with welfare economic theory. On the contrary they consider this theory as a flawed basis for the valuation of ecosystem services as it does not

produce monetary values that represent an equitable reflection of the benefits of ecosystem services to society as a whole and it cannot incorporate plural values. For this reason most of the authors of the theoretical papers consider it important that WTP values are determined by the whole group as a whole, with some authors arguing for values specified as a fair price that should be paid as an individual (e.g. Ward 1999) and other authors arguing for values specified as an aggregated value for society as a whole (e.g. Wilson & Howarth 2002). However, Jacobs (1997) as well as Brown et al. (1995) recognise the possibility of producing monetary values by aggregating individual values provided by participants, similar to the approach taken in most empirical papers. However, both of them stress that these values should not be interpreted in the same way as values produced by conventional stated-preference methods.

However, while the theoretical papers assert that DMV can produce monetary values that are more appropriate for many ecosystem services than the ones produced under a neoclassical economic paradigm, they do not provide an alternative theoretical framework in which these values should be interpreted and included into decision-making. For example while Blamey et al. (2000) consider that monetary values produced by citizens' juries could potentially be used as an input into cost-benefit analysis, Jacobs (1997) considers this not possible due to issues of double counting. Due to plural values associated with ecosystem services Lo and Spash (2013) argue that the meaning of the monetary values produced cannot be determined beforehand but should itself be determined in the deliberative process.

5. Discussion

All the studies reviewed consider that DMV approaches have a large potential to improve the monetary valuation of ecosystem services and address flaws in conventional stated preference methods, even though there are considerable differences in opinion what these flaws are and how they can be improved. There exists a distinction between the theoretical and empirical papers regarding the justifications for DMV and the values it is considered to produce,

although there is considerable variations within both sets of sets, for example the approach proposed by Lo & Spash (2013) differs in important aspects from the other theoretical papers. Raymond et al. (2014) describe a similar distinction for non-monetary valuation techniques distinguishing between an instrumental and a deliberative paradigm. All the papers agree that deliberative elements in valuation have considerable benefits for the provision of adequate information about complex and unfamiliar ecosystem services. While this constitutes the main concern in the empirical papers, however, the theoretical papers highlight the potential for more democratic processes and equitable outcomes as even more important. However, while there might potential in DMV there equally remains a number of theoretical and practical challenges.

If DMV is employed to produce WTP values in line with welfare economic theory, a large challenge for DMV is related to the need for large sample sizes. In this framework WTP estimates need to be aggregated across the relevant population to provide meaningful input into decision making and therefore rely on sufficiently precise estimates (Hanley et al. 2007, p.336). However, citizens' juries are time-consuming and costly to organise and rely on small groups (Kenyon & Nevin 2001). Even in the arguably reduced form of citizens' juries employed in most of the empirical papers it can be considered prohibitively expensive to implement a sufficient number of juries to reach large sample sizes. This could therefore prohibit the estimation of general preferences (Atkinson et al. 2012). This is reflected in the comparatively small number of participants in the empirical papers (Table 5). Only Kenter et al. (2011) and Balderas Torres et al. (2012) achieve sample sizes considerably larger than 100 and both studies relied on a single group session in each group. This problem has generally been recognised in the empirical studies, but while Álvarez-Farizo et al. (2009, p.497) admit that aggregation poses an "awkward" question they do not propose a solution. Therefore, for applications where statistical representativeness is required DMV approaches might only be appropriate for local scale problems, for which it might be possible to obtain a representative

sample size. However, for decision-making on regional, national or even global scales there is a fundamental tension between the strict requirements for statistical representativeness in welfare economic theory and the ideal of in-depth discussions in deliberative democracy. This leaves the question in how far the two approaches might be incompatible.

Even leaving the problem of sample sizes aside the approach to DMV employed in the empirical papers still leaves many current problems with the valuation of ecosystem services unaddressed. A prominent example of this is the need to address issues of unequitable distribution of the benefits derived from ecosystems (Potschin & Haines-Young 2011). The theoretical papers reviewed in this study argue that DMV is well placed to take the issue of equity and plural values into account if the monetary values produced are interpreted outwith the strict assumptions of the neoclassical paradigm. However, as discussed in section 4.3, there is currently no consistent theoretical base of how the monetary values produced by DMV should be interpreted once the welfare-economic conceptualisation of value is abandoned. This might explain why the approaches described in the theoretical papers have so far remained abstract and have not been implemented in practice.

In addition there remain a substantial number of practical challenges to the realisation of the free and reasoned discoursed that is considered the strength of DMV in both the empirical and the theoretical papers. First of all the process of group discussion can be prone to a number of negative dynamics, such as “group-think” or domination by a few participants (Dietz et al. 2009). Differences in status and power can lead to polarisation and prevent the sharing of new information by participants (Howarth & Wilson 2006). These problems are widely recognised by empirical and theoretical papers alike. For the former these processes can misdirect the formation of rational preferences and bias WTP results (Macmillan et al. 2002), for the latter it violates the ideals the deliberative democracy and leads to suboptimal decisions (Wilson & Howarth 2002). It is generally considered, however, that these problems can be overcome

through adequate group facilitation and structuring of the process (Ward 1999). An example of this is the 'nominal group technique' used by Dietz et al. (2009).

Furthermore deliberative groups and juries are far from immune to the capturing and manipulation by vested interests. Blamey et al. (2000) argue that organisers, moderators and witnesses all have a considerable influence and could be potential avenues for any kind of manipulation. They therefore stress the need that effective processes have to be developed to curtail this possibility, for example a procedure to remove misleading information provided by witnesses (Blamey et al. 2000).

Another challenge in the conduction of DMV is the question of representation. As the valuation approaches proposed in the theoretical papers do not rely on statistical representativeness they could prove more practical in providing values for ecosystem services on a greater, for example, national scale. However, the question of how to design a series of deliberative processes that can make legitimate recommendations on behalf of a whole nation and potentially even future generations is difficult (O'Neill 2001) and has not been addressed in the literature so far.

Lastly, the successful application of DMV relies on an effective integration of its recommendations into decision-making (O'Neill & Spash 2000). A major rationale for using DMV is the consideration that current decision-making processes are only able to include values for ecosystem services in monetary terms (Niemeyer & Spash 2001). DMV can produce a lot more than just a monetary value. It produces a record of the different concerns and values that underlie the recommendation and a jury might decide that monetary values can only be assigned to a certain part of ecosystem services. How this qualitative information can be integrated into political processes, however, is a challenging question. As Goodin and Dryzek (2006) point out, citizens' juries and other deliberative institutions often fail to influence political processes. They stress, however, that there are also successful examples and

many different ways through which deliberative institutions affect change. O'Neill and Spash (2000) conclude that the valuation methods need to be tailored to fit existing institutional arrangements and that the utilisation of the full benefits of DMV will require an adaptation in institutional structure to allow the incorporation of the rich information and diverse values provided.

Considering these considerable challenges and the still limited literature on theoretical underpinnings and empirical applications of DMV it is early days to tell the potential of DMV for the valuation of ecosystem services. Hence there is large scope for further research into the topic of DMV of ecosystem services. Based on this review several important directions can be identified. Firstly there is a need to develop of a stronger theoretical basis for the different values that can be produced by DMV, as well as to investigate how they can be incorporated into decision-making and whether they provide more equitable outcomes than conventional methods of valuation. This should be pursued using theoretical approaches as well as empirical research into the factors that are taking into consideration by groups when deciding on values. Secondly, there is considerable scope to widen the application of DMV to ecosystem services not covered so far and to explore different methods for DMV that have not been tested, for example the use of contingent valuation with group decision-making. Thirdly, criticism in the theoretical papers presented here largely refer to the use of monetary values in cost-benefit analysis. However, there are a multitude of different applications for values obtained for ecosystem services (Costanza et al. 2014). Another avenue of research would therefore be to explore for which of these applications DMV is most suitable. For example, DMV might potentially be useful in the context of payments for ecosystem services as these schemes are often on a local scale and associated with challenges of equitable distribution (c.f. Jack et al. 2008, Kosoy et al. 2008, Muradian et al. 2010). Lastly, it is important that DMV research works closely together with the increasing number of other non-monetary or socio-cultural approaches to the valuation of ecosystem services all of which try to go beyond monetary

metrics (Castro et al. 2014, Raymond et al. 2014). DMV can support a better understanding of beliefs, motivations and socio-demographic aspects that influence choices and actions by local people in relation to their environment. Consequently, it can potentially provide a different and innovative approach that does not only facilitate shared understanding of the human-landscape relationships (Opdam 2013; Fürst et al 2014), but also fosters collective management of common values.

5. Conclusion

This literature review revealed that there exists a considerable variation in the justifications, paradigms and methods used for DMV. The studies that practically implemented DMV were mostly concerned with using DMV for producing more valid economic values within the neoclassical economic paradigm. While there are signs that deliberation aids preference formation in the valuation of complex and unfamiliar ecosystem services, most of the papers struggle with a lack of sufficient sample sizes. In contrast many theoretical papers highlight the need for DMV because it is more suited for taking into account social equity and plural values. Their approach departs from neoclassical economic theory. While this opens up the possibility for different ways in which monetary values can be expressed and interpreted a comprehensive theoretical basis for this is currently lacking.

Considering these challenges it is too early to judge the potential of DMV to improve the valuation of ecosystem services. However, by being situated at the intersection between conventional monetary valuation and concerns for plural values DMV approaches force us to confront many important challenges associated with the meaningful integration of ecosystem services into decision making. The topic therefore offers a large scope for fruitful research.

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References

Aldred, J. & Jacobs, M., 2000. Citizens and wetlands: evaluating the Ely citizens' jury. *Ecological Economics*, 34(2), pp.217–232.

Álvarez-Farizo, B. et al., 2007. Choice modeling at the "market stall": Individual versus collective interest in environmental valuation. *Ecological Economics*, 60(4), pp.743–751.

Álvarez-Farizo, B., Gil, J.M. & Howard, B.J., 2009. Impacts from restoration strategies: Assessment through valuation workshops. *Ecological Economics*, 68(3), pp.787–797.

Álvarez-Farizo, B. & Hanley, N., 2006. Improving the process of valuing non-market benefits: combining citizens' juries with choice modelling. *Land economics*, 82(3), pp.465–478.

Atkinson, G., Bateman, I. & Mourato, S., 2012. Recent advances in the valuation of ecosystem services and biodiversity. *Oxford Review of Economic Policy*, 28(1), pp.22–47.

Balderas Torres, A. et al., 2012. The valuation of forest carbon services by Mexican citizens: the case of Guadalajara city and La Primavera biosphere reserve. *Regional Environmental Change*, 13(3), pp.661–680. Available at: http://link.springer.com/10.1007/s10113-012-0336-z [Accessed October 13, 2013].

Bateman, I. et al., 2002. *Economic Valuation with Stated Preference Techniques: A Manual*, Cheltenham: Edward Elgar.

Blamey, R. et al., 2000. Citizens' juries and environmental value assessment. *Departmental paper. Canberra: Australian National University*.

Bohman, J., 1998. Survey Article: The Coming of Age of Deliberative Democracy. *Journal of Political Philosophy*, 6(4), pp.400–425.

Brown, T., Peterson, G. & Tonn, B., 1995. The values jury to aid natural resource decisions. *Land Economics*, 71(2), pp.250–260.

Burgess, J., Limb, M., Harrison, C.M., 1988. Exploring environmental values through the medium of small groups: 1. Theory and practice. Environ. Plan. A 20, 309 - 326. Cardinale, B.J. et al., 2012. Biodiversity loss and its impact on humanity. Nature, 486(7401), pp.59–67.

Carson, R., Flores, N. & Meade, N., 2001. Contingent valuation: controversies and evidence. *Environmental and Resource Economics*, 19, pp.173–210.

Castro, A. et al., 2014. Multidimensional approaches in ecosystem service assessment. In D. Alcaraz-Segura, C. Di Bella, & J. Straschnoy, eds. *Earth Observation of Ecosystem Services*. Boca Raton: CRC Press, pp. 427–454.

Chan, K.M.A., Guerry, A.D., Balvanera, P., et al. (2012): Where are Cultural and Social in Ecosystem Services? A Framework for Constructive Engagement. *BioScience* 62(8), pp. 744-756.

Christie, M. et al., 2012. An evaluation of monetary and non-monetary techniques for assessing the importance of biodiversity and ecosystem services to people in countries with developing economies. *Ecological Economics*, 83, pp.67–78

Clark, J., Burgess, J. & Harrison, C.M., 2000. "I struggled with this money business": respondents' perspectives on contingent valuation. *Ecological Economics*, 33(1), pp.45–62.

Coote, A. & Lenaghan, J., 1997. Citizens' Juries: Theory into Pratice, London: Institute for Public Policy Research.

Costanza, R. et al., 2014. Changes in the global value of ecosystem services. Global Environmental Change, 26, pp.152–158.

Costanza, R. et al., 1997. The value of the world's ecosystem services and natural capital. *Nature*, 387, pp.253 –260.

Daily, G.C. et al., 2009. Ecosystem services in decision making: time to deliver. *Frontiers in Ecology and the Environment*, 7(1), pp.21–28.

De Groot, R. S., Alkemade, R., Braat, L., Hein, L., Willemen, L. (2010): Challenges in integrating the concept of ecosystem services and values in landscape planning, management and decision making. Ecological Complexity 7(3): 260-272

Dietz, T., Stern, P. & Dan, A., 2009. How deliberation affects stated willingness to pay for mitigation of carbon dioxide emissions: an experiment. *Land Economics*, 85(2), pp.329–347.

Douai, A., 2009. Value Theory in Ecological Economics: The Contribution of a Political Economy of Wealth. Environmental Values, 18(3), pp.257–284.

Farber, S.C., Costanza, R. & Wilson, M.A., 2002. Economic and ecological concepts for valuing ecosystem services. *Ecological Economics*, 41(3), pp.375–392.

Fisher, B., Turner, R.K. & Morling, P., 2009. Defining and classifying ecosystem services for decision making. *Ecological Economics*, 68(3), pp.643–653.

Fürst, C., Opdam, P., Inostroza, L., Luque, S. (2014) A balance score card tool for assessing how successful the ecosystem services concept is applied in participatory land use planning. Landscape Ecology 29(8), pp. 1435-1446

Goodin, R.E. & Dryzek, J.S., 2006. Deliberative Impacts: The Macro-Political Uptake of Mini-Publics. *Politics & Society*, 34(2), pp.219–244.

Gregory, R. 2000. Valuing Environmental Policy Options: A Case Study Comparison of Multiattribute and Contingent Valuation Survey Methods. *Land Economics* 76 (2), pp. 151-173.

Gregory, R. & Keeny R.L. 1994. Creating policy alternatives using stakeholder values. *Management Science,* 40(8), pp. 1035 – 1048.

Gregory, R. , Lichtenstein, S. & Slovic, P. 1993. Valuing environmental resources: a constructive approach. *J. Risk Uncertaint,* 7, pp. 177-197.

Gregory, R. & Slovic, P., 1997. A constructive approach to environmental valuation. *Ecological Economics*, 21, pp.175–181.

Gregory, R. & Wellman, K., 2001. Bringing stakeholder values into environmental policy choices: a community-based estuary case study. *Ecological Economics*, 39(1), pp.37–52.

Hanley, N. & Shogren, J.F., 2005. Is Cost–Benefit Analysis Anomaly-Proof? *Environmental and Resource Economics*, 32(1), pp.13–24.

Hanley, N., Shogren, J.F. & White, B., 2007. *Environmental Economics in Theory and Practic* 2nd editio., New York: Palgrave Macmillan.

Hanley, N., J.Shogren and B.White. 1997. Environmental Economics in Theory and Practice. 1st edition only. Basingstoke: Macmillan

Hein, L. et al., 2006. Spatial scales, stakeholders and the valuation of ecosystem services. Ecological Economics, 57(2), pp.209–228.

Hoehn, J. & Randall, A., 2002. The effect of resource quality information on resource injury perceptions and contingent values. *Resource and Energy Economics*, 24, pp.13–31.

Howarth, R. & Wilson, M., 2006. A theoretical approach to deliberative valuation: aggregation by mutual consent. *Land Economics*, 82(1), pp.1–16.

Ito, N. et al., 2009. The influence of decision-making rules on individual preferences for ecological restoration: Evidence from an experimental survey. *Ecological Economics*, 68(8-9), pp.2426–2431.

Jack, B.K., Kousky, C. & Sims, K.R.E. 2008. Designing payments for ecosystem services: Lessons from previous experience with incentive-based mechanisms. *Proceedings of the National Academy of Sciences of the United States of America*, 105, pp. 9465-9470

Jacobs, M., 1997. Environmental Valuation, Deliberative Democracy and Public Decision-Making Institutions. In J. Foster, ed. *Valuing Nature? Economics Ethics and the Environment*. London: Rouledge, pp. 211–231.

Kahneman, D. & Knetsch, J., 1992. Valuing public goods: the purchase of moral satisfaction. *Journal of Environmental Economics and Management*, 22, pp.57–70.

Kenter, J.O. et al., 2011. The importance of deliberation in valuing ecosystem services in developing countries—Evidence from the Solomon Islands. *Global Environmental Change*, 21(2), pp.505–521.

Kenyon, W., Hanley, N. & Nevin, C., 2001. Citizens' juries: an aid to environmental valuation? Environment and Planning C: Government and Policy, 19(4), pp.557–566.

Kenyon, W. & Nevin, C., 2001. The use of economic and participatory approaches to assess forest development: A case study in the Ettrick Valley. *Forest Policy and Economics*, 3, pp.69–80.

Kolstad, C.D. 2000. *Environmental Economics Volume 1*. Oxford University Press. 400p.

Kosoy, N., Corbera, E. & Brown, K. 2008. Participation in payments for ecosystem services: Case studies from the Lacandon rainforest, Mexico. *Geoforum*, 39, pp. 2073-2083.

Krutilla, J.V. 1967. Conservation reconsidered. *The American Economic Review,* 57(4), pp. 777-786

Lenaghan, J. 1999. Involving the public in rationing decisions. The experience of citizens juries. *Health Policy,* 49, pp. 45 – 61.

Lienhoop, N. & Fischer, A., 2009. Can you be bothered? The role of participant motivation in the valuation of species conservation measures. *Journal of Environmental Planning and Management*, 52(4), pp.519–534.

Lienhoop, N. & MacMillan, D., 2007a. Contingent valuation: comparing participant performance in group-based approaches and personal interviews. *Environmental Values*, 16(2), pp.209–231.

Lienhoop, N. & MacMillan, D., 2007b. Valuing wilderness in Iceland: Estimation of WTA and WTP using the market stall approach to contingent valuation. *Land Use Policy*, 24(1), pp.289–295. Available at:

Lo, A.Y., 2011. Analysis and democracy: the antecedents of the deliberative approach of ecosystems valuation. *Environment and Planning C: Government and Policy*, 29(6), pp.958–974.

Lo, A.Y. & Spash, C., 2013. Deliberative Monetary Valuation: in Search of a Democratic and Value Plural Approach To Environmental Policy. *Journal of Economic Surveys*, 27(4), pp.768–789.

MacMillan, D., Hanley, N. & Lienhoop, N., 2006. Contingent valuation: Environmental polling or preference engine? *Ecological economics*, 60, pp.299–307.

Macmillan, D.D. et al., 2002. Valuing the non-market benefits of wild goose conservation: a comparison of interview and group based approaches. *Ecological Economics*, 43, pp.49–59.

Maguire, L.A. & Servheen, C. 1992. Integrating Biological and Sociological Concerns in Endangered Species Management: Augmentation of Grizzly Bear Populations. *Conservation Biology* 6 (3), pp. 426 - 434

Martinez-Alier, J., Munda, G. & O'Neill, J., 1998. Weak comparability of values as a foundation for ecological economics. *Ecological Economics*, 26(3), pp.277–286.

McDaniels, T.L. et al., 2003. Decision structuring to alleviate embedding in environmental valuation. *Ecological Economics*, 46(1), pp.33–46.

McDaniels, T.L. 1992. Reference points, loss aversion, and contingent values for auto safety. *Journal of Risk and Uncertainty* 5(2), pp. 187-200

Millennium Ecosystem Assessment, 2005. *Ecosystems and human well-being: Synthesis*, Island Press, Washington, DC.

Muradian, R., Corbera, E., Pascual, U., Kosoy, N. & May, P. H. 2010. Reconciling theory and practice: An alternative conceptual framework for understanding payments for environmental services. *Ecological Economics*, 69, pp. 1202-1208

Niemeyer, S. & Spash, C., 2001. Environmental valuation analysis, public deliberation, and their pragmatic syntheses: a critical appraisal. *Environment and Planning C: Government and Policy*, 19(4), pp.567–585.

O'Neill, J., 2001. Representing people, representing nature, representing the world. *Environment and Planning C: Government and Policy*, 19(4), pp.483–500.

O'Neill, J. & Spash, C., 2000. Conceptions of value in environmental decision-making. *Environmental Values*, 9, pp.521–536.

Opdam, P. 2013. Using ecosystem services in community based planning: science is not ready to deliver. In: Fu, B., Jones, K.B. (eds) *Landscape ecology for sustainable environment and cult*ure. Springer, Berlin, pp 77–101

Parks, S. & Gowdy, J., 2013. What have economists learned about valuing nature? A review essay. *Ecosystem Services*, 3, pp.e1–e10.

Pearce, D. & Turner, R., 1990. *Economics of Natural Resources and the Environment*, New York, London: Harvester Wheatsheaf.

Pereira, H.M. et al., 2010. Scenarios for global biodiversity in the 21st century. *Science*, 330(6010), pp.1496–501.

Philip, L.J. & MacMillan, D., 2005. Exploring Values, Context and Perceptions in Contingent Valuation Studies: The CV Market Stall Technique and Willingness to Pay for Wildlife Conservation. *Journal of Environmental Planning and Management*, 48(2), pp.257–274.

Raymond, C.M., Kenter, J.O., Plieninger, T., Turner, N.J., Alexander, K.A., 2014. Comparing instrumental and deliberative paradigms underpinning the assessment of social values for cultural ecosystem services. Ecol. Econ. 107, 145-156.

Russell, R. et al., 2013. *Humans and Nature: How Knowing and Experiencing Nature Affect Well-Being*,

Sagoff, M., 1998. Aggregation and deliberation in valuing environmental public goods: A look beyond contingent pricing. *Ecological Economics*, 24, pp.213–230.

Schkade, D. A. & Payne, J. W. (1994). How people respond to contingent valuation questions: A verbal protocol analysis of willingness to pay for an environmental regulation. *Journal of Environmental Economics and Management*, 26, pp. 88-109.

Spangenberg, J.H. & Settele, J., 2010. Precisely incorrect? Monetising the value of ecosystem services. *Ecological Complexity*, 7(3), pp.327–337.

Spash, C., 2007. Deliberative monetary valuation (DMV): Issues in combining economic and political processes to value environmental change. *Ecological Economics*, 63(4), pp.690–699.

Spash, C., 2008a. Deliberative monetary valuation and the evidence for a new value theory. *Land Economics*, 84(3), pp.469–488.

Spash, C., 2008b. How Much is that Ecosystem in the Window? The One with the Bio-diverse Trail. *Environmental Values*, 17(2), pp.259–284.

Spash, C., 2006. Non-economic motivation for contingent values: Rights and attitudinal beliefs in the willingness to pay for environmental improvements. *Land Economics*, 82(4), pp.602–622.

Szabó, Z., 2011. Reducing protest responses by deliberative monetary valuation: Improving the validity of biodiversity valuation. *Ecological Economics*, 72, pp.37–44. Available at: http://linkinghub.elsevier.com/retrieve/pii/S0921800911004010 [Accessed October 13, 2013].

TEEB, 2010. *The Economics of Ecosystems and Biodiversity* P. Kumar, ed., London: Earthscan.

Urama, K. & Hodge, I., 2006. Participatory environmental education and willingness to pay for river basin management: Empirical evidence from Nigeria. *Land Economics*, 82(4), pp.542–561.

Vatn, A., 2009. An institutional analysis of methods for environmental appraisal. *Ecological Economics*, 68(8-9), pp.2207–2215.

Ward, H., 1999. Citizens' juries and valuing the environment: A proposal. *Environmental Politics*, 8(2), pp.75–96.

Ward, H. et al., 2003. Open Citizens' Juries and the Politics of Sustainability. *Political Studies*, 51(2), pp.282–299.

Wätzold, F. et al., 2008. Estimating optimal conservation in the context of agri-environmental schemes. Ecological Economics, 68, pp.295–305. Available at: http://dx.doi.org/10.1016/j.ecolecon.2008.03.007.

Wegner, G. & Pascual, U., 2011. Cost-benefit analysis in the context of ecosystem services for human well-being: A multidisciplinary critique. *Global Environmental Change*, 21(2), pp.492–504. Available at: http://linkinghub.elsevier.com/retrieve/pii/S0959378010001226 [Accessed October 2, 2013].

Whitehead, J. & Blomquist, G., 1991. Measuring contingent values for wetlands: effects of information about related environmental goods. *Water resources research*, 27(10), pp.2523–2531.

Whittington, D. et al., 1992. Giving respondents time to think in contingent valuation studies: A developing country application. *Journal of Environmental Economics and Management*, 22, pp.205–225.

Wilson, M. A. & Howarth, R.B., 2002. Discourse-based valuation of ecosystem services: establishing fair outcomes through group deliberation. *Ecological Economics*, 41(3), pp.431–443.

Zografos, C., Howarth, R.B. (Eds.), 2008. Deliberative ecological economics, Ecological Economics and human well-being. Oxford University Press, New Delhi.