



Using von Thünen rings and service-dominant logic in balancing forest ecosystem services

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ABSTRACT

The allocation of forest land to different uses for ecosystem services (ES) is a complex task which is increasingly influenced by current urbanisation trends and the growth of the service-oriented economy. With the focus on cultural ES, this paper examines the principles that are intended to ensure the best cultural ES value in forest land use allocation. The analysis considers the co-creation process of cultural ES value and the trade-off between cultural and other categories of ES in an urban–rural context. A literature review of applied studies on forest land use allocation and ES is presented and research gaps are identified. Based on the findings of the review, two theoretical frameworks for an improved analysis of cultural ES value and land use allocation are suggested: the von Thünen location theory and service-dominant logic (SDL). Von Thünen showed that optimal land use is determined by the land rents for different alternative uses, which vary depending on distance from population centres. SDL, a theory from the field of marketing research, focuses on the role of skills and services – in addition to the traditional *goods-related* attributes – for the creation of customer value. This paper argues that a combination of the two frameworks can inspire future research and policymaking concerning forest land use allocation. The von Thünen framework highlights the role of local forest landscapes in proximity to population centres for creating cultural ES value. The SDL theory emphasises the co-creation of forest based cultural ES value that involves the forest ecosystem; beneficiaries of cultural ES value; and actors, who also are resource integrators (e.g. forest owners, planners, associations and other actors). Examples of applications of the two frameworks are given and both practical implications and limitations are discussed.

1. Introduction: Cultural ecosystem services – a challenge for forest land use planning

1.1. The role of cultural ecosystem services

The spatial allocation of forest land for ecosystem services (ES) involves balancing conflicting views on its most optimal use (Niemelä et al., 2005; Rantala and Primmer, 2003; Sténs et al., 2016). Current societal changes characterised by urbanisation, the growth of a service economy and changed lifestyles also influence the conditions for forest land use planning. There is a risk that diverging priorities between conservationists and forest industry interests will become increasingly pronounced, alongside the envisioned transition to a bio-based economy that require a more intensive forest production for energy and materials (Staffas et al., 2013). Against this background, it is relevant to revise the prevailing principles that guide forest land use allocation for

cultural and other categories of ES.

The ecosystem services (ES) concept is key to this study. ES are linked to the benefits that people obtain from an ecosystem, including those from forests, categorised in *supporting services*, such as nutrient cycling and soil formation; *provisioning services*, e.g. for food, water, fibre and fuel; *regulating services* of climate, water quality and disease; and *cultural ES services*, which involve non-material benefits related to spiritual enrichment, cognitive development, reflection, recreation, and aesthetic experiences. Other specified benefits comprise cultural diversity and identity, cultural landscapes and heritage values, inspiration, social cohesion, cultural identity and diversity, sense of place, and knowledge systems (MA, 2005, p 40; Chan et al., 2012a, b). Chan et al. use a broad characterisation of cultural ES: “Accordingly, we define cultural services inclusively as ecosystems’ contributions to the non-material benefits (e.g., capabilities and experiences) that arise from human–ecosystem relationships” (Chan et al., 2012b, p 9). The

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Millennium Ecosystem Assessment admits the intricacy and even elusiveness involved in describing the nexus between ecosystems and human culture, highlighting that “...it is not possible to fully separate the different spiritual, intellectual, and physical links between human cultures and ecosystems...” (MA, 2005, p 120). This complexity is also noted in Chan et al. (2012a) and by Milcu et al. (2013) who provide the qualification that cultural ES frequently must be viewed as multifaceted.

Furthermore, ES *bundles* combine different categories of ES, e.g. where sport fishing provides food (a provisional ES) jointly with being a recreation activity (linked to cultural ES) (Deal et al., 2012; Raudsepp-Hearne et al., 2010; Turner et al., 2014). *Bundles* can also consist of different types of cultural ES, e.g. when a scenic landscape supports aesthetic benefits, recreation, and a sense of place (Chan et al., 2012a). Cultural ES have received less attention in literature than other ES categories, such as regulating and provisioning ES, which can be more readily quantified in monetary terms (Chan et al., 2012a; Plieninger et al., 2013).

The challenge of forest land use planning consists of spatially allocating forest land uses to generate an optimal ES value. However, the *valuation* of ES is both a wide field of research and a controversial and debated topic, where different, competing theories are used (Bunse et al., 2015; Farber et al., 2002; Liu et al., 2010; Perlman et al., 2003, p 56–81, 400–01). The Millennium Ecosystem Assessment Report (MA, 2005, p 120) includes monetary, non-monetary values, public good values and intangibles in the ES value concept – which is similar to the definition of total economic value (TEV), which combines direct and indirect value, option value and existence (intrinsic) value in the concept (Pearce, 1993, p 17). Chan et al. (2012b, p 10) explain that ES represent the processes that underpin the valued goods and experiences of ecosystems – the *benefits*; whereas corresponding *values* refer to “preferences, principles and virtues” that people or groups ascribe these benefits. This distinction is comparable with the *ecosystem service cascade* concept outlined in Haines-Young and Potschin (2010). It is regularly noted that some ES values are possible to estimate in monetary terms, whereas others, not the least those related to cultural ES, are frequently not quantifiable, commensurable or marketable (Chan et al., 2012b). These perspectives on ES value, in turn, reflect a wider definition of human welfare including not only conventional economic metrics of value, but also include *Quality of Life* aspects in the concept (Stiglitz et al., 2009). Equivalently, Wu (2013) argue that landscape sustainability should be assessed according to a wide, multidimensional definition of human well-being. Hence, this paper regards cultural ES values as partly objective and quantifiable but they also rest to a large degree on subjective, immaterial, and local indicators. Furthermore, it employs an open definition of the user or beneficiary of cultural ES value, who may be both local community members and users that could be characterized as “outsiders” (e.g. city inhabitants visiting a forest for recreation, social activities or inspiration).

However, the *process* of cultural ES value creation over time is often overlooked in the literature (Mattila et al., 2013; Sténs et al., 2016). The process view on value creation stems from marketing science (Gronroos and Voima, 2013; Payne et al., 2008; Prahalad and Ramaswamy, 2004) but it is claimed here that it can be widened to analyse the role of stakeholders'/actors' *services* in the processes that creates cultural ES value. Such a perspective implies that the creation of cultural ES value is based on interactions, involving the forest ecosystem and different stakeholders (i.e. forest managers, policymakers, and forest users or visitors). The human ecosystem relationship for value have been partially highlighted e.g. in Chan et al. (2012b). Also Fish et al. (2016) and Wu (2013) describe ES and associated benefits within a relational network context including humans and the ecosystem. It is claimed here that this view is pertinent and needs to be pursued further.

Cultural ES are enjoyed by a large proportion of the population across regions and countries. In 2015, almost half the US population (48.4%) participated in an outdoor activity (Outdoor Foundation,

2016). High participation rates are also reported in Europe, where main drivers for the popularity of outdoor activities, e.g. in forests, are economic growth, demographic changes, the emergence of the information society, interest in health and wellbeing and increased environmental awareness (Bell et al., 2007). Forest visits for cultural ES can be inclusive activities that do not require large resources, and for this reason, local forests for cultural ES are particularly important for low-income groups (Boman et al., 2013). Green areas close to residential locations are appreciated by inhabitants and tend to increase house values (Jim and Chen, 2010; Poudyal et al., 2009).

The recent interest in forest land use challenges and cultural ES has prompted intensified research on the subject (Milcu et al., 2013). A range of recent studies show an association between cultural ES and both psychological and physiological well-being (Korpela et al., 2013; Maas et al., 2006; Nilsson et al., 2010; Shanahan et al., 2015; Tyrväinen et al., 2014; WHO, 2016). Studies also find that specific properties of a forest nature area, such as biodiversity and landscape features, can improve the level of satisfaction among forest users (Carrus et al., 2015; Norman et al., 2010; Sandifer et al., 2015; Poudyal et al., 2009).

Real-world forest land use decisions to balance cultural, provisioning and regulating ES are influenced by geophysical, socio-economic, technological and institutional factors (Platt, 2014). Urbanisation is one contemporary, global trend that shapes land use patterns and people's opportunities to experience cultural ES value. The number of urban residents in Europe increased by 30 million between 2000 and 2015 and the figure will grow further by 20 million until 2030 (United Nations, 2014). Together with increasing living standards in many regions, this development increases people's awareness of the significance of different forest-based ES (Franzen and Meyer, 2010; Mattila et al., 2015). There is also an expanding recognition on the part of society of the biodiversity value of forests and their role for the environment (Hannerz et al., 2016), reflecting emerging post-materialistic attitudes when more basic human needs have been fulfilled (Franzen and Meyer, 2010; Guo et al., 2010).

Policies are consequently being formulated at different levels to protect and enhance cultural ES. One such example of on a supranational level is the European Union (EU) Forest Strategy stating that “forests also offer wide societal benefits, including for human health, recreation and tourism” (European Commission, 2013, p 2). At the national level, using Sweden as an example, the government confirms the role of forests in achieving both environmental goals (Swedish Environmental Protection Agency, 2017a) and also lists specific goals related to cultural ES (Swedish Environmental Protection Agency, 2017b). The significance of forests for recreational ES values is mentioned in policy documents in several European countries (Mann et al., 2010). Local level policies for the support of forests for cultural ES are also frequently being formulated (Lawrence et al., 2013; Mann et al., 2010; Mattila et al., 2015) where policymakers consider nature beauty and recreation to be assets that promotes citizens' wellbeing and increase a region's attractiveness (Källstrom and Ekelund, 2016). There is, however, a risk that land use conflicts around population centres will escalate as continuing growth of cities gradually decrease the availability of urban fringe forests (Olsson, 2013). In conclusion, urbanisation together with other changed life patterns and values will initiate an increased pressure on cultural ES in many regions. Despite the topic's growing importance there is still a lack of conceptual models and tools for problem formulation and analysis. There is consequently a need for improved frameworks for forest land use planning, and approaches that more realistically define and analyse forest-based cultural ES (Hörnsten and Fredman, 2000; Mattila et al., 2015).

The objective of this paper is to identify conceptual principles for how cultural ES can be assessed to enable a reasonable allocation of forest land uses. Based on a literature review of existing approaches, it proposes two frameworks, which, in combination, can inform planners and researchers in the further analysis of forest land use. More specifically, this study includes the following sub-objectives:

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