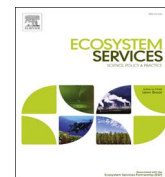


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The law, ecosystem services and ecosystem functions: An in-depth overview of coverage and interrelation

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ABSTRACT

Ecosystem services have been particularly since the Millennium Ecosystem Assessment in 2005 a broadly analysed issue. This discussion has been widely led by scholars from environmental and related economic sciences, while social scientists have paid less attention and legal scholars have hardly entered a deeper controversy about the topic.

This paper addresses the following questions

1. in how far law in general already currently covers – perhaps not explicitly - ecosystem services,
2. in how far law goes beyond the pure coverage of these ‘services’ and additionally covers functions of ecosystems which usually are not already considered ‘services’,
3. which consequences arise from this differentiated coverage by law, and
4. which services/functions of ecosystems the law and even governance in the widest sense are not able to cover at all or in particular situations.

The whole analysis is implemented by an in-depth review of existing academic literature as well as by means of theoretical and practical cases which support the arguments brought forward.

First, it is shown by examples that law covers since millennia the essence of all the main different ecosystem services but not necessarily by using the term ecosystem services.

Secondly, several cases describe how law addresses functions of ecosystems which often are not considered (anymore) by humans as ecosystem services, such as river floods, springtides and volcano eruptions.

Thirdly, among the consequences found are conflicting interests between more ecocentric related functions and more anthropocentric related services of ecosystems. Law has played in the past a pivotal role in fostering these ecosystem services. With regard to ecosystem functions the role of law has during the past been a less enabling, but rather a restricting one. However, some recent changes of this situation, e.g. in flood protection or wilderness conservation are shown.

Fourthly, the paper indicates e.g. natural genetic modifications and fertilizing through volcano eruption as services/functions of ecosystems which the law and even governance in the widest sense is not able to cover at all in the sense of enabling, but only – if at all - can cover in a reactive way.

The results of this contribution provide a basic assessment of the relationship between law and the functions as well as the services of ecosystems. In this way, the findings critically reflect potentials and pitfalls to be globally considered when intending to apply law on these features.

1. Introduction

Ecosystem services became since its coining as term in the early 80ies (Peterson et al. (2010) referring to Ehrlich and Ehrlich (1981))

one of the most prominent wordings in the environmental discussion in academia and its use since then is still increasing.

Numerous definitions followed of which some of the most mentioned are the one by Daily (1997 p. 3: “Ecosystem services are the

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conditions and processes through which natural ecosystems, and the species which make them up, sustain and fulfil human life”) and the one used by the Millennium Ecosystem Assessment (MA, 2005 p. V) defining them as “the benefits people obtain from ecosystems”. Numerous other definitions have been provided since then (for an overview see e.g. Braat and De Groot (2012), Danley and Widmark (2016)) and the development of the term ecosystem services towards an increasing anthropocentric (including economic) orientation has been pointed out (Brown et al., 2007; Peterson et al., 2010) as well as critically discussed (see e.g. Spash (2008), Redford and Adams (2009), Norgaard (2010), Vatn (2010), Schröter et al. (2014), Silvertown (2015), Potschin et al. (2016)).

Common to most of the definitions of ecosystem services is the focus on the utilitarian aspects for humans as well as that they do not include any concrete time scale. Already Daily (1997 p. 3), immediately after her widely cited definition provided above, additionally points out:

“They [ecosystem services] maintain biodiversity and the production of ecosystem goods, such as seafood, forage, timber, biomass fuels, natural fiber, and many pharmaceuticals, industrial products, and their precursors. ... In addition to the production of goods, ecosystem services are the actual life-support functions, such as cleaning, recycling, and renewal, and they confer many intangible aesthetic and cultural benefits as well.

Here Daily equals ecosystem services with “actual life support functions” (italics added by author) without clearly distinguishing between anthropocentric (in the sense of having utilitarian aspects for humans) and – opposite - ecocentric aspects (having the biosphere in its focus).

The Millennium Ecosystem Assessment (MA, 2005) then explicitly used “support” to circumscribe one aspect of the term ecosystem services as “Supporting” Services in an anthropocentric way and concentrated the discussion towards attributes benign to humans. In particular after the MA (2005), the discussion about ecosystem services broadened this “capacity side” of ecosystem services towards distinguishing (more or less clear) among structures, processes, functions, services, benefits as well as values and thereby borrowing strongly from the past literature related to these additionally introduced terms (see e.g. Potchin and Haines-Young (2011)).

Authors (such as De Groot et al. (2010)) thereby separate ‘functions’ from the fundamental ecological structures and processes, in the sense that the concept of functions not only describes the above-mentioned combinations of structure and processes, but at the same time represents the potential that ecosystems have to deliver a service. In a rather anthropocentric sense, Potschin and Haines-Young (2011 p. 578 with further discussion) use the word ‘function’ “to indicate some capacity or capability of the ecosystem to do something that is potentially useful to people.” Also anthropocentrically limited, already de Groot et al. (2002 p. 394) define ecosystem functions as “the capacity of natural processes and components to provide goods and services that satisfy human needs, directly or indirectly” and indicating before that “(i)n the ecological literature, the term ‘ecosystem function’ has been subject to various, and sometimes contradictory, interpretations.” but without adding an citation.¹ Similarly, some use the terms “Ecosystems functions and elements” wherefrom an “Ecosystem Service Potential” derives (Spangenberg et al., 2014). But the same authors negate that ecosystem functions determine ecosystem services and instead refer in this regard to the use-value attribution which transforms the ecosystem functions into ecosystem service potentials (ESP) which is followed by a change of service potentials, towards

different mobilisation and appropriation patterns, and different benefits (Spangenberg et al., 2014).

This discussion overview shows a diverse understanding of the term “ecosystem function” with a rather clear focus on a more anthropocentric interpretation with a utilitarian background. Functions of ecosystems should be instead seen – starting from a more ecocentric view - as environmental capacities in the sense of biotic and abiotic stocks and flows from ecosystems (Mauerhofer, 2008a) which are capable to provide benefits to both, humans and non-humans. The actual take through humans in form of an appropriation, possession or use of these stocks and flows (in terms of both, goods and services) was then usually simply connoted a service, an ecosystem service.

This widespread connotation has been for example criticised by Peterson et al. (2010) (113, referring to Odum and Odum (2000:21)) in the following way:

“Reframing ecosystem functions as economic services does not address the political problem of commodification. Just as it obscures the labor of human workers, commodification obscures the importance of the biota (ecosystem workers) and related abiotic factors that contribute to ecosystem functions. This erasure of work done by ecosystems impedes public understanding of biodiversity. Odum and Odum’s radical suggestion to use the language of ecosystems (i.e., emergy or emergy memory) to describe economies, rather than using the language of economics (i.e., services) to describe ecosystems, reverses this erasure of the ecosystem worker.”

In any way, the value of the whole extent of functions and, thus, also therefrom deriving stocks and flows for non-humans has to be respected and taken into consideration, too.

Already Sutherland et al. (2009) listed eight questions related to “Ecosystem Function and Services”, one of the twelve thematic areas used when trying to identify hundred questions of importance to the conservation of global biological diversity. Furthermore, Braat and De Groot (2012) point on the still poor understanding of the quantitative relationships between aspects of biodiversity, ecosystem components and processes, functions and services. Thus, apart of a more coherent terminology, also knowledge in practice on the relationship among the attributes is highly wanted.

For instance also in connection to law, Breure et al. (2008) call for focused research on the proper qualitative relationship of ecosystem structure (species composition) and ecosystem functioning and on the impact of disturbing the environment and appropriate management measures in the ecological assessment methods for system-oriented ecotoxicological research and its legal applications. Approaches to legally address functions of individual types of ecosystems have been starting earlier. For example, Rombke et al. (2005) point out legal initiatives particular for natural functions of soils that have been introduced e.g. in the Netherlands since 1987. Even younger than the focus on ecosystem services is the coining of the term “Ecosystem Management” (ESM) starting with the early 1990ties in the US (Robbins, 2013) but which takes – opposite to ecosystem services – a clearly ecocentric direction towards the intrinsic value of nature (see also e.g. Vogt et al. (1997) and Yanhong et al. (2008)). In comparison, according to an earlier prominent - because globally agreed - definition (UN CBD, 1992) the term “biological diversity” means the variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems;”. Here, a sole biotic focus could be – at the first view - visible while intrinsic value such as focused on in ESM upon can additionally cover abiotic elements such as geologic formations. But the definition of “ecosystems” in the CBD clearly also refers to abiotic elements such as following: “‘ecosystem’ means a dynamic complex of plant, animal and micro-organism communities

¹ The restriction to human “needs” in this definition is also not clear, as these functions in practice also satisfy (at least some) human wants (apart of the needs and wants of non-humans).

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