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## Essays and Perspectives

# The ecosystem service approach and its application as a tool for integrated coastal management



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### ABSTRACT

Ecosystem services are the benefits that natural environments supply to human beings. Due to the immense diversity of ecosystems and objectives for which their services are being assessed, there are no standard methodologies for this type of evaluation. The high biodiversity and geodiversity of the coastal zone allow a wide range of services. However, deleterious impacts to the environment threaten the delivery of these services and, consequently, the human well-being they lead to. The coastal zone, with its multiple users and impacts, is a case in which an ecosystem-based approach would bring many benefits within the scope of an integrated coastal management strategy. By considering the ecosystem services supplied by the coastal zone, it is possible to make well-informed decisions. The objective of the present study was to carry out a revision on ecosystem services and their application within the context of coastal management.

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## Introduction

Ecosystem services can be defined simply as the benefits natural ecosystems supply to guarantee human well-being. Although the human species presents a certain level of detachment from the direct relationships with the environment, especially due to cultural and technological issues, we are still fundamentally dependent on the flow of ecosystem services. For instance, a car can only move with fuel (gas, electricity, biodiesel, etc.), constructions are only possible with raw material, our breathing depends on the production of oxygen by photosynthesizing organisms, and so forth.

The study of ecosystem services can be included in what is called “ecological economics”, a transdisciplinary science through which different fields of knowledge seek to communicate by means of a common language (Daly and Farley, 2004). For example, in an environmental impact study on the construction of a coastal enterprise, how is it possible to clearly separate the areas of influence of oceanography, geology, and biology, among others? The flow of services is very interactive. More than one service can be delivered by the same ecosystem, while the same service may be delivered by different ecosystems. Thus, by considering this interactivity, by means of including multidisciplinary teams in decision-making processes and taking an integrated view

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of the environment, it is possible to understand the limits of the environment and its resources, creating policies that allow for sustainable development.

Malone et al. (2014) defend a holistic and integrated approach when addressing ecosystem services and sustainable development. These authors consider that sustainable development involves three dimensions: economic development, social development and environmental sustainability. However, while public policies have treated these dimensions as interactive, these are not always seen as being interdependent. From an ecological economics standpoint, economic activity occurs within a system of social relationships, which is limited by environmental parameters and, thus, should respect the carrying capacity limits of natural environments (Costanza et al., 1997; Daly and Farley, 2004; Malone et al., 2014).

By integrating the ecosystem service approach and the decision-making process, ecosystem-based management strategies can be developed (Fig. 1). While isolated, the decision-making process considers social preferences and human activities without necessarily accounting for the inherent value of nature or the benefits provided by ecosystem services. However, by striving for more sustainable and resilient policies, managers may then understand that an ecosystem-based management strategy would allow an integrative approach toward the issue at hand, valuing the natural capital of the area, respecting the environment's carrying capacity and reaching long-term and fair benefits to all involved.

Thus, the objective of the present study was to carry out a review on the ecosystem service approach and its applicability in integrated coastal management strategies.

## Historic background

The explicit recognition of the term “ecosystem services” is fairly recent, but the general notion that natural ecosystems support human society is ancient. Daly and Farley (2004) exemplify this condition with the nomad behavior of pre-historic man, always searching for resources for survival. Mooney and Ehrlich (1997) mention how Plato, the Greek philosopher (c. 400 BC), understood that the soil erosion and dying rivers in the region of Attica were a consequence of deforestation in a farther upstream area. These same authors also state that the modern understanding of ecosystem services probably began with the book *Man and Nature*, by George Perkins Marsh, in 1864, in which the erroneous concept that our planet's resources are infinite was contested for the first time in a high-impact publication.

After a period of hiatus, in which Marsh's work was not greatly recognized, undoubtedly due to the influence of the 1st and 2nd World Wars, three authors resumed the themes he had addressed during the 1940s. These were Fairfield Osborn, William Vogt and Aldo Leopold, whose publications reignited the discussions on human reliance on the environment, adopting the concept of “natural capital” (Mooney and Ehrlich, 1997). Natural capital can be understood as all natural resources, in other words, the stock of material and information that exists in a given moment originated from natural environments, such as solar energy, soils, trees, minerals, fossil fuels, ecosystems and atmosphere (Costanza et al., 1997; Daly and Farley, 2004). This is the starting point for the flow of ecosystem services.

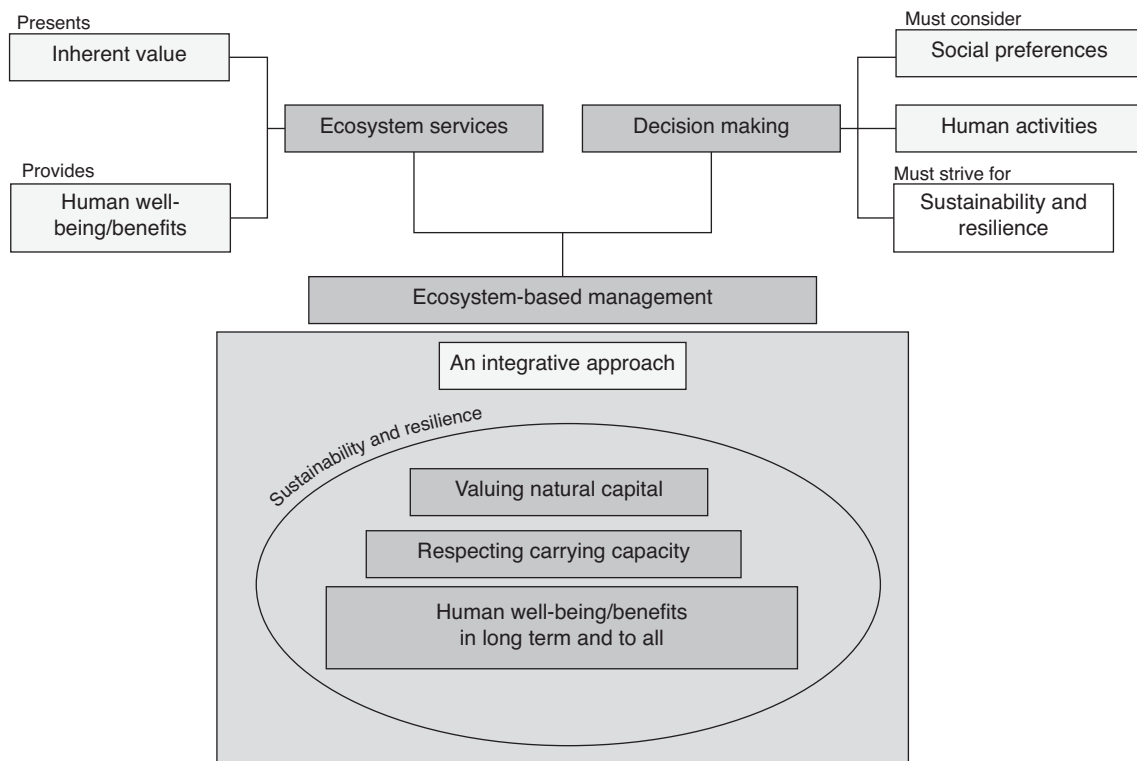


Fig. 1 – Schematic representation of how the ecosystem service approach and the decision-making process can be integrated to create an ecosystem-based management strategy.

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