



**Valuation of ecosystem services in the
Catalan coastal zone**

Jorge Brenner-Guillermo

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Photo in the cover: Llafranc town & beach, Girona, Spain (ICC 2001).



Laboratori d'Enginyeria Marítima
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Valuation of ecosystem services in the Catalan coastal zone

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< ! *“There is no single, universally accepted way of formulating the linkage between social systems and natural systems”* (Berkes and Folke 1998) >

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Abstract

This study departs from the hypothesis that ecosystem services are becoming scarce by experiencing serious degradation in regard to their capability to provide services efficiently in the Catalan coast, Spain. It constitutes a contribution to the analysis of non-market natural capital in the Catalan coastal zone from an efficient allocation perspective. The general objective of the study was to “assess the non-market value of ecosystem services provided in the Catalan coastal zone, in monetary terms.” The work starts providing a description of three main dimensions relevant to Integrated Coastal Zone Management of the Catalan coast: socio-economic, natural and administrative dimensions. The 12 littoral *comarcas* and their marine water extent to a depth of 50 m constituted the operational definition and study area in this work. The approach focused on natural and semi-natural, terrestrial and marine, functions and services which are not counted in the economic markets. Results provide an outlook of ecological functions and services provided by the Catalan coast and available data on its value. The study provided a set of three methodologies which contribute to estimating the ecosystem services value that should be considered relevant in coastal and environmental management. First, it proposes an indicator-based method to identify the social-ecological spatial heterogeneity of the coast, which led to the identification of homogeneous management units on which valuation of the social-ecological system was carried out at the *comarca* level. Four different classes of Homogeneous Environmental Management Units were obtained, ranging from highly natural and less developed *comarcas* to less natural and highly developed *comarcas*. Secondly, a benefit transfer spatial function was used in order to estimate the annual contribution of ecosystem services value to citizens' well-being. Based on individual preferences value from more than 90 peer-reviewed studies, it was found that non-market services of terrestrial and marine ecosystems in the study area provide at least 3.2 billion USD in 2004 ($2,572 \times 10^6$ Euros). It was found that ecosystem services when provided by different land cover types vary substantially in its economic value, and this study reflects such variability. Single largest contribution to ESV flow was provided by forest while larger coastal-marine contribution was provided by the continental shelf. To replace the current ecosystem services, at least an annual increment of 2.7 % in the Gross Domestic Product should take place in the study area. Furthermore, it was assumed that the more efficient is an ecosystem in providing a service, the more valuable will be to the society. Thus, ecological, human footprint and fragility indexes were used in the construction of the Ecosystem Services' Provision Capacity Index which constituted the proxy of the capacity of ecosystems to deliver services to citizens in the terrestrial part of the study area. Result showed that it accounted for a positive capacity to provide services and its resulting geography represented a proxy of the natural structure and processes. An integrated ecosystem services value flow of 3.37 billion USD/ha·yr ($2,712 \times 10^6$ Euros) was estimated. This new estimate represents more than a 42 % increment to that of terrestrial individual preference value. Both valuation processes kept close spatial relationship to that of Homogeneous Environmental Management Units geography. Integrated valuation method was considered to reduce human induced bias (via stated-preferences) and thus provide a more realistic estimate of the ecosystem services flow. By estimating the economic value of ecosystem services not traded in the marketplace, social costs or benefits that otherwise would remain hidden or unappreciated are revealed. Therefore, this work can be useful in evaluating tradeoffs between economic development and conservation in the coastal zone. It was considered that making the contribution of ecosystem services to human well-being and the ecosystem functions that underlie those services more explicit, should help motivate policy towards integrated sustainability.

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General notes

- Point is used for decimal separator and comma for thousands separator.
- Billion dollars correspond to billions in the U.S.A. (USD x 10⁹).

List of acronyms

CAMCAT	Marine Waters Accidental Pollution Emergency Plan [Pla Especial d'Emergències per Contaminació Accidental de les Aigües Marines a Catalunya]
CAS	Complex Adaptive Systems
CV	Contingent Valuation
CZ	Coastal Zone
EBM	Ecosystem-Based Management
EC	European Communities
EI	Ecological Index
ESPCI	Ecosystem Services' Provision Capacity Index
ESV	Ecosystem Service Value
EU	European Union
FI	Fragility Indicator
GDP	Gross Domestic Product
GIS	Geographic Information System
GNP	Gross National Product
GPP	Gross Primary Production
hab	Inhabitants
HEMU	Homogeneous Environmental Management Unit
HFI	Human Footprint Index
HII	Human Influence Index
ICZM	Integrated Coastal Zone Management
JCR	Journal Citation Reports
LIM	Marine Engineering Laboratory [[<i>Laboratori d'Enginyeria Marítima</i>]
MAUP	Modifiable Aerial Unit Problem
MEA	Millennium Ecosystem Assessment
NHVI	Natural Heritage Value Index
NPV	Net Present Value
PDUSC	Coastal System Urbanization Plan [<i>Pla Director Urbanístic del Sistema Costaner</i>]
PEGIZC	Integrated Coastal Zone Management Strategic Plan [<i>Plan Estratégico para la Gestión Integrada de las Zonas Costeras de Cataluña</i>]
PEIN	Natural Interest Spaces Plan [<i>Pla d'Espais d'Intèrés Natural</i>]
PI	Production Indicator
PTMD	Public Terrestrial-Marine Domain
SES	Social-Ecological System
TEV	Total Economic Value
UPC	Polytechnic University of Catalonia [<i>Universitat Politècnica de Catalunya</i>]
USD	United States Dollar