Environmental Science & Policy 55 (2016) 186–195

Contents lists available at ScienceDirect

Environmental Science & Policy

journal homepage: www.elsevier.com/locate/envsci

Ecosystem services values in Spain: A meta-analysis

Cristina Quintas-Soriano [a,b,*], Berta Martín-López [c,b], Fernando Santos-Martín [b], María Loureiro [d], Carlos Montes [b], Javier Benayas [b], Marina García-Llorente [e,b]

[a] Andalusian Center for the Assessment and Monitoring of Global Change (CAESCG), Biology and Geology Department, University of Almeria, 04120 Almería, Spain
[b] Social-Ecological Systems Laboratory, Department of Ecology, Universidad Autónoma de Madrid, 28049 Madrid, Spain
[c] Leuphana University of Lüneburg, Faculty of Sustainability, Institute of Ethics and Transdisciplinary Sustainability Research, Scharnhorststr. 1, 21335 Lüneburg, Germany
[d] Departamento de Fundamentos da Análise Económica, Facultade de Ciencias Económicas e Empresariais, Universidade de Santiago de Compostela, Avda. do Burgo s/n, Campus Norte, 15782 Santiago de Compostela, Spain
[e] Applied Research and Agricultural Extension Dpt. Madrid Institute for Rural, Agricultural and Food Research and Development (IMIDRA), Finca Experimental el Encín, 28800 Alcalá de Henares, Madrid, Spain

ARTICLE INFO

Article history:
Received 16 February 2015
Received in revised form 8 September 2015
Accepted 4 October 2015

Keywords:
Economic valuation
Ecosystem service
Monetary metric
Spain
Systematic review

ABSTRACT

We analyzed the state of the art in research on the economic valuation of ecosystem services in Spain. A review of 150 publications was conducted and included 649 economic value estimates. The results showed an increase in the number of scientific studies on the economic valuation of ecosystem services and a dissimilar distribution across regions. Cultural ecosystem services received the most attention, and coastal systems and forested areas were the most studied ecosystem types. We found differences in the economic value estimates among categories of services and among economic valuation methods, with provisioning services and market-based methods as those that elicited the highest economic values, respectively. Our results provide an overview of past and current economic valuation studies in Spain. In addition the results depict patterns that help in understanding the effects of different factors on economic value estimates and in providing insights for future research on ecosystem services assessment in Spain. We conclude that although economic assessments remain important in scientific and policy forums, we should also recognize additional approaches that are able to incorporate the plurality of values attached to ecosystem services.

1. Introduction

The Millennium Ecosystem Assessment has provided important evidence of both the past and ongoing degradation of global biodiversity and ecosystem services (MA, 2005). In response, a variety of international initiatives has been developed, including the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES), which provides mechanisms to identify information and tools needed for policy makers (Perrings et al., 2011), and The Economics of Ecosystems and Biodiversity initiative (TEEB), which has stimulated increased scientific interest in the economic valuation of ecosystem services (TEEB, 2010).

In a European context, Action 5 of the Biodiversity Strategy (EC, 2011) requires Member States to map and assess the state of ecosystems and their services in their national territory by 2014, to estimate the economic value of such services, and to promote the integration of these values into accounting and reporting systems at the EU and national level by 2020 (Maes et al., 2013). In this context and as an advanced example, the UK National Ecosystem Assessment (UK NEA, 2014) has provided a comprehensive and systematic economic analysis of the way in which ecosystems in the United Kingdom are linked to the services that they generate, and it has highlighted the need for incorporating their value into land-use decision-making.

Within this general context, the scientific community has recognized the need to strengthen the incorporation of economic valuation into decision-making processes to partially assess the effect of ecosystems on human wellbeing (De Groot et al., 2010). In fact, since the 1950s, an abundant body of literature has developed that considers the monetary valuation of ecosystem services (Baveye et al., 2013). Since the publication of the Costanza et al. (1997) study, which constitutes a key but controversial milestone in ecosystem services valuation, the number of scientific publications on economic

* Corresponding author at: Biology and Geology Department, Andalusian Centre for Evaluation and Monitoring Global Change, University of Almeria, 04120 Almería, Spain.
E-mail address: cqs572@ual.es (C. Quintas-Soriano).

http://dx.doi.org/10.1016/j.envsci.2015.10.001
1462-9011/

valuation has increased steadily (Chaudhary et al., 2015). More recently, De Groot et al. (2012) and Costanza et al. (2014) provided updated global monetized estimates of the value of ecosystems and their services. However, although the analyses in these publications covered 300 case study locations, no existing Spanish studies were considered. To fill this knowledge gap in economic valuation, this study aims to provide evidence on ecosystem services valuation activities focusing on Spanish ecosystems, in the context of the Spanish National Ecosystem Assessment (Spanish NEA, 2014).

In this study, we explored the current state of the art on the economic valuation of ecosystem services in Spain. With this aim, we have covered the following specific objectives: (1) give an overview of past and current economic valuation studies by describing their temporal evolution, methodologies and distribution and examining potential biases; (2) provide estimates of the mean economic values for a range of ecosystem services in monetary metrics (€/ha/year); and (3) understand the effects of methods, ecological and socio-economic factors on economic value estimates to contribute to the general understanding of the monetary values of ecosystem services.

2. Methodology

2.1. Systematic review

We reviewed published papers that were indexed in the ISI Web of Science (https://www.accesowok.fecyt.es/) through the end of 2012 and were on the topic of the economic valuation of ecosystem services in Spain. A study was included when (1) the study area was located in Spain, (2) it focused on ecosystem services as valuation amenities, and (3) it used economic techniques for ecosystem services valuation. A full description of the keywords used in the search process is shown in Appendix A. To avoid double counting, we searched for original articles in journals (Cossarini et al., 2014). Papers were screened to determine relevant articles for this study. Overall, 150 of the 170 papers met these selection criteria (Fig. 1). Appendix B lists the studies that were incorporated in the review analysis. Publications were analyzed following the spreadsheet method of Pullin and Stewart (2006) (see Appendix C). These guidelines include (1) planning for conducting a review, (2) protocol design, (3) search strategy, (4) data inclusion, (5) data extraction and (6) analysis and interpretation.

2.2. Generation of the databases

A first database was compiled to explore the status of the current knowledge on the economic valuation of ecosystem services in Spain. We included publication characteristics (i.e., data source, scale or study area boundaries), valuation techniques, ecosystem types and ecosystem services categories. Then, a second coded database was compiled in which the rows represented monetary estimates and the columns were the variables that could explain the economic value estimates obtained. Based on the specifications of previous meta-analyses (e.g., De Groot et al., 2012), we defined groups of explanatory variables that represented different determinants of variation in value, namely study site characteristics (e.g., GDP, surface area and population density), ecosystem services valuation techniques (e.g., market-based methods, cost methods, stated preferences methods and revealed preferences methods) and ecosystem service categories (e.g., provisioning, regulating and cultural) (see Appendix C). A total of 649 monetary estimate observations were obtained from the 150 primary studies because a single study usually provided multiple economic estimates (Fig. 1). Following Brander et al. (2013), we included multiple estimates when they represented independent observations; this occurred when more than one method was used or when several ecosystem services were valued. To achieve a direct comparison and aggregation of economic value estimates of ecosystem services, the economic value estimates were standardized in common spatial, temporal and currency units, namely, euros per hectare per year (€/ha/year). The economic value estimates were adjusted to 2012 using gross domestic product (GDP) deflators for each region of Spain (data are from the Spanish National Institute of Statistics in 2012; http://www.ine.es/). The 649 estimates included the information required to address a particular type of ecosystem and to assign a single ecosystem service. Of these estimates, only 433 achieved the quality criteria for a meta-analysis. These criteria required that related information about surface area and population size also be included in each of the papers. In addition, we removed those observations that were outliers based on a Kaplan–Meier probability distribution. As a result, the final monetary database comprised 433 observations (Fig. 1).

2.3. Data analysis

First, we explored the current state of knowledge on the economic valuation of ecosystem services through a general descriptive analysis of the studies. We analyzed the temporal evolution, methods used and spatial distributions of ecosystem service categories. Then, chi-square tests were performed on the 649 economic value estimates to detect significant associations between specific ecosystem services and particular ecosystems.

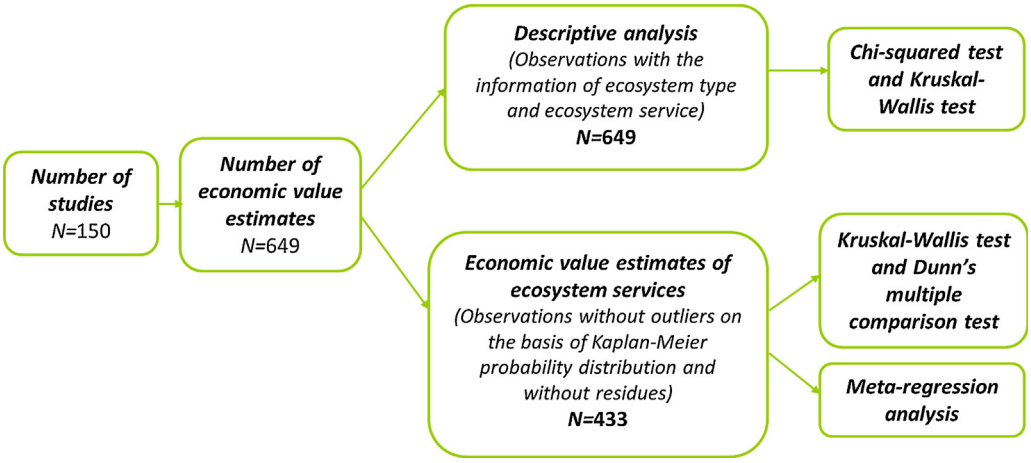

Fig. 1. Methodological procedure: number of observations (*N*) obtained in the two different databases and the treatments performed for the statistical analyses.