



## Original Articles

# Integrating marine ecosystem conservation and ecosystems services economic valuation: Implications for coastal zones governance



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## ABSTRACT

This paper presents a preliminary attempt to estimate the awareness and value that society gives to the maintenance and protection of marine protected areas, linking the ecological and economic value scale assigned to the study. To accomplish this, we took as illustrative example the Biophysical Interest Zone of Avenças (ZIBA), in Portugal. The ZIBA spans over one ha and its coastal ecosystems present a very rich biodiversity, providing several socio-economic opportunities to society. To estimate the value that society attributes to this area we conducted a contingent valuation exercise, considering two different aspects: 1) the direct economic value that people state to conserve the ecosystem and 2) the willingness to contribute through the allocation of hours of voluntary work to its conservation. The values obtained indicate the dependence and importance of this ecosystem to local population (willing to pay to conserve it of 60 € per household per year and willing to give 3 h of voluntary work per year). The proximity of the local population to the protected area increases the willing to pay for its conservation; this could reveal a good local indicator of ecosystem valuation. This valuation exercise highlights the importance of coastal ecosystem services to society and draws attention to the benefits that local populations derive from those systems. These results have also implications in future governance actions regarding protected areas, as well as to justify for sustainable investments in coastal management efforts, to sustain the flow of coastal ecosystem services for current and future generations.

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## 1. Introduction

Coastal zones are open land/sea interfaces, exposed to strong environmental gradients that establish high connectivity with other coastal ecosystems (Thompson et al., 2002). This is an area exposed to several different environmental and human pressures. The anthropogenic pressure is continually rising due to the growing human population concentration in the shores, causing pollution problems and the overexploitation of natural resources for food purposes. It is equally an area with great richness in biological diversity and valuable habitats, like the coastal reefs. Particularly in rocky shores, the existence of several reef species that migrate between rocky reefs (Gladstone 2007) is an important characteristic to the maintenance of the coastal ecosystem.

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Marine Protected Areas (MPA) are good management instruments to maintain the coastal zone biodiversity. In Portugal, the first protected area encompassing marine territory was classified in 1981, and in the present days there is a record of 16 places with some protection status that include marine territory. Traditionally this classification occurred without a strong public participation and with many conflict of interests, transforming the management of these areas into a challenge (Ferreira et al., 2015).

From the human society perspective, the coastal zones and MPA provide an innumerable range of services. They are leisure areas and an important food source, where several industrial and touristic activities take place. This intensive use of coastal areas causes competition for the occupation of these regions and requires for techniques and methods that quantify the social, ecological and economic benefits that humans take from these systems. An ecosystem total economic value (TEV) consists of use and non-use values. By use values we can have direct (like food) and indirect (like recreation) values. The non-use values are usually associated with the conservation/preservation of the ecosystem for option future uses or bequest values (Kriström 1990; Bateman et al., 2002). There are

several methods to value ecosystem services to society, however this study will focus only in one methodology (contingent valuation), due to the importance for society of the non-use values in this case study: a coastal protected area easily accessible to the population where no entrance fee is collected. Contingent valuation is a survey-based technique for stating the preferences of non-use values or indirect values to society, over other items of private consumption. It is the most commonly used approach to placing a monetary value on non-use environmental resources (Boyle and Bishop 1988; Mitchell and Carson, 1989; Bateman et al., 2002).

The contribution to nature conservation in form of volunteer work could be a family activity increasingly valued by the population as a practice of teaching values and bonding with the future generations. The willing to spend time in activities like beach clean ups, invasive species eradication or native species plantation, is considered a form of leisure while contributing to nature conservation, especially in urban nucleus where nature activities are not normally available. García-Llorente et al. (2015) propose willingness to give up time in contingent valuation studies, as a useful non-monetary technique, particularly in areas with economic limitations.

With the current scenario of economic crisis, governments have cut backs in their annual budgets. Investment is mostly in social services and local economic empowerment, with the main objective of decreasing the unemployment rate and poverty. Therefore, although nature and coastal zone ecosystem services remain indispensable to the population, during a financial and economic crisis there is a risk of that being relegated to the bottom of the political agenda priorities. Communication of the importance of these ecosystem services to the policy makers, in a simple way, could increase the importance allocated to its conservation.

When conducting a multiple indicator study to communicate similar ecological outcomes, Zhao et al. (2013) demonstrated that in valuation studies, when the ecological indicator of ecosystem services are equivalent, the correspondent valuation measure used, is robust to the use of alternative ecological indicators within the survey scenarios. This approach can be beneficiary when communicating with managers and policy makers once contingent valuation studies are a major tool to justify investments in nature conservation, namely in the coastal zones, because they quantify in money (in this case euros), just how much the services provided by this ecosystem are valued by the population. With this type of information, coastal zone managers can develop a cost benefit-analysis, prioritizing investments in its territory, like a specific budget to erosion problems in the shore, investments in environmental education, and investments in pollution emergency plans, or nature restoration initiatives. They can also compare the benefits of different projects or programs, maximizing the public wellbeing with the investments made.

In Chile, Gelcich et al. (2013) reported a 97% rate of respondents willing to pay (WTP) for the financing of a marine protected area with the charge of an entrance fee, covering 10–13% of the MPA running costs. The same tendency was reported in Croatia, over 80% of the interviewees were WTP for their holiday in support of marine conservation (Batela et al., 2014). From the tourist perspective the availability to pay an extra amount while visiting a particular area for nature conservation is well recorded: sun-sea-sand tourists report a median WTP of US\$ 3.77, while nature based tourists state a higher WTP value of US\$ 4.38 (Gelcich et al., 2013) for nature conservation. In Kentucky it was recorded a WTP value between US\$ 6 and US\$ 13 for a “Wetland Preservation Fund” (Whitehead 1990), and in Spain, the results showed that the mean WTP for an improvement in water quality was about €33 per household per year (Ramajo-Hernandez and Saz-Salazar 2012).

This type of studies can never alone provide the definitive answer to any major policy question; they help to provide man-

agers a more complete package of information, allowing them to make choices concerning the provision of the particular environmental amenity in a forward-looking manner (Carson 1998).

The objective of this work is to determine the valuation of a protected area in a distance decay perspective and the population's (users and non-users of the area) willing to pay or to give time for marine ecosystem conservation of the area and its cultural services, from a management perspective. The use of a non-monetary technique as the willing to give up time in nature's conservation is not commonly used in contingent valuation studies, and intends to be an innovative perspective for the management of coastal protected areas.

More specifically, this study was aimed to:

1. Determine if the socio-economic characteristics, distance to the area and usage of the population, influences the willing to pay or to give time for coastal zone conservation;
2. Determine the value that people are willing to pay for coastal zones conservation in € and voluntary work as a proxy to traditional willing to pay; and
3. Determine the reason for that willing to pay for coastal zones conservation.

## 2. Methods

### 2.1. Study-site description

The Biophysical Interest Zone of Avencas (ZIBA), located in Cascais municipality (Portugal) (Fig. 1), is characterized by extended calcareous rocky platforms with a small sandy beach in the middle (Avencas beach) sheltered from the dominant north winds. This beach is a type III beach (semi-natural beach) with a carrying capacity of 156 people in total (considering that each person occupies 12 m<sup>2</sup> of sand while at the beach) (POOC, 1998).

ZIBA was classified as a Biophysical Interest Zone in 1998 by the National Coastal Management Plan (Cidadela – São Julião da Barra) (POOC, 1998) because of its intertidal biodiversity richness and geological particularities. Activities as fishing or motor boat sailing are prohibited as a function of the statute of protected area.

Several schools and universities use this area to perform their field trips all year round (Ferreira et al., 2015). Tide pooling and swimming are important activities in the summer. This rocky shore has also an historical and therapeutic interest due to its renowned health benefits in treating bone disease with natural limestone.

Avencas beach users are constantly exceeding the carrying capacity of the place. Trampling of the rocky shore, along with illegal fishing and human disturbance at the reproduction time of local marine species (spring and summer) are the main pressures identified for this protected area (Ferreira et al., 2015).

### 2.2. Questionnaire implementation

We conducted a pre-test before the surveys, in May 2014, to ensure that respondents understood correctly the survey questions and scenarios and to test if the classes included in the payment card were adequate. The full survey was implemented during the 2014 summer season (between 1st of June and 30th of September), comprehending 300 face-to-face surveys (100 surveys at each municipality) at three different coastal municipalities with the same touristic characteristic in the summer, being visited during this season for their beaches. Cascais is the municipality of the protected area (distance = 0 km), Almada is the municipality located to a distance of 40 km and Aveiro is the most distant municipality, located to a distance of 250 km. (Fig. 1). We have chosen this period in order to ensure that most of the population targeted by the ques-

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