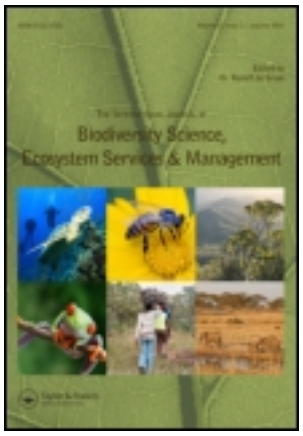

International Journal of Biodiversity Science, Ecosystem Services & Management

Publication details, including instructions for authors and subscription information:
http://www.tandfonline.com/loi/tbsm21

Ecosystem services and landscape management: three challenges and one plea

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Version of record first published: 11 Sep 2012.

To cite this article: Gunhild Setten , Marie Stenseke & Jon Moen (2012): Ecosystem services and landscape management: three challenges and one plea, International Journal of Biodiversity Science, Ecosystem Services & Management, 8:4, 305-312

To link to this article: http://dx.doi.org/10.1080/21513732.2012.722127

International Journal of Biodiversity Science, Ecosystem Services & Management
Vol. 8, No. 4, December 2012, 305–312

Taylor & Francis
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Ecosystem services and landscape management: three challenges and one plea

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This article identifies three interrelated challenges concerning the ecosystem services (ES) framework and the nature of landscape dynamics within the context of landscape management. These challenges are set within a problematic externalization of nature inherent in the ES framework. The first challenge concerns the lack of compatibility between the ES framework and the logics of landscapes. The second challenge addresses the complexity of ecosystems, unsubstitutable values, and intangible dimensions in economic valuation when applied to landscapes. The third challenge points at how the ES framework has problems in accounting for how and why sociocultural processes are crucial to environmental attitudes and behavior. We argue that the idea of landscape and its inherent landscape dynamics, a crosscutting dimension of these challenges, is a missed opportunity for the ES framework in order to take immeasurable and context-specific social and cultural processes more seriously and consequently deliver sounder advice on landscape management. We thus make a plea for the importance of creating platforms for dialogue across research communities working to improve the understanding of human–nature dynamics.

Keywords: ecosystem services; landscape dynamics; landscape management; social and cultural services; nature–culture relations

Introduction

In the early 1980s, Ehrlich and coworkers (Ehrlich and Ehrlich 1981; Ehrlich and Mooney 1983) introduced ecosystem services (ES) as a pedagogical tool to raise the public awareness of the many services that ecosystems provide to humans and in that way argue for protection of those ecosystems. By joining forces, economists and ecologists have established ES 'as a way of framing conservation imperatives to convince humans of the value of the natural world' (Redford and Adams 2009, p. 785). Even though it may have been painful to those who value nature for its intrinsic values, it has been argued that 'the use of market metaphors was necessary to awaken a public deeply embedded in a global economy and distant from natural processes' (Norgaard 2010, p. 1219). Yet, for almost two decades, very few took any notice of the ES framework (at least as reflected in the very low number of papers published on ES). This changed in 1997 when Costanza et al. (1997) put forward the proposal that the Earth is worth $33 trillion. Since Costanza et al.'s 'undeniably intoxicating' (Robertson 2012, p. 387) estimation of the Earth's worth, the number of research papers on ES has grown almost exponentially. While the Millennium Ecosystem Assessment (Millennium Ecosystem Assessment 2005) lacked data to continue the valuation of services, this challenge has been taken on by the recent TEEB project (The Economics of Ecosystems and Biodiversity; TEEB 2010a): 'Ideally, TEEB will act as a catalyst to help accelerate the development of a new economy: one in which the values of natural capital and the ecosystem services which this capital supplies, are fully reflected in the mainstream of public and private decision-making' (TEEB 2010b, p. 3). This commodification, and on the whole neo-liberalization of nature, coupled with arguments for nature conservation, is thus made possible by a narrow and simplistic understanding of *value* disconnected from the complexities of the social world (cf. Chan et al. 2012; Dempsey and Robertson in press).

Awareness-raising and boosting arguments for the value of ES for nature conservation is hence not to be confused with developing strategies for sustainable management of biotic qualities. The emergence of ecosystem management as a means of obtaining a sustainable use of natural resources has highlighted the importance of ecological processes and governance at larger scales than individual management units (e.g., a single farm or forest stand; de Groot et al. 2010; Kenward et al. 2011). Crucially, this is not only a call for broadening the scalar complexity of governing ecological processes. It is equally a call to approach ecosystems generally, and ES more specifically, beyond the economic framework so characteristic of the majority of ES research (Chan et al. 2012). The political 'appetite for economic decision-making frameworks' (Chan et al. 2012, p. 16) is thus increasingly questioned, and the field of ES is becoming somewhat of a political and academic battlefield (e.g., Chan et al. 2012; Robertson 2012, Dempsey and Robertson in press). Fish (2011) holds that the implications of embracing ES within 'environmental decision-making

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ISSN 2151-3732 print/ISSN 2151-3740 online

http://dx.doi.org/10.1080/21513732.2012.722127
http://www.tandfonline.com

are little understood (cf. also Chan et al. 2012). Many ecologists criticize the ES concept in that the current obsession with end products ('services') ignores the species and processes that actually produce those end products (see, e.g., Peterson et al. 2009). This has resulted in attempts to incorporate species and functional traits in relation to services produced (e.g., de Bello et al. 2010; Lavorel et al. 2011). However, it is unclear how well this can be integrated into current valuation schemes.

This article is a direct response to much of the recent questioning of the ES framework. We come from the disciplines of ecology and human geography, respectively, and are joined by an interest in landscape dynamics, a concern central to both disciplines. A basic premise for our arguments in this article is that landscapes, landscape dynamics, and ecosystems are closely related. Landscapes are, both physically and symbolically, made through nature–culture relations. Consequently, any understanding of landscapes must draw on cross-disciplinary as well as cross-sectoral insights. In this article we want to make the case that this has implications for ES within the context of landscape management.

The European Landscape Convention (Council of Europe 2000) enforces the signature parties to legally acknowledge the landscape as a unit for management in both ecological and social terms. By defining landscape as 'an area, as perceived by people, whose character is the result of the action and the interaction of natural and/or human factors' (Council of Europe 2000), the Convention moves us straight into the complexity of landscapes. We are also taken into the daunting complexity of the social world for the meaning and value of landscapes and ecosystems. We believe this is a much needed move, though, if we are to take the ES framework seriously as a framework for 'taking account of ecosystem services within decision making' (Fish 2011, p. 672). This is consequently a response to those who argue for opening the door to 'other social perspectives – those more fully representative of the vicissitudes of human behavior and the less tangible social and ethical concerns' (Chan et al. 2012, p. 8). Importantly, this also opens the door to acknowledging the issue of (the nature of) language, both between the human/social sciences and the natural sciences, as well as between experts and stakeholders, for decision-making. The now global debate about ES is taking place within a wide range of disciplines and institutions. Even though proponents and critiques coexist within these disciplines and institutions, it is more often the case that scientific ES critique is raised from quarters outside core ES disciplines such as ecology and economy, i.e., quarters often with scant contact with this 'core.' Much of this critique is directly or indirectly addressing the complicated fact that the ES framework contains an implicit mix of descriptive and normative attributes. The purpose of the ES framework is thus left open for contested and contradictory interpretations across both science and policy, i.e., it is in many respects vague and elusive, both conceptually and methodologically. Strunz (2012) holds that vagueness is an inherent quality of the social world and consequently reflected in social sciences – and not a problem per se – yet it poses huge challenges when it comes to political decision-making. This is highly relevant for the valuation and operationalization of ES. More specifically, it concerns language and knowledge production in a broad sense, and we return to this later in this article.

So, what is the relevance of a landscape perspective within this context? By using landscape as a critical lens on the ES framework, we want to discuss the usefulness of the ES concept in framing and analyzing the management of landscapes. Our aim is to illustrate what we believe are some key areas that need to be critically discussed and clarified. We wish to point out that, while we may appear critical to the ES framework, the purpose of this article is not to argue for the abandonment of the framework but to engage in a critical discourse in order to develop the framework further. In the following, we therefore discuss three interconnected challenges. The first challenge concerns the ES framework and the logics of landscapes, where we argue that only with difficulty can one identify compatibility between the two. The second challenge addresses the relationship between landscape management and economic theory. In order to demonstrate this challenge, we investigate the effects of adapting landscape management to economic theory through connecting the end products (the services) and the landscape that produces those services. Our third challenge revolves around what are termed social and cultural services within the ES framework and relational landscape dynamics. The cultural services have not been treated with credibility within the framework. This is much due to the scientific language they come in. We are not, however, reducing the ES debate to merely a question of semantics. We rather argue that there is a well-developed social science language that can inform the debate about ES in general and the social and cultural services in particular. This article is drawn to a close with a plea that a landscape perspective could represent an opportunity for taking social and cultural processes more seriously within the framework by integrating theoretical developments in both the social and natural sciences. We end with a note on how sciences can handle concepts and frameworks that have gained rhetoric power within political circles. Rhetoric power within the environmental policy field is (too) often based in a society–nature schism, i.e., nature as externality. This, no doubt, has fundamental implications for the understanding of landscape dynamics, landscape management, and the design of strategies for sustainable use (TEEB 2010a).

First challenge: ES and the logics of landscapes

A range of disciplinary perspectives on landscape(s) compete for explanatory authority on its nature and consequent dynamics. It is, however, widely acknowledged that nature and society cannot be regarded as separate realms. The management of our physical environment must

rather be considered within a multidimensional framework where societal values, such as human well-being and cultural heritage, are recognized (European Science Foundation 2010). This is also expressed in the ecosystem approach from which the ES framework emanates. In presentations of the framework and its terminology, there is, however, an implicit divide following the traditional structure in science, with nature providing services and human society benefitting from it (Costanza et al. 1997; Millennium Ecosystem Assessment 2005). For instance, ecological systems and the social sphere are often portrayed as separate entities in conceptual models, with ES or land use as the connections (see, e.g., Diaz et al. 2011). Notwithstanding that The Millennium Ecosystem Assessment acknowledges that human management has created or modified almost all ecosystems, the conceptualization blurs that long-term interactions between humans and nature also have created much of the identified services and are continuously vital for their maintenance. Examples are biodiversity richness in semi-natural grazing lands, productivity through plant breeding, water provision in wetfield cultivation, not to mention many of those services that are labeled as cultural. There is, thus, a fundamental paradox inherent in the ES framework: while empirical evidence increasingly demonstrates that the world's ecosystems cannot be understood without accounting for the strong and often dominant influence of humans, a separationist way of talking about things is maintained (Head 2007). Moreover, research drawing on the ES concept characteristically tries to build a unity from single components by departing from a number of services and then analyzing interactions and trade-offs (de Groot et al. 2010; Raudsepp-Hearne et al. 2010). In contrast, a large body of landscape research within the social sciences and humanities holds the unity, the landscape, as a premise and a starting point (cf. Hägerstrand 2001).

Another commonly agreed characteristic of landscape(s) is spatial variation. The intricate and unique constellation of material as well as immaterial aspects in delimited areas demands a design of landscape management which is able to orchestrate a complex web of features and processes (TEEB 2010a). In a relational perspective on society–nature interactions and focusing on the material dimension, a landscape can be described as an arena where various societal projects and land use interests coincide in space and time with physical structures and nonhuman flows. Such land use interests are, e.g., agriculture, forestry, reindeer herding, recreation, cultural heritage, and nature conservation. The continuous interactions are influenced by external and internal driving forces, which affect the power relations between land use interests. Drivers of land use change operate at various spatial, temporal, and institutional scales and also differ depending on local socioeconomic and biophysical characteristics. The manifestation in the physical landscape, the landscape dynamics, will be place specific and dependent on concrete human actions. The landscape dynamic thus results from the interplay between various land use interests, with both synergies and trade-offs, as well as on the response from the nonhuman components affected by the actions (Hägerstrand 1982; Stenseke et al. Forthcoming 2012). In terms of ES, the existence of various land use interests implies that a multitude of services can potentially be generated within the same landscape (Rodríguez et al. 2006; Kareiva et al. 2007). In order to design efficient strategies for sustainable landscape management, it is crucial to understand the relationships between services within a specific landscape in the perspective of a multitude of land use interests (Bennett et al. 2009) and to take into account trade-offs between different services (Foley et al. 2005; Tallis et al. 2008; Raudsepp-Hearne et al. 2010). Because far from all services can be maximized in an area, measures dealing with landscape management consequently have to include priorities. In practice, place-specific negotiations between various conservation objectives as well as between conservation objectives and other societal objectives are inevitable.

The issues of spatial and temporal scales also call for caution when using ES as a concept within the context of landscape dynamics. The extent of human mobility and impact has increased considerably over the last centuries. This makes it difficult to determine the appropriate scale for elaborating and analyzing ES. Similarly, there have been remarkable transformations in modern times in how humans relate to nature, much due to fundamental urbanization processes. Moreover, in the developed world the techniques for cultivation and extraction have shifted, but also the role and use of the physical environment itself, with, for example, recreation and outdoor activities for well-being having developed as an increasingly important land use interest. What could be labeled as a service is thus time specific, and the globalization of society makes it complicated to identify who is served by the ecosystem, even within delimited areas.

In conclusion, then, we find there is a fundamental challenge related to ES as a concept and the logics of landscapes. This is because the conceptualization of ES insists on reproducing a largely separationist perspective on humans and nature. At the same time, time and space scales of inherent heritage values are little recognized.

Second challenge: landscape dynamics and the economic bias in the ES framework

It is evident that a large part of the research around ES today is framed around the monetary valuation of services; for instance, in a literature review by Dick et al. (2011), 35% of the 1821 papers found contained both search words 'ecosystem service*' and 'econom*.' The initiative for this focus on the economics of ES came from conservationists who wanted to strengthen the arguments against biodiversity losses (Gómez-Baggethun et al. 2009; Salles 2011), while the economists were sometimes less convinced of this approach (e.g., Hanley et al. 1995; Nunes and van den Bergh 2001). Nevertheless, considerable effort has been put into developing methods for

valuing nonmarket-based ES, including contingent valuation, choice modeling, the travel cost method, and hedonic pricing (excellently summarized in TEEB 2010a). Recently, the concept of payments for ecosystem services (PES) has attracted a lot of attention as a way of internalizing environmental externalities by paying land users to protect or produce certain services. All together, this places conservation policies right at the core of current neoclassical economic theory.

Several authors have criticized this move into economics from various aspects. Van Hecken and Bastiaensen (2010) point out that the framing of environmental problems as externalities creates a mind-set where it is inevitable that there will be inappropriate price signals for environmental degradation. Wegner and Pascual (2011) argue that ecosystems and ES have certain characteristics that challenge some theoretical assumptions of neoclassical economics, such as intangible dimensions of human well-being; characteristics based on intrinsical and collective values rather than values of individual utility; and dynamics characterized by thresholds, complexity, and uncertainty (cf. the notion of 'resilience'; Folke et al. 2004). Kumar and Kumar (2008) discuss the shortcomings of assumptions on rational economic agents, well-functioning markets, and consistency of preferences in valuation of ES, while Kosoy and Corbera (2010) base their criticism of PES on Marxist theory. The latter focus their discussion on the commodification of ES which they claim involves narrowing down ecological functions into a single 'service.' This separates services from the ecosystem and assigns a single exchange value to this service where prices tend to be socially constructed rather than reflecting real changes in the quantity or quality of the service. This obscures complexities and interrelationships in ecosystems and draws boundaries that are difficult or impossible to define. Further, valuation has difficulties in handling varying temporal scales, where the use of discounting future costs and benefits may have deep ethical dimensions (TEEB 2010a).

These theoretical problems with economic valuation of ES are brought to the fore when the approach is placed in a delimited landscape. Several studies indicate that, when using a spatially explicit approach, the results of valuation studies are context or place dependent (e.g., Pagiola et al. 2004; Satake et al. 2008; Potschin and Haines-Young 2011). For instance, different groups of people may derive well-being from different ES. This creates winners and losers as ES change (Daw et al. 2011; also see our first challenge). The designation of a protected area may thus be good from a tourism perspective and bring revenue for tourism companies, but may severely hamper the livelihood of farmers or hunters who were unable to make the transition to a new economy. A place-based, or landscape, perspective is thus necessary in order to specifically deal with trade-offs and to understand cross-scale or multiscale impacts of the promotion of particular ES. This becomes paramount when so-called cultural services are discussed in our third challenge, as described below.

In an attempt to critically discuss valuation of ES, Wegner and Pascual (2011) suggest that economic valuation may be an expedient way of informing policy processes when (1) the subject of valuation is a simple good that is privately owned and traded in a market, or where (2) the subject of valuation is a local project with a limited spatiotemporal extent. Both of these criteria are seldom fulfilled in a landscape context. Wegner and Pascual (2011) further suggest that alternative tools based on deliberative democracy are better suited when decisions involve intangible dimensions of human well-being, intrinsic ethics, critical thresholds, scientific uncertainty, significant distributional biases, and spatiotemporally extensive ecological impacts, which characterize many ES. In short, economic valuation methods seem poorly adapted to ES, and even more so when applied to a landscape as defined by the European Landscape Convention.

Third challenge: cultural services and the nature of relational landscape dynamics

The problem of externalizing and commodifying nature is well illustrated by what are cast as 'cultural ES.' These are designed to provide an understanding of human benefits from nature and the consequent social, economic and environmental changes that arise (UK NEA 2011, Ch. 16, p. 8). This more explicitly interpretative conception of natural resources is nevertheless a reductionist view on culture as a 'service' provided by ecosystems, implying 'a linear and deterministic relationship between ecosystems and culture' (Fish 2011, p. 674). Fish (2011) thus aptly points out that 'advocates of the ecosystem services framework face a steep climb in winning the hearts and minds of cultural theorists . . . .' This is not because the cultural services identified within the framework, do not, from a cultural theorist perspective, fall under the rubric of cultural signifiers. It is rather the scant treatment and poor understanding of their 'nature' which makes the ES framework hard to embrace. The fact that the so-called cultural services are a mostly neglected part of the framework is, according to Schaich et al. (2010), due to a lack of contact between what might be labeled the ES research community and research communities that for a long time have been busy analyzing and explaining the role of so-called cultural services for human well-being. This is a relevant argument, yet it provides no answer to why this is the case. Sharman's critical observation is useful here: 'Much current environmental policy is built on the assumption that ecosystem services are properties of the ecosystem itself, and therefore independent of the stakeholder, and at the same time linked to the biodiversity from which they derive' (Sharman 2010, p. 1). In line with Sharman, we find this decontextualized assumption fundamentally problematic. Context – whether cultural, social, economic, or spatial – is a crucial premise for even talking about benefits, services, and well-being 'provided' by ecosystems. Cultural 'benefits' have been the concern for many social scientists for a long time. There are well-developed languages and theories to

capture the complex nature of these 'services.' Importantly, then, cultural services are not under-researched, nor poorly understood as such, but they come in a different language. Furthermore, cultural services cannot and should not be reduced to externalized 'services.' Finally, they are most often not framed within economics or ecology. Very often these aspects of nature have been addressed within a qualitative landscape perspective, and research has demonstrated that a useful place to start addressing what *can* fall under the rubric of 'cultural services' is to talk about landscapes. This is, in fact, acknowledged in the recently published UK NEA (2011, p. 10) where it is pointed out that 'the term "ecosystem services" is not a meaningful framework for the interpretation of human-environment relationships for the vast majority of people; yet it has gained recent traction in policy. Culturally, the concepts which have most meaning are those of "nature", "place" and "landscape"'. This points back to the introductory argument we made about the importance of language for the conceptualization and operationalization of ES. According to Strunz (2012, p. 116), common understanding between stakeholders and scientists are more easily and usefully framed by everyday language rather than scientific terms: 'Conceptual rigor and abstract, theoretical knowledge do not necessarily contribute to that aim.' The ES framework is consequently getting increasing foothold within environmental policies across the globe, although not within the public sphere (at least not in Europe), and to a limited degree among social scientists working within what we might call the environmental and ecological humanities (Head et al. 2005); for example, human geography, anthropology, and environmental history. This is rather ironic, because it is a fact that cultural services 'are seen by stakeholders as highly important, but that there is uncertainty over how they should be addressed' (UK NEA 2011, Ch. 16, p. 13).

So rather than taking people's language seriously, the UK National Ecosystem Service Assessment (UK NEA 2011) suggests 'environmental settings' as the final cultural ES. An environmental setting, a spatial category crossing different scales – e.g., a garden, a neighborhood, the countryside, or the nation – is the unit *containing and delivering* cultural services such as heritage values, possibilities for doing outdoor recreation, and experiencing wildlife. But does the idea of 'environmental setting' advance the understanding and consequences of social and cultural processes in relation to ecosystem use and change? We need yet again to return to the age-old discussion about the relationship between humans and nature. A whole series of concepts, ideas, and frameworks within and across the natural and social sciences have been developed in order to communicate, capture, and explain our relationship to nature. All of these have been designed to get both society and nature right, not to say the relationship between them. Importantly, these conceptualizations are often competing, yet united in the fact that they tend to separate humans from nature. As anthropologist Ingold (2000, p. 58) argues: 'Something . . . must be wrong somewhere, if the only way to understand our creative involvement in the world is by taking ourselves out of it.' In the ES framework people are taken out not only once, but twice: first, the way the four categories of services are designed is not only a demonstration of a linguistic separation. Provisioning, supporting, and regulating services are moreover on a different level than culture, and the first three are seen to belong to the natural and hard sciences and is within ecology relatively easily separated from culture. Second, the final cultural service of 'environmental setting' is ironically also taking people out because a setting is conceptualized as a rather passive container of human values and practices, even though it is claimed that a setting is coproduced by interactions of humans and nature. It thus appears very hard to assign the environment any form of agency, i.e., to handle that the environment comes into being *through* people's embodied practices and aspirations, i.e., it is relational and processual (Setten 2004). This can be handled by the current nature of the ES framework only with great difficulty.

One plea: ecosystemic challenges and landscape dynamics

We have pointed at three challenges related to the ES framework and landscape dynamics when it comes to sustainable landscape management and conservation politics. We have demonstrated a lack of compatibility between the framework and the inherent character, or the logics of landscapes; that difficulties arise in addressing the complexity of ecosystems, unsubstitutable values, and intangible dimensions in economic valuation when applied to landscapes; and that the ES framework to a large degree falls short in understanding how context-specific sociocultural processes are crucial to environmental attitudes and behaviors. Consequently, we want to end on a cautious note even though many worthwhile and important steps toward management and conservation have been taken within the realm of ES research (summarized in TEEB, 2010a, 2010b). We agree, however, with Chan et al. (2007) in emphasizing that we cannot rely on economics to single-handedly reverse the degradation of ecosystems or design sustainable landscape management. It must be acknowledged that the lack of convergence between assumptions in economic theory and the complexity of ecosystems will more often than not lead to market failures and prevent an efficient allocation of resources to conservation even under the best of intentions. In our view, a key issue that must be further elaborated for future development of the ES framework is the decoupling of ecosystem function, caused by the organisms and their interactions, and the ES that only looks at the end products of those functions (cf. Peterson et al. 2009), as, e.g., the 'environmental setting' discussed above. For instance, it is problematic that a key provisioning service such as the production of fiber from wood may be as, or even more, efficiently produced by single species, non native stands as produced by native multispecies forests while being minimally useful

in biodiversity protection (Myers 1984). It is somewhat of a paradox that initial attempts to argue more strongly and clearly for ecosystem conservation by focusing on the services provided (e.g., Ehrlich and Mooney 1983) have led to a shift in conservation thinking toward economics that may actually reduce our understanding of human dependence on ecosystems.

As for the framework's ability to grasp cultural and social processes, identifying and measuring cultural services is to a large extent an exercise in understanding people's perceptions of the environment and the subsequent decision-making processes. So, there is a recognition in the ES framework that one needs to pay attention to what we might call 'cultures of nature': 'sets of beliefs, practices and often unarticulated assumptions which underlie human relations with the environments in which people live' (Head et al. 2005, p. 252). We note that there are considerable conceptual overlaps between landscapes, as it is conceptualized in the long tradition of studying context-specific co-constitutions of humans and nature particularly within human geography, and what are cast as cultural services. We argue therefore that landscape is a missed opportunity for the understanding of human–nature dynamics: *because* landscape is an everyday concept, it provides stakeholders with both a material and symbolic tool to communicate their feelings, experiences, and shared knowledge about the co-constitution of the social and natural worlds. A more interpretative and relational landscape conception thus contributes to open up for key democratic issues related to, e.g., use, distribution, and participation in the management of natural resources, without taking a reductionist and commodified view on the social world. Consequently, landscape keeps people in: because landscape is both symbolic and material, the human is folded into the concept itself. This is a direct response to the problems that arise when culture and nature are separated. It is also a concept used within a large number of disciplines – 'It has [for example] provided a vehicle for ecological science to recognize positive as well as negative human contributions to biodiversity' (Head Forthcoming 2012) – as well as within a number of policy fields.

Research on cultures of nature tends, however, to bring out the tension between science-dominated environmental research and management and cultural understandings. We believe that some hindrances for acknowledging landscape as a fruitful complement to the ES framework are related to the following points: landscape is a highly context-specific notion; it is often a subjective feeling; it is ridden with a complex scientific and political history; it has different meanings and connotations in different disciplines; and a number of landscape studies tend to be too set on the local level. Hence, there is a need to acknowledge that landscapes are locally manifested yet made by forces that at present are very much global. Additionally, and importantly, landscape is not an inherent property of a narrow set of disciplines. We would thus make a plea for a closer collaboration between research on ES and research in the social sciences on landscapes and cultural 'services.' Currently, these are parallel research discourses, each having a deep understanding from their respective perspectives. We believe it is crucial to create platforms for improving the possibilities to communicate across these discourses. This would mean a significant step forward in understanding and enabling conservation and management policies in landscapes.

A wider conclusion here points to the need to acknowledge the distinction between terms used in policy rhetoric on the one hand, and researchable conceptualizations on the other. ES debates go well beyond semantics. These are terms that 'do work.' The concept of ES has been launched to boost argumentation for nature conservation. Similar to other concepts within the environmental discourse, it is thus not designed as a tool for scientific structuring and analyses. This calls for caution when it is introduced in science; the weaknesses of the concept, and consequently the framework as a whole, have to be recognized, made transparent, and addressed. The research design and methodology have to meet the shortcomings, and importantly also the analysis and interpretations of the results. In the quest for sustainability, we need research that critically scrutinizes frameworks and concepts in tandem with research aiming at solving problems as they are perceived in prevailing frameworks for action (Jerneck et al. 2011). In order to find strategies for preventing further biodiversity losses, research on how to solve the problems as they are defined and framed in existing paradigms has to be performed together with research that examines prevailing institutional orders, power relations, biases in how problems are framed and defined, and the usefulness and effectiveness of frameworks and concepts. We believe that the ideas of landscape and landscape dynamics, cutting across the challenges we have addressed, can shed light on the usefulness of the ES framework for conservation politics, both as a policy tool and an analytical device for science.

Acknowledgements

We thank the anonymous reviewers for their comments that greatly improved this article. JM was supported by Future Forests, a multidisciplinary research program supported by the Foundation for Strategic Environmental Research (MISTRA), the Swedish Forestry Industry, the Swedish University of Agricultural Sciences (SLU), Umeå University, and the Forestry Research Institute of Sweden (Skogforsk). MS was supported by The Swedish Research Council for Environment, Agricultural Sciences and Spatial Planning (FORMAS).

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