



## Communicating research on the economic valuation of coastal and marine ecosystem services



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### ARTICLE INFO

#### JEL codes:

Q51  
Q25  
Q57  
Q58

#### Keywords:

Economic valuation  
Marine and coastal ecosystem services  
Coastal and marine management  
Policy analysis  
Benefit transfer

### ABSTRACT

Quantifying the monetary value of ecosystem services (ES) provided by coastal and marine resources can help policy makers assess the trade-offs and synergies inherent in ecosystem-based management of marine and coastal environments, thus increasing the social efficiency of decision-making processes. As shown by the valuation literature, the number of coastal and marine management settings where valuation researchers have attempted to make a contribution is rising fast. However, this rise in research activity has not been matched by the increase in the use of economic valuation (EV) in the actual management of coastal and marine resources. This raises an interesting question: is EV responding to the needs of policy makers? This paper provides a comprehensive overview of the knowledge base regarding the economic values for coastal and marine ecosystems. It then discusses how to improve the uptake of ES valuation research by focussing on two core issues which are thought to be essential for more effective communication with the policy community.

### 1. Introduction

Economic valuation (EV) can provide policy makers, environmental managers and planners with information about the social benefits and costs associated with alternative coastal and marine policies. It can help to assess and highlight the trade-offs and synergies inherent in ecosystem-based management, thus increasing the social efficiency of decision-making processes. A key question is thus why such valuation is not more widely used in actual decision-making.

As this paper shows, valuation researchers have applied their methods to an increasingly wide variety of coastal and marine ecosystems. However, the growing number of valuation studies has not been accompanied by an increase in the use of EV in the actual management of such ecosystems. As stated by Ruckelhaus et al. [1], “the pace at which the theory of ecosystem services (ES) valuation is being incorporated into real decisions has been painstakingly slow, with disappointingly few success stories”. Laurans et al. [2] argue that, despite valuation being able to demonstrate to policy makers the benefits derived from sustainable resource management, it has been used “in an *informative* way rather than in a *decisive* or *technical* perspective”.

This situation raises an interesting question for valuation researchers: *Is EV responding to the needs of policy makers?* This question

becomes even more relevant in a framework where environmental policies increasingly call for a balancing of the benefits and costs of regulations, and for regulatory impact assessments [3–6]. In a recent paper, Hanley et al. [7] wonder if EV of marine and coastal ecosystems is “currently fit for purpose”, given the demands of European environmental legislation. The authors conclude that evidence that non-market values are used in policy formation is mixed, which can be explained by the “lack of scientific knowledge of key linkages in the valuation framework, a lack of relevant economic valuation studies, methodological problems in applying certain valuation methods to marine issues”, and the “unfamiliarity of most people with marine ecosystems and their components”.

Hanley et al. [7] mainly focus on the limitations of EV and the analysis of the extent to which the current scientific evidence base allows valuation to be conducted. However, they also call for further interaction between political and social scientists on the basis there is a need “to communicate ES research more effectively and to improve understanding of the *realities* of policy makers to economists and marine and coastal scientists”. The motivation for the present paper is to guide policy makers interested in using EV in coastal and marine policy formation and management. To achieve this aim, it presents a systemic survey of the current evidence base on the values for coastal and marine resources, placing emphasis on the analysis of both the

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policy implications of current studies as well as the main research needs stated by those undertaking the valuation studies. It then discusses the scope for these kinds of studies to get used in policy implementation and environmental management, as well as the main barriers to a more widespread and in-depth use of EV in coastal and marine ecosystem management.

The paper extends the analysis by Hanley et al. [7], emphasizing the multiple roles which EV can play. We highlight the need for more primary and high quality valuation studies to increase the scale and quality of benefit transfer; and advocates for examination of the potential of EV to complement more participatory and deliberative decision-making approaches. The paper thus attempts to start a discussion about the most profitable directions for further research work. We also stress the importance of collaboration among social, natural and political sciences in increasing the use of EV methods in ecosystem management.

The structure of the paper is as follows. Section 2 describes the methodology used to provide a comprehensive overview of the knowledge base regarding the valuation of coastal and marine ecosystem services. Section 3 presents the main conclusions from the analysis of the current evidence base and examines the scope for EV to play in the better management of coastal and marine ecosystems, while Section 4 discusses the main barriers to a more influential use of the method. A “Concluding Remarks” section ends the paper.

## 2. Methodology

The increasing demand for non-market economic values in policy decisions has led to an increase in the use of valuation estimate databases that may be used in value transfer exercises [7]. Our systemic survey of the current evidence base on the values for coastal and marine ecosystem services (ES) has been undertaken through an extensive literature review, the main source for which has been the National Ocean Economics Programme/Middlebury Institute of International Studies at Monterey (NOEP) database.<sup>1</sup> The criteria selected to obtain the list of NOEP papers have been the following: i) to guarantee the quality of the publications, only peer-reviewed papers have been considered, so technical reports, book chapters and working papers have not been taken into account, ii) published between 2000 and 2015, iii) conducted in any country or region in the world, iv) using any valuation methodology, v) being original or undertaking meta-analyses, vi) estimating any type of value (i.e. use values, non-use values or both), vii) valuing any type of relevant natural capital asset, and viii) focusing on any type of use or activity in relevant ecosystems.

From the resulting list of papers, two types of journals where these have been published can be identified. The first type refers to journals interested in publishing work related to specific natural resource and environmental issues, for which further development of valuation methods and their novel applications to new data sets is of major concern. Articles published between 2000 and 2015 in 10 journals which are considered relevant within this type have been reviewed if they focus on valuing coastal and marine ES. The second type corresponds to 22 journals interested in publishing work around both ecological and management issues in coastal and marine settings. In total, 196 papers whose primary objective is the valuation of goods and services provided by coastal and marine ecosystems have been analysed, which can be viewed as representative of the valuation work that has been undertaken so far during the 21st century in marine and coastal settings.<sup>2</sup>

### 2.1. Responding to policy makers' needs: paper classification by ecosystem type

The papers have been analysed according to their study object; the ES being valued, which has/have also been classified according to the Millennium Ecosystem Assessment [8]'s category/ies to which it/they belong to (i.e. provisioning, regulating, cultural and supporting services); the types of values being estimated; and their main outcomes and policy implications. Additionally, the most important research needs as well as major challenges stated by the authors have been examined. To better contribute to the analysis of the role of economic valuation (EV) in coastal and marine ecosystem decision-making, the papers have been classified relating to different ecosystem types resulting from the consideration of different management frameworks. These frameworks have been determined according to both the major management concerns among valuation researchers identified in the literature; and the classification of aquatic ecosystems made by the Water Framework Directive (WFD, 2000/60/EC) which establishes integrated river basin management as the best strategy to achieve good status of water.

The review of the valuation literature has allowed the identification of eight management areas to which valuation research has made a potential contribution: wetland management, beach management, coastal area management, freshwater resource management, coastal water management, coral reef management, marine protected area (MPA) policy design, and strategies to protect the deep sea/open ocean waters. The WFD establishes a framework for the protection of inland surface, transitional, coastal and ground water, where inland waters (standing or flowing), which include rivers, streams, canals, lakes and reservoirs are freshwater ecosystems; coastal waters are marine ecosystems; and transitional waters, which include estuaries and deltas, involve a mix of freshwater and marine ecosystems.

Accordingly, and to classify the papers, eight management areas have been identified and hence eight *broad ecosystem types* have been considered, as shown in Table 1. The table also depicts the *specific ecosystems* whose services are object of valuation within each ecosystem type, and the management area which the papers within each type could contribute to.

As it will be noted, the marine ecosystem types are not mutually exclusive. Indeed, marine protected areas (MPA) are established to protect marine environments which involve some of the three remaining ecosystem types, namely protection of coral reefs, deep sea organisms or coastal waters being habitat of iconic species. Besides, cold-water corals (CWC) are deep-sea organisms and, unlike coastal coral reefs, their services cannot be enjoyed directly by most of people.

Accordingly, some assumptions have been made for paper classification within each marine ecosystem category. First, the studies focusing on MPA valuation have been categorized as “MPA studies” regardless of the ecosystem type the MPA aims to protect due to the specific policy implications derived from MPA management.<sup>3</sup> Second, papers concerned with coral reef conservation which do not make any reference to the creation of an MPA as a conservation tool have been categorized as “coral reef studies”. While it is true that many MPA papers focus on protected coral reef areas, not all papers valuing coral reef services centre on the creation of MPAs for their protection. In fact, EV of coral reef services can serve to demonstrate the benefits of their sustainable management regardless of the management tool [2]. Besides, MPAs involve marine environments possessing features of uniqueness and national importance which are not exclusive of coral reefs. Third, the Coral reefs category only includes studies around *coastal* coral reefs, thus excluding those estimating the value of CWC

<sup>1</sup> <http://www.oceaneconomics.org/nonmarket> (accessed from September 7th to September 21st, 2015).

<sup>2</sup> See Torres and Hanley [107] for further details about the reviewed journals.

<sup>3</sup> This implies, for instance, that papers examining the values for an MPA in coastal waters have been jointly analysed with papers estimating the value of either CWC or coastal coral reef protection through an MPA.

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