



## Research article

# Is economic valuation of ecosystem services useful to decision-makers? Lessons learned from Australian coastal and marine management



Jean-Baptiste Marre <sup>a, c, d, \*</sup>, Olivier Thébaud <sup>b, c, d</sup>, Sean Pascoe <sup>c, f</sup>, Sarah Jennings <sup>e, f</sup>, Jean Boncoeur <sup>a</sup>, Louisa Coglán <sup>d</sup>

<sup>a</sup> Université de Bretagne Occidentale, UMR AMURE, Brest, France

<sup>b</sup> Ifremer, UMR M101, AMURE, Unité d'Économie Maritime, Brest, France

<sup>c</sup> CSIRO Wealth from Oceans Flagship, Marine and Atmospheric Research, Brisbane, Australia

<sup>d</sup> School of Economics and Finance, Queensland University of Technology, Brisbane, Australia

<sup>e</sup> Tasmanian School of Business and Economics, University of Tasmania, Hobart, Australia

<sup>f</sup> Center for Marine Socioecology, University of Tasmania, Hobart, Australia

## ARTICLE INFO

## Article history:

Received 16 June 2015

Received in revised form

1 February 2016

Accepted 7 April 2016

Available online 29 April 2016

## Keywords:

Economic valuation

Ecosystem services

Decision-making

Ecosystem management

Coastal and marine ecosystems

## ABSTRACT

Economic valuation of ecosystem services is widely advocated as being useful to support ecosystem management decision-making. However, the extent to which it is actually used or considered useful in decision-making is poorly documented. This literature blindspot is explored with an application to coastal and marine ecosystems management in Australia. Based on a nation-wide survey of eighty-eight decision-makers representing a diversity of management organizations, the perceived usefulness and level of use of economic valuation of ecosystem services, in support of coastal and marine management, are examined. A large majority of decision-makers are found to be familiar with economic valuation and consider it useful - even necessary - in decision-making, although this varies across groups of decision-makers. However, most decision-makers never or rarely use economic valuation. The perceived level of importance and trust in estimated dollar values differ across ecosystem services, and are especially high for values that relate to commercial activities. A number of factors are also found to influence respondent's use of economic valuation. Such findings concur with conclusions from other studies on the usefulness and use of ESV in environmental management decision-making. They also demonstrate the strength of the survey-based approach developed in this application to examine this issue in a variety of contexts.

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## 1. Introduction

Ecosystem Services economic Valuation (ESV) allows estimating, in dollar terms, the value of the benefits (or changes in the benefits) derived by humans from ecosystems. In practice, it encompasses a wide range of techniques, and can be executed through various methodologies and in combination with other tools (Liu et al., 2010). A substantial amount of ESV has been conducted in recent decades, and it is now frequently advocated as a means to support ecosystem management (Costanza et al., 2014; Liu et al., 2010; Sukhdev, 2008; Boyd and Banzhaf, 2007). In

particular, more ESV work is recommended for coastal and marine ecosystems worldwide (Börger et al., 2014; Laurans et al., 2013a; Schuman, 2011; Brander et al., 2007; Pendleton et al., 2007), in view of their increasing degradation (Barbier, 2012).

However, despite significant advances in methods and applications, ESV has also been subject to many criticisms (e.g. Vatn and Bromley, 1994; Spangerberg and Settele, 2010). Since the main *raison d'être* of ESV is to support decision-making (e.g. Costanza et al., 2014; Laurans et al., 2013b; Balmford et al., 2011; Sukhdev, 2008), growing concern has developed among academics and practitioners regarding the implementation and impact of valuation in 'real world' decision settings (e.g. Rogers et al., 2013; Laurans et al., 2013b; Balmford et al., 2011; de Groot et al., 2010; Liu et al., 2010; Daily et al., 2009), including for coastal and marine

\* Corresponding author. Pacific Community, 98848 Noumea, New Caledonia.  
E-mail address: [jean-baptistem@spc.int](mailto:jean-baptistem@spc.int) (J.-B. Marre).

ecosystem management (Waite et al., 2015; Börger et al., 2014; Laurans et al., 2013a; Kushner et al., 2012; Pendleton et al., 2007). In a recent contribution, Costanza et al. emphasize that: “[ecosystem] services must be (and are being) valued, and we need new, common asset institutions to better take these values into account.” (Costanza et al., 2014, p.152).

Understanding the role that economic valuation plays in ecosystem management and policy-making and how it is currently perceived and used by stakeholders is crucial (Waite et al., 2015; Laurans et al., 2013b; Rogers et al., 2013). However, the academic literature is, with only a few exceptions, notably quiet on this issue, leading Laurans et al. (2013b) to talk about a “literature blindspot”. By “use” of ESV, the authors refer to the various ways in which it may be considered as an input in decision-making processes. They identify three categories of ESV use: decisive, technical and informative. Other authors focus on the observable influence of ESV on decision-making (Waite et al., 2015). In these studies, use of ESV ranges from a simple reference in discussions to a clear integration in the analyses of various management options (e.g. cost-benefits analysis).

In the case of the Caribbean, for instance, more than 200 valuation studies of coastal and marine ecosystem services have been conducted yet only a few of these studies were perceived to have had an influence (Kushner et al., 2012; Waite et al., 2015). In the South Pacific, coral reef ecosystem service valuation studies seem to have been mostly used to raise awareness rather than directly to support decision-making (Laurans et al., 2013a). In the UK and the US, although the role of ESV in marine planning is referred to in policies and legislation, its actual use is still rare (Börger et al., 2014).

In Australia, economic valuation is officially acknowledged, and sometimes explicitly recommended for ecosystem management and policy evaluation (Australian Government, 2007; Bennett, 2011; Rogers et al., 2013). A considerable amount of ESV including non-market valuation has been undertaken in this country in recent decades, including for coastal and marine ecosystem services<sup>1</sup> (e.g. Rogers et al., 2013; Bennett, 2011; Stoeckl et al., 2011). However the actual use made of ESV in decision-making and its perceived usefulness remain largely unexplored. Rogers et al. (2013) examined these issues focusing on terrestrial ecosystems and non-market valuation through surveys and interviews of experts and decision-makers in Australian environmental bodies.

More recently, Marre et al. (2015) documented how and to what extent ESV is used in, and influences, coastal zone management in Australia. The authors provided a review of the cases in which ESV has been used (or not) in decision-making, based on real-world examples collected in a nation-wide survey of decision-makers involved in the management of coastal and marine ecosystems.

The purpose of this paper is to complement and broaden the scope of this previous study by (1) characterizing the general perceptions of ESV's usefulness among decision-makers, in the context of Australian coastal and marine management, and (2) analysing such perceptions in the light of their stated use of ESV and of the opportunities and challenges associated with ESV. The analysis presented thus provides answers to the following questions: is ESV perceived as useful for decision-making? If so, for what purposes? How useful is the estimation of economic values for the various ecosystem services? What are the perceived limits to ESV utilization? Are there factors that explain the existing use of ESV?

The paper is organized as follows. Section 2 presents the survey

approach, questionnaire structure, and statistical methods used for the analysis. Section 3 describes the profile of the respondents and the results from the survey. Section 4 discusses these results and Section 5 concludes.

## 2. Materials and methods

### 2.1. Characterization of ESV usefulness

In designing the survey, the characterization of the potential usefulness and limits of ESV in decision-making was informed by a review and synthesis of the literature on the potential drivers of decisions to use ESV, as well as perceived ESV limitations (e.g. Adams, 2014; Waite et al., 2015; Rogers et al., 2013; Laurans et al., 2013b; Liu et al., 2010; Spangerberg and Settele, 2010; Vatn and Bromley, 1994).

As understood in this article, ESV use does not refer to the execution of an ESV, but rather to the way in which the information produced by an ESV is considered, and taken into account in a decision-making process.<sup>2</sup>

The systematic review on the issue of the use of ESV in the peer-reviewed scientific literature conducted by Laurans et al. (2013b) was used as a starting point for this study. The authors list three categories and various sub-categories of ESV use:

- “Informative”: ESV is used for awareness raising, justification and/or for accounting purposes;
- “Decisive”: ESV is used to assess trade-offs, as an environmental management criterion;
- “Technical”: ESV is used to establish damage compensation or for price setting.

The authors also identified six reasons why ESV may fall short of expectations in practice (Laurans et al., 2013b, p.216).

For the purpose of this work, these ESV use categories and limits to the use of ESV were supplemented based on a review of the literature, and then adapted to: (i) the context of coastal management (based on Waite et al. (2015) and Börger et al. (2014)); (ii) the Australian context (based on Rogers et al. (2013)); and (iii) the requirements of a broad online survey, including the need for simple and clear wording.

The way in which the potential usefulness and limits of ESV in decision-making were characterised in the survey is presented in Figs. 1 and 2. These provide a framework for addressing the following questions: do decision-makers think ESV is useful, or even necessary? If yes, for which categories of use? If not, for what reason(s)? And what limitations do they see to its use?

In practice, ESV refers to a broad range of economic values, which can be estimated through very different valuation techniques. The survey also aimed at characterizing the usefulness of ESV for a range of economic values based on two criteria: the perceived importance of estimating various categories of economic values (from nil to high importance); and the level of trust associated with such estimates (from nil to high level of trust). The economic values considered were those associated with commercial activities (fisheries, aquaculture, ports and shipping etc.), recreational activities (aesthetic benefits, recreational fisheries etc.), regulating ecosystem services (water regulation, carbon sequestration etc.), as well as non-use and option benefits.

<sup>1</sup> Although value estimates regarding coastal and marine ecosystem services are still uncommon in many decision contexts in Australia; see Marre et al., 2015.

<sup>2</sup> Of course, executing an ESV cannot be fully disconnected from its use, since anticipating the use may define the scope of an ESV, and how it is executed.

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