



From regional environmental planning to implementation: Paths and challenges of integrating ecosystem services



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ABSTRACT

Planning and governance at the regional scale is a promising field for the application of the ecosystem service (ES) concept. The objective of this paper is to explore the potential implications of integrating the ES concept into regional planning and governance. We focus on two pathways of influence: (i) information on ES and their values as decision-support in planning and management, (ii) the ES concept as a boundary object for facilitating cross-sectoral interaction and collaboration.

A case study illustrates the effects of applying the ES concept in planning processes. The usefulness of the ES concept as a boundary object was derived from focus groups with scientists and practitioners. Integrating the ES information into planning, facilitates the consideration of trade-offs and multi-functionality in decision-making. Furthermore, it helps people to recognize how individuals or societies are affected, thus, improving preconditions for public participation. Additionally, ES can serve as a mutual reference level within the valuation and monitoring systems of different environmental disciplines. Challenges are found in assessing utilized ES and differentiating benefits for public and individuals. Employing economic valuation could supplement existing planning procedures, but carries risks. There is a need for research in the field of applicable assessment methods and standardizations.

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1. Introduction

'Governance' describes the collaboration of governmental agencies and non-governmental (private) actors (e.g. NGOs, companies, citizens), towards joint objectives, and within a system of rules and regulations (hierarchies, markets, networks, communities) (Bache and Flinders, 2004a,b; Benz, 2009, 2001). Consequently, governance includes both formal and informal coordination and cooperation processes among, across, and beyond different sectors of public administration.

It has been increasingly recognized that environmental problems can only be sufficiently handled in an integrative and adaptive way to include diverse policy fields from all scales and actors from different fields (Huitema et al., 2009; Pahl-Wostl et al., 2012). However, the administrative systems of many European member states are predominantly sectorally organized (Knüppe and Pahl-Wostl, 2013; Nielsen et al., 2013). Cross-sectoral coordination is emphasized as a challenge in administrative systems in Germany and other Western countries (Pahl-Wostl et al., 2012;

Köck and Bovet, 2015; von Haaren, 2011; SRU, 2008; Schanze et al., 2006 (for flood protection); Evers, 2008 (for water/river basin management)). In light of this, governance requirements for improving collaboration between sector-administrations, governmental and non-governmental actors and new forms of governance were introduced, e.g. for key regions such as the integrated management of coastal zones (Bruns, 2010).

In the last few years, ecosystem services (ES) have been increasingly proposed as an integrative concept and boundary object that could help to address governance challenges and facilitate the development of more integrated planning and cooperative implementation. (Dendoncker et al., 2014; Hauck et al., 2013; Primmer and Furmann, 2012; Viglizzo et al., 2012; Opdam et al., 2015). Boundary objects are understood here as collaborative products, that include reports, maps, models, and voluntary agreements, which "are both adaptable to different viewpoints and robust enough to maintain identity across them" (Star and Griesemer, 1989; see also Cash et al., 2003; Star, 2010; Clark et al., 2011). The benefits of using the ES concept are seen in clarifying the dependence of human well-being on ecosystem services, illustrating trade-offs between decision-options in terms of ES costs and benefits, and in providing estimated values of ecosystem services for society (e.g. de Groot et al., 2010; Albert et al., 2014a, 2016). More specifically, the ES concept may contribute to spatial

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planning and governance in terms of cross-sectoral coordination (Abson et al., 2014) and by illuminating cross-scale trade-offs (e.g. global benefits for climate change mitigation vs. local action, trade-offs between downstream and upstream riparians; Laterra et al., 2012; Albert et al., 2015). Furthermore, the ES concept may help to communicate environmental aspects to stakeholders (von Haaren and Albert, 2011).

A broad range of approaches and methods for mapping and assessing ES have recently been developed for various scales, from local to continental, in order to support planning and decision-making (Maes et al., 2012; Pagella and Sinclair, 2014; Albert et al., 2014b). Examples for ES assessment approaches at the regional level are diverse. They include mapping with expert-based estimates of provisioning capacities (Burkhard et al., 2012; Kopperinen et al., 2014), the use of software tools such as GISCAME (Frank et al., 2014), participatory approaches (Plieninger et al., 2013), combined biophysical modeling and social assessments (Casado-Arzuaga et al., 2013), and mental model mapping approaches (Moreno et al., 2014). Applying the ES concept could add three types of new information to existing planning and governance procedures (von Haaren et al., 2014): quantifications of ES in terms of the contributions from ecosystems that may provide benefits to humans (termed “offered ES”) and the actually utilized ES that are directly consumed or enjoyed by humans (herein called “utilized ES”), aggregated accountings of the amount of offered or utilized ES, and economic ES valuations. Additionally, it contributes to the assessment of multifunctional effects (Galler et al., 2015).

Nevertheless, the ES concept is usually not well implemented in actual planning processes, especially at the local and regional scale (Primmer and Furman, 2012; Hauck et al., 2013; Albert et al., 2014a). Indeed, regional planning, and landscape planning in particular, are already linked with the ES concept as they both consider societal interests for the preservation and sustainable use of environmental resources (German spatial planning act; Pahl-Weber and Henckel, 2008). However, existing environmental information in the landscape and spatial plans do not explicitly emphasize the benefits of offered ES for human well-being (see the evaluation by Rall et al., 2015). Conceptual attempts to integrate ES into planning frameworks are beginning to emerge (Schöber et al., 2010; van Oudenhoven et al., 2012; Helming et al., 2013; Albert et al., 2016). Barriers for implementation include a prevailing lack of awareness and interest among practitioners, a dearth of substantial data and resources for assessing and valuing ES, difficulties of integrating the ES concept within existing planning and management instruments (Scolozzi et al., 2012), and a lack of successful practical examples of implementation and the resulting added value. Furthermore, the ES concept is increasingly criticized for its supposed emphasis of economic valuation and commodification (e.g. Kosoy and Corbera, 2010; Bauler and Pipart, 2014). Additionally, the use of economic values for spatial planning is a subject of debate (Viglizzo et al., 2012; Carreño et al., 2012; McKenzie et al., 2014). Though strong counter arguments for the critiques have been provided (Schröter et al., 2014), the criticisms need to be carefully considered. A further and overarching challenge is that economic valuations of ecosystem services remain primarily a scholarly endeavor and very few examples exist in which such valuations have actually been used in decision-making (Laurans et al., 2013; Ruckelshaus et al., 2015).

The objective of this paper is to explore the potential implications of integrating the ES concept in regional planning and governance, within the context of Germany. In accordance with the aforementioned potentials and deficits, we focus on two pathways of influence: Firstly, information about ES and their decision-support value in planning and management are illustrated. Here, we explicitly emphasize how ES information can be used for the

assessment of multifunctionality and how this contributes to their decision-support value. Secondly, the value of the ES concept as a boundary object for facilitating cross-sectoral interaction and collaboration is discussed.

A case study is used for illustrating how ES information can be generated on the basis of available environmental data. Furthermore, the case study highlights the characteristic features of the ES concept and compares them with conventional landscape planning, which encompasses only parts of the ES information. For this purpose, we refer to a recently suggested, practice-oriented ES evaluation (PRESET) model (von Haaren et al., 2014) that introduced the disaggregation of offered and utilized ES mentioned above and provides clear links to different value bases as relevant in public planning and management.

The following section describes the methodology utilized in this study. The subsequent section provides the case study results. Section 4 first gives a characterization of the governance context with which we are dealing (Section 4.1). The innovations of including ES assessment in regional (environmental) planning are then emphasized (Section 4.2) and the added value for multifunctionality assessment (Section 4.3) is highlighted. We then point out the potential of ES as a boundary object for facilitating collaboration between administrative actors (Section 5). In Section 6 the results are discussed and conclusions are drawn.

2. Methodology

Investigating the two above mentioned potential influences of ES information in planning requires several methodological approaches: (i) A case study explores a differentiated evaluation of ES indicators and compares the results with conventional planning information. (ii) The values of information on ES in planning and decision-making, and also the role of the ES concept as a boundary object for facilitating cross-sectoral interaction and collaboration, were derived on the basis of recent governance literature and the results of expert workgroups.

The case study demonstrates procedures for ES assessment and preparation for decision support. It focusses on climate change mitigation through carbon sequestration of soils in the Region of Hanover. This case study shows the relevance of spatially explicit assessment and points out the added value of using and further developing the well established regional landscape plan. With the example of climate change mitigation and water quality, the case study includes an assessment of multifunctional effects and ES trade-offs. Effects were calculated for different scenarios.

The assessment builds upon available data from landscape planning. The potential carbon sequestration of soils was assessed in a GIS analysis by applying the method presented by Saathoff et al. (2013). The assessment uses habitat types to acquire land use information and soil type maps are used for identifying soils with high carbon storage. Effects on water quality were estimated with respect to nitrogen (N) input. The net amount of N-input was calculated according to Osterburg and Runge (2007). For the estimation, we used the mean value for N-input and calculated a difference in N-input between cropland and grassland use of 50 kg N/ha/year. Delivery radii of biomass plants were calculated assuming an average crop area of 0.36 ha for the production of 1 kW power. Based on that, we assumed radii of 1.5 km for plants with less than 255 kW, 3 km for plants with 256–400 kW, and 5 km for plants with more than 400 kW capacity.

Governance structures and processes, within the context of spatial planning at a regional scale, were analyzed on the basis of a literature examination. The opportunities and challenges for fostering the integration of sectorial administrative actions were illustrated by using the example of the German spatial planning

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