C. R. Biologies 334 (2011) 441–449

Contents lists available at ScienceDirect

Comptes Rendus Biologies

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Biodiversity/Biodiversité

The diversity of the ecosystem services concept and its implications for their assessment and management

Implications de la diversité des définitions du concept de service des écosystèmes pour leur quantification et pour son application à la gestion

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ARTICLE INFO

Article history:
Available online 21 February 2011

Keywords:
Ecosystem services
Environmental services
Landscape services
Functions
Benefits
Semi-natural grasslands
Biodiversity

ABSTRACT

The ecosystem services concept is used in different scientific disciplines and is spreading into policy and business circles to draw attention to the benefits that people receive from biodiversity and ecosystems. However, the concept remains multiform and is used interchangeably with a range of other terms such as ecological, landscape or environmental services. We argue that lexical differences, in fact, result from different understandings of the concept, which could slow its use in nature conservation or sustainable resource use. An application to semi-natural grasslands shows that such differences could lead to very different assessments, of quality, quantity and location of ecosystem services. We argue that a compromise must be found between a broad and simple definition, which is useful for communicating the concept and large-scale policies, and a more refined definition for research and implementation goals such as environmental management and national and international assessments and accounting.

Mots clés :
Services des écosystèmes
Services environnementaux
Services du paysage
Fonctions
Bénéfices
Prairies semi-naturelles
Biodiversité

RÉSUMÉ

Le concept de service écosystémique est utilisé par de nombreuses disciplines scientifiques et commence à être largement utilisé dans le domaine politique et entrepreneurial. Pourtant plusieurs définitions et usages du concept coexistent, ainsi que des termes tels que services écologiques, environnementaux ou du paysage. Nous suggérons que cette variété terminologique traduit des différences de compréhension du concept. Celle-ci peut compliquer son utilisation pour la conservation de la nature et la gestion des ressources naturelles. Une application aux services fournis par des prairies semi-naturelles montre que ces différences peuvent amener à des évaluations très contrastées, que ce soit en termes de qualité, quantité ou localisation des services. Afin d'éviter ces problèmes, un compromis doit être trouvé entre une définition élargie et utile pour la communication et les politiques à grande échelle et une définition plus précise et donc plus adaptée aux actions de gestion des écosystèmes et aux exigences d'une comptabilité nationale ou internationale des services.

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1631-0691/$ – see front matter
doi:10.1016/j.crvi.2010.11.007

1. Introduction

Although the deliberate identification of the range of goods and services that people obtain from nature (e.g. game, berries and fruit...) is not new, it has received increasing attention in recent years under the banner of "nature's services" or "ecosystem services" [1]. This new way of framing the relationships between biodiversity, ecosystems and human well-being first gained strength in the field of nature conservation during the 1990s and later spread through a wide range of scientific disciplines [2,3] and more recently into policy and business circles [4,5].

The concept has provided a new, anthropocentric, justification for conserving species and ecosystems, based on our dependence on the goods and services they provide. Not only has it been widely used to draw attention to the importance of the benefits that people receive from biodiversity and ecosystems, it has also developed into a useful concept for framing the study of the relationships between nature, including both species and whole ecosystems, and the livelihoods of the communities that use or benefit from it. Part of the ecosystem and community ecology research communities took up the term as it shifted its focus from the effects of species number [6] on ecosystem functions such as productivity to the effects of the identity and abundance of species with particular sets of traits (i.e. functional diversity [7]) on ecosystem services [8,9]. Scientists working in the fields of agriculture, rangelands, forestry or natural resources in general have now taken up the concept of ecosystem services when referring to their positive outcomes for society, which were previously framed in terms of amenities or functions (as in multifunctional agriculture) [10]. These are used to better justify their practices or the considerable public support they sometimes receive (e.g. agri-environmental schemes under the European Union Common Agricultural Policy). The valuation of ecosystems by economists is not a new endeavour [11–13] but its importance has grown considerably as market-based instruments have gained strength in the formulation and implementation of conservation policies worldwide [14,15].

As the number of scientific disciplines that refer to the ecosystem services concept grows, and with its incorporation into political and corporate discourse, the concept is becoming multiform and harder to grasp, and it has generated debates about definitions and classifications [2,16–20]. The aim of this paper is to highlight the implication of terminological diversity around the ecosystem services concept rather than open a semantic debate. We first review the general terminology that has gained currency in the environmental literature, with a specific focus on the diversity of meanings and approaches that have been applied for the use of the ecosystem services concept in the recent literature. We then briefly illustrate the implications of such definitional choices for a case study that aimed to quantify ecosystem services provided by mountain grasslands. We end with a discussion of the implications for scientific and operational purposes of the use of a diversity of definitions for the ecosystem services concept.

2. Terminological diversity in concepts of nature's services to society

2.1. The different broad terminologies of nature's services

While the main term used in the ecological and nature conservation literature to describe all things nature provide us is "ecosystem services", a series of related terms and concepts (merge here under a generic term "nature's services") (borrowed from [1]) have been developed in other contexts and disciplines.

Ecosystem services sensu stricto are broadly defined in the reference [21] as the benefits people obtain from ecosystems (Table 1) and are classified in four categories: provisioning services (i.e. products obtained from ecosystems, such as food, fibre or timber), regulating services (e.g. flood or pest control and climate regulation), cultural services (i.e. non-material benefits such as aesthetic and recreational enjoyment) and supporting services (i.e. those services that are necessary for the proper delivery of the other three types of services, such as nutrient cycling). The validity of this last category has since been questioned as it amounts to mixing "ends" (i.e. services) and "means" (i.e. the ecological processes necessary) [17]. In a farming context, the concept of ecosystem services has also been used to refer to "input services" and "output services" for agriculture [22]. In addition, the term ecosystem goods (as in goods and services) is sometimes used for those services that have a direct market value such as food but both tangible goods and immaterial services provided by ecosystems are now generally labelled as ecosystem services.

Ecological services have been used by some authors as a synonym to ecosystem services [23,24] but the term sometimes refers to services provided by a particular species or group of species rather than processes occurring at the ecosystem level [25].

Landscape services and the terms land, land-use and landscape functions are widely used when referring to services supplied by regions, landscapes or land-use systems with the technical and socio-economic characteristics of the land-use system being taken into consideration together with abiotic and biotic components [26,27]. Landscape functions are often considered in terms of their "potential" for human use [28]. Other authors suggest that landscape services differ from ecosystem services in that they take explicitly into account the underlying role of spatial patterns, landscape elements and horizontal landscape processes [29].

Environmental services are often used as a synonym of ecosystem services in PES schemes (Payment for Environmental Services), where stewards are paid by third party beneficiaries for an activity aimed at intentionally transforming or maintaining some useful characteristics of an ecosystem (or landscape) [30]. Other authors have proposed to use the term environmental services to label human-made services, which totally or partially substitute ecosystem services [31]. This fits with the use of the term to label waste and water management services (as in the case of the company Veolia Environnement© which claims to be a "world leader in environmental services"). The term