

Ecosystem's Services Approach from an Economic Perspective

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Abstract. Continuous degradation of natural systems is proven by a number of factors such as the continuous reduction of forest area, the disappearance of many species and increasing the number of endangered species, coral reef bleaching, the proliferation of exotic species etc. If maintained at the current rate of biodiversity loss it is estimated that an area of 1.3 billion hectares will lose its full original biodiversity by 2050. Seventy percent of poorer people live in rural areas and depend directly on biological resources which provide 90% of its food, fuel, medicines, shelter and transportation. Over three billion people depend on marine biodiversity, and 1.6 billion rely on forest products. Habitat degradation and biodiversity loss threaten the living environment for over one billion people living in arid and semiarid areas, especially in Africa. The Economic approach has become increasingly sharp, both theoretical and practical and contributed to the emergence of new concepts with which the complex interdependencies between people and nature can be interpreted so as to provide relevant information for decision making. Among these, a key position is occupied by the concept of "ecosystem's services" around which most solutions can be incorporated into policies and strategies to protect biodiversity. The paper is structured according to these coordinates: delimitation of ecosystem's services; direct and indirect determinants of ecosystem change; correlation of services and functions of ecosystems.

Keywords: Ecosystem's services, Biodiversity, Economic approach

1. Introduction

The concept of ecosystem services is of relatively recent history, as originally proposed in the form of environmental services. Its rationale is the need to create a conceptual link between ecosystems and the human welfare state that allows quantitative expression of the value of ecosystems and the change propagation mechanism.

This link has been reported long ago by the renowned naturalists and ecologists such as George Perkins Marsh, Aldo Leopold, Fairfield Osborn and Paul Sears. In general, natural sciences and environmental signals about the state of society and suggests that essential elements of life in general, and thus human life, are dependent on proper functioning of the components of nature.

2. Delimitation of ecosystems' services

Contributions The Economic approach to nature has its origins in a number of theories developed since the eighteenth century. By contrast, the notion of ecosystem services is of relatively recent origin, close to the beginning of coherent environmental concerns, namely the 1970s.

A complete and detailed analysis of the evolution of conceptual was made recently by **Gomez-Baggethun et al. (2010)** proposing the division process in three stages: origin and genesis, consolidation, construction of market instruments.

Currently, although the issue of ecosystem services enjoyed great attention from researchers, the significance of the concept is still subject to different interpretations.

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1. Ecosystem services are the flows of materials, energy and information from natural capital stocks which combine with manufactured and human capital services to produce human welfare (**Costantza and colab., 1997**).
2. Processes by which the environment produces resources that are considered free of people, such as clean water, timber, habitat, pollination (**American Ecological Society, 2000**).
3. Ecosystem services are benefits that people obtain from ecosystems. (**MEA, 2005; TEEB, 2008**).
4. Are components of natural ecosystems services consumed or used directly to produce human welfare (**Boyd and Banzhaf, 2006**).
5. Conditions and processes through which natural ecosystems and species that are part of them, and necessary for human life. For example, providing clean water, maintaining a constant atmosphere (carbon sequestration), pollination of crops and flora, fulfilling the needs of cultural, spiritual and intellectual people (**FAO, 2008**).

Definitions from **Box 1**, reveal at least three meanings. Such flows are ecosystem services/ processes, benefits, and components. In the first case, decisions should be directed to the maintenance of such an intensity deemed appropriate, in the second would introduce how they contribute to human welfare (utilitarian approach), while in the third case targets should be expressed in a large stock (natural capital). In the light of quantitative analysis it is important to clarify these issues and the emphasis is on the last option, which may correlate with enough accuracy benefits.

Costantza and colab. (1997) identified 17 ecosystem services. The list of ecosystem services has been finalized taking into account the large classes of natural capital that are essential for human welfare, namely those for which qualitative or quantitative change may impact on welfare. Such changes include small changes in large scale and small scale changes. For example, relatively small changes in atmospheric composition (scale - global) can affect the viability and welfare of the global population, and large changes in species structure of forest ecosystems (small scale - local, regional) can degrade ecosystems having an impact on benefits and costs of human activities.

MEA (2005) identifies 24 ecosystem services that we grouped into four categories. Thus, ecosystem services are:

- Providing services for the life of material resources (food, freshwater, timber, fiber etc.);
- Regulating services (climate, invasions, pollination, natural hazards, erosion etc.);
- Cultural services (spiritual and religious values, education and inspiration, aesthetic and recreational values etc.);
- Support services (primary production, biogeochemical cycles, soil formation etc.).

3. Direct and indirect determinants of ecosystem change

The determinants are represented by natural and human factors that directly or indirectly cause changes in an ecosystem. Unequivocally they are influences on the ecosystem and are a direct determinant. More diffuse determinants act indirectly by altering one or more as determined directly. The main determinants of an ecosystem change can be Indirect such as: population (demographic), economic, social and political factors, key scientific and technological, and cultural and religious factors. With regard to the direct determinants, climate change, use of fertilizers, land conversion and habitat change resulting from invasive species and pathogens can be considered as a priority.

A change of ecosystem services is almost always caused by multiple determinants, which interact with one another. In addition, changes in ecosystem services can have a feedback effect, in turn influencing the determinants characteristics. Among these we mention the formation of new oportunities and constraints for land use, institutional changes in response to perceived and anticipated resource degradation.

4. Services-functions corelation of the ecosystems

"Ecosystem's services" is a relatively new approach developed as a result of economic pressure, and in turn, was adopted because it proved to be the most suitable in relation to the determinants of ecosystem degradation. In essence, it reflects an anthropocentric position in which nature is in service to humanity. In contrast, "ecosystem function" is a well-defined concept of ecology to describe the purpose of ecosystem interactions with the system at its higher level - the biosphere. To the extent that instead using an anthropocentric view ecocentrica practically overlapping functions and ecosystem services, because the company is one of the components of the biosphere, such as the welfare state is directly linked to the biosphere caused, in turn, the ecosystem functions.

Linking ecosystem services-functions is discussed by **Costanza and colab. (1997)** in a reference work for the evolution of the concept of ecosystem services. This distinction between the two concepts uses as the dividing line, utility, based on which there are functions of ecosystems, i.e. results that do not directly contribute to human welfare and ecosystem services, and results directly contributing to human welfare. In other words, the functions are indirect determinants of welfare and services as determined directly.

We next, try to show the correlation between functions and services, grouping of ecosystem functions that contribute to the manifestation of certain services. Such clustering is presented in Table 1.

Table 1. Ecosystem's services and functions

Ecosystem's Services	Ecosystem's Functions	Examples
Gas Adjustment	Adjustment of the chemical composition of the atmosphere	Results of carbon dioxide / oxygen, ozone protection against UVB, sulfur dioxide concentrations
Climate Adjustment	Adjustment of temperature, precipitation and other biologically mediated climatic processes at global and local	Adjustment of greenhouse gas emissions, which affect cloud formation
Disturbances Adjustment	Empowerment and integrity of ecosystem response to environmental fluctuations	Protection against storms, flooding, recovery from drought and other aspects of habitat response to environmental variability mainly controlled by vegetation structure
Water Adjustment	Adjustment of hydrological flows	Provision of water for agriculture (irrigation) and industry (washing ore) and transportation
Water Reserve	Water storage and retention	Provision of water in river basins, reservoirs and groundwater
Erosion control and sediment retention	Soil retention in an ecosystem	Prevention of soil loss by wind erosion, storm or other processes, deposit sediment in lakes and wetlands
Soil's fomation	Soil formation processes	Altered rocks and accumulation of organic material
Biogeochemical Cycles	Storage, internal circulation, processing and acquisition of nutrients	Nitrogen fixation, nitrogen cycle, phosphorus and other nutrients
Waste Treatment	Recovery of mobile nutrients and removal or breakdown of substances in excess	Waste treatment, pollution control, detoxification
Pollination	Movement of floral gametes	The provision of pollinators for the reproduction of populations of plants
Biological control	Adjustment of food-population dynamics	Control of key predators on populations of prey species, predators reduce herbivores to top
Shelter	Habitat for resident populations and in transit	Farms, habitats for migratory species, regional habitat for locally harvested species, or species wintering
Food Production	That portion of gross primary production that can be extracted as food	Production of fish, meat, crops, fruit by gathering, hunting, subsistence agriculture and fishing
Raw materials	Part of primary production that can be extracted as raw material	Production of timber, fuel and feed
Resurse genetice	Sources of biological materials and unique products	Medicinal products for materials science, genes for plant resistance to pathogens and pests of crops, ornamental species (pets, horticultural varieties of

Ecosystem's Services	Ecosystem's Functions	Examples
		plants)
Recreation	Providing opportunities for recreational activities	Eco-tourism, sport fishing and other outdoor recreational activities
Cultural	Providing opportunities for non-commercial use	Aesthetic value, artistic, educational, spiritual and / or scientific ecosystems

Source: Costanza, R., d'Arge, R., de Groot, R., Farber, S., Grasso, M., Hannon, B., Limburg, K., Naeem, S., O'Neill, R.V., Paruelo, J., Raskin, R.G., Sutton, P., van den Belt, M. (1997), *The value of the world's ecosystem services and natural capital*, *Nature*, 387, pp. 253-260.

Analyzing the representation in **Table 1**, we can see that between ecosystem functions and services is not always a one to one correspondence. In some cases an ecosystem service is the product of two or more functions of ecosystems, while in other cases a single ecosystem function contributes to two or more ecosystem services. It is also important to note the nature of the interdependence of ecosystem functions.

5. Summaries

Although the functions and services are interdependent, in many cases they can be combined because the ecosystem has common products that contribute to human welfare. **Costanza and colab. (1997)** underscores the need for a minimum of "infrastructure" for ecosystem services that can occur. This reveals another aspect of the correlation functions of ecosystem services, namely that the event service must meet a minimum level of function.

In the conceptual framework developed by **MEA (2005)**, a distinction is made between four categories of services: support, supply, adjustment and cultural aspects. Definition of the first categories creates difficulties for the delimitation of ecosystem services ecosystem functions. The proposed interpretation is in fact supported by services ecosystem functions. The same reasoning applies to the regulation services.

"Ecosystem's services" is one such a concept whose content cannot be so clearly defined as the concept of ecosystem functions.

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