



Assessing, mapping, and quantifying cultural ecosystem services at community level

Tobias Plieninger^{a,b,*}, Sebastian Dijks^b, Elisa Oteros-Rozas^c, Claudia Bieling^d

^a Berlin-Brandenburg Academy of Sciences and Humanities, Ecosystem Services Research Group, Jägerstr. 22/23, 10117 Berlin, Germany

^b Humboldt-Universität zu Berlin, Geography Department, Unter den Linden 6, 10099 Berlin, Germany

^c Universidad Autónoma de Madrid, Social-Ecological Systems Laboratory, C/Darwin 2, Edificio de Biología, 28049 Madrid, Spain

^d University of Freiburg, Institute for Landscape Management, Tennenbacher Str. 4, 79106 Freiburg, Germany

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ABSTRACT

Numerous studies underline the importance of immaterial benefits provided by ecosystems and especially by cultural landscapes, which are shaped by intimate human–nature interactions. However, due to methodological challenges, cultural ecosystem services are rarely fully considered in ecosystem services assessments. This study performs a spatially explicit participatory mapping of the complete range of cultural ecosystem services and several disservices perceived by people living in a cultural landscape in Eastern Germany. The results stem from a combination of mapping exercises and structured interviews with 93 persons that were analyzed with statistical and GIS-based techniques. The results show that respondents relate diverse cultural services and multiple local-level sites to their individual well-being. Most importantly, aesthetic values, social relations and educational values were reported. Underlining the holistic nature of cultural ecosystem services, the results reveal bundles of services as well as particular patterns in the perception of these bundles for respondent groups with different socio-demographic backgrounds. Cultural services are not scattered randomly across a landscape, but rather follow specific patterns in terms of the intensity, richness and diversity of their provision. Resulting hotspots and coldspots of ecosystem services provision are related to landscape features and land cover forms. We conclude that, despite remaining methodological challenges, cultural services mapping assessments should be pushed ahead as indispensable elements in the management and protection of cultural landscapes. Spatially explicit information on cultural ecosystem services that incorporates the differentiated perceptions of local populations provides a rich basis for the development of sustainable land management strategies. These could realign the agendas of biodiversity conservation and cultural heritage preservation, thereby fostering multifunctionality.

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Introduction

Fostering a broad range of ecosystem services has become a dominant environmental paradigm that has opened up important conservation opportunities around the world (de Groot et al., 2010). In the European Union, the idea of protecting and restoring the benefits that ecosystems provide to people has been promoted through the EU 2020 Biodiversity Strategy, which explicitly acknowledges biodiversity and ecosystem services as underpinnings of employment, economies, wealth, and well-being (European Commission, 2011). Corresponding ecosystem services assessments are

currently being carried out throughout Europe, which is predominantly covered by “cultural landscapes” (Plieninger and Bieling, 2012). This latter term indicates that cultural services, one of the four pillars comprising common ecosystem services classifications, are of utmost importance. Cultural services, defined as “ecosystems’ contributions to the non-material benefits (e.g. capabilities and experiences) that arise from human–ecosystems relationships” (Chan et al., 2012b: 9), are in general less directly linked to human well-being than provisioning and regulating services, but their potential for mediation is low (Millennium Ecosystem Assessment, 2005). In other words, locally degraded provisioning and regulating services may be substituted by socio-economic means (e.g. drinking water from a polluted well can be replaced by bottled water), but the cultural values of an ecosystem or a landscape are irreplaceable. Accordingly, a recent global analysis has stressed that, although societies become less dependent on provisioning and regulating services in the course of

* Corresponding author at: Berlin-Brandenburg Academy of Sciences and Humanities, Ecosystem Services Research Group, Jägerstr. 22/23, 10117 Berlin, Germany. Tel.: +49 30 20370 538; fax: +49 30 29370 214.

E-mail address: plieninger@bbaw.de (T. Plieninger).

a country's economic development, their dependency on cultural services increases (Guo et al., 2010).

Given the importance of cultural services for developed societies, it is surprising that cultural services – with the exception of recreation and tourism – are rarely considered in ecosystem services assessments (Feld et al., 2009). Cultural services differ in various aspects from other ecosystem services, presenting strong barriers toward their broader incorporation (Chan et al., 2012a,b). The definitions of most cultural services categories are vague and, for many of them, it is difficult to establish significant relationships between ecosystem structures and functions and the satisfaction of human needs and wants (Daniel et al., 2012). Also, cultural services do not represent purely ecological phenomena, but rather are the outcome of complex and dynamic relationships between ecosystems and humans in landscapes over long time spans (Fagerholm et al., 2012). They are difficult to quantify in biophysical assessments, and their economic evaluation is generally subject to controversy. Moreover, their normative nature and the heterogeneity of their valuation by various stakeholders provide additional challenges (Rambonilaza and Dachary-Bernard, 2007; van Berkel and Verburg, 2012). However, many of these challenges, for example the subjectivity of enjoyment of ecosystem services, are inherent to other categories of ecosystem services as well, though rarely addressed explicitly (Daniel et al., 2012).

Incorporating cultural services into ecosystem services assessments is indispensable for comprehensive accounting of the contributions of ecosystems to human well-being and, thus, avoiding bias toward other ecosystem services and unwanted trade-offs in land management, but their integration is a challenging task (Schaich et al., 2010). Current research on ecosystem services is strongly focused on biophysical assessments, on the one hand, and on economic/monetary valuation exercises, on the other. A third, but largely overlooked, component of ecosystem services is the socio-cultural domain, which requires alternative evaluation approaches, drawing on a wide range of social science tools and methods (Daniel et al., 2012). To capture this dimension, it is essential to address cultural services and socio-cultural preferences toward ecosystem services (Chan et al., 2012b). Studies of perceptions, values, attitudes, and beliefs may generate more meaningful insights regarding the contributions of ecosystem services to human well-being than purely biophysical assessments (Martín-López et al., 2012). In particular, they give more precise understanding of the relevance of ecosystem services for local stakeholders, allowing greater cultural sensitivity (Chan et al., 2012b) and recognition of trade-offs in ecosystem services valuation between different user groups, such as between tourists and local inhabitants (Fagerholm et al., 2012). Most perception studies (as reviewed by Martín-López et al., 2012) have revealed a preference for cultural services that is comparable in magnitude to preferences for regulating or providing ecosystem services.

Mapping exercises can be powerful tools for grasping the socio-cultural realities of communities, regions, landscapes, and ecosystems (Ryan, 2011). Cartographic representation of perceptions and preferences enables localization of the most highly valued ecosystems in a landscape (cultural services “hotspots”, Bryan et al., 2010) and, consequently, identification of critical focal areas for cultural services management. Mapping the cultural services that stakeholders attribute to ecosystems also facilitates better comparison to provisioning and regulating services, thus informing effective analysis and negotiation of trade-offs between cultural services, biodiversity, commodity production, and other ecosystem services at landscape scale (Nelson et al., 2009). Additionally, such mapping may account for the spatial heterogeneity of ecosystem services demand, lack of which is a common limitation of economic valuation techniques (de Groot et al., 2010; Martín-López et al., 2009). Mapping stakeholder perspectives also allows consideration

of place-based ecological knowledge, which frequently deviates from literature- and model-based assessments (Fagerholm et al., 2012) and whose importance has been particularly highlighted in the process of establishing the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) (Turnhout et al., 2012). However, most of the small number of available studies (see Table A.1 for key examples) have covered only a few services, and only one study (with a focus on monetary valuation) has been performed in a European rural landscape (van Berkel and Verburg, 2012).

The present study aims to fill this gap by performing a spatially explicit mapping of the full range of cultural ecosystem services as perceived by local people. As it is increasingly being acknowledged that ecosystems not only provide benefits, but also various external costs (Dunn, 2010; Lyytimäki and Sipilä, 2009), we additionally consider several disservices. The study was carried out in an area in Eastern Germany, taking into account the specificities of cultural landscapes, in particular land cover mosaics and diversity of stakeholders. We were guided by the following research questions:

- What bundles of cultural services and disservices can emerge from diverging perceptions, and how can these differences be explained by socio-demographic determinants?
- How are the perceived (dis)services spatially distributed in the landscape?
- What cultural (dis)services do people perceive in relation to different land covers?

Study area

The study was performed in five villages within the Upper Lusatia Pond and Heath Landscapes Biosphere Reserve, located in the eastern part of the state of Saxony in Germany (Fig. 1). The area covers 30,102 ha and has 12,800 inhabitants. The climate is sub-continental, with an average temperature of 8.5 °C and an average precipitation of 630 mm. Traditional fishing ponds and heathlands represent the most characteristic ecosystems of the area, with fish farming having an almost 800 year tradition. Keystone plant species are *Erica tetralix*, *Drosera intermedia* and *Ledum palustre*. Gray wolf (*Canis lupus*), European otter (*Lutra lutra*) and Eurasian elk (*Alces alces*) have been frequently recorded within the reserve (Bastian et al., 2005). The five villages in which the survey was performed – Brösa (197 inhabitants), Gutttau (371 inhabitants), Kleinsaubernitz (344 inhabitants), Lömischau (123 inhabitants), and Wartha (153 inhabitants) – are part of the Gutttau municipality and cover 1950 ha. Land cover is composed of forests (29.6%), cropland (28.2%), grassland (20.0%, around ¾ of which are intensively managed agricultural grasslands and ¼ extensively used seminatural grasslands and heathlands), water bodies (12.0%), settlements (8.3%) and quarry (1.9%) (Freistaat Sachsen, 2009). The municipality is a popular holiday and recreation destination, with a camping area, swimming lakes and further leisure opportunities. The water bodies are mainly traditional fish ponds and artificial lakes formed from former mining sites.

Methods

Study design

Our approach applied methods for social landscape values assessment and acquired local landscape knowledge through a combination of mapping and structured interviews, with subsequent integration into a geographical information system (GIS) (Brown, 2005; Fagerholm and Käyhkö, 2009; Tyrväinen et al., 2007). The overall study design was tested, discussed, and refined with

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