



Landscape management accounting as a tool for indicating the need of action for ecosystem maintenance and restoration – Exemplified for Saxony



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ABSTRACT

A politically fixed und broadly concerted social consensus for the permanent preservation of wildlife and of their habitats reflects the demand for biodiversity and intact cultural landscapes. But wherever human beings have to intervene in nature in order to secure their own existence, targeted landscape management becomes necessary for the preservation of the values and performances of ecosystems.

This paper explains the methodological framework of a landscape management accounting system as exemplified by the German Free State of Saxony. Management tasks are defined and the method of cost calculation is explained. The calculation of management costs comprises, first, the determination of care-dependent habitats; second, an allocation of necessary measures; and third, the estimation of the related costs per year. The total financial requirement is composed of costs for maintaining, developing and investing measures per habitat type. Based on different inventories of landscape structures showing the losses of the last decades, and considering the habitat needs of key species, a demand for restructuring measures was determined.

A total requirement for habitat management was quantified for almost 10% of the land area. Regarding the restructuring needs, analyses and assessments were made for running waters and accompanying structural elements demanding the opening of 300 km of closed rivulets from their pipes, the planting of copses along 680 km of bare streams, and the abandonment of 21,300 ha of arable fields in floodplains. Furthermore, 2500 km of tree lines, hedgerows and field margins are necessary to plant in the agricultural landscape.

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1. Introduction

There exists a broad social consensus for the permanent preservation and development of our cultural landscapes with their habitats, which expresses itself in a growing demand for biodiversity and intact cultural landscapes, as well as in the willingness to provide the financial means to do this (e.g. Gibbons et al., 2011; Spangenberg and Settele, 2010). However, in order to secure their own existence, human beings have to intervene in nature, altering it through various forms of land use. In addition to provisioning services (e.g. generation of foodstuffs and raw materials through agriculture and forestry), cultural landscapes and their ecosystems also furnish many regulatory and socio-cultural services. In order to make the broad range of ecosystem services permanently available, i.e. to ensure that the biodiversity and productivity of the ecosystems are preserved, targeted landscape management is necessary, something which entails financial expenditure for society.

If we take account of the politically specified need for the preservation of species and habitats as contained in treaties, guidelines, laws and regulations (e.g. Convention on Biological Diversity, EU-Natura 2000 Guidelines, EU Biodiversity Strategy, Measures Program for Biological Diversity, Habitat Directive, Water Framework Directive), then suitable measures have to be taken in accordance with the technically derived requirements. The social expenditures and costs for landscape management therefore represent an indicator of the economic valuation of ecosystems, since the existence of some cultural landscape ecosystems is not secure without these performances. Apart from ethical, esthetic and informational values, which are very difficult to determine in monetary terms, landscape management accounting is a tool for indicating the need of action to maintain ecosystems and can help to negotiate the level of socially agreed demand for nature as well as the willingness to pay for nature protection. The ecosystem services approach addresses calls for incorporation of such economic valuations in ecological management decisions (Carpenter and Turner, 2000; Farber et al., 2006; Grunewald and Bastian, 2013).

We owe a large part of the biological diversity in Germany to traditional or less intensive forms of agricultural management,

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which are no longer economically competitive in the world market. These forms of agricultural management frequently result in newly created habitats such as dry and semi-dry grassland, dwarf shrub heathland and mat grassland, mountain meadows and wetland meadows, as well as clearance cairns and vineyard walls. In order to preserve these forms of use or to guarantee adequate management, financial support is imperative. In EU countries, funding is principally carried out using the agricultural development funds, and, secondly, using nature conservation funds. Usually these funds are co-financed by the individual countries.

The above-mentioned ecosystems (habitats) are only partially rooted in protected areas, and are also found in broad swathes of the “normal landscape”. Efforts to preserve biodiversity should therefore not restrict themselves solely to protected areas but must also include the more or less intensively used “normal landscape” (Polasky et al. (2008) use the term “working landscape”). In the last decade especially, field margin structures along paths and along the edges of woods and fields have disappeared, thereby leading to discernible species impoverishment (e.g. Ringler et al., 1997; Wolff, 2004; Steffens, 2009). Today, intensively used agricultural landscapes in the most fertile locations lack natural landscape elements over broad areas, on which the animals and plants of the agricultural ecosystems are dependent for survival and which provide important ecosystem services. Exactly in such areas it is important to integrate landscape management and land use in a more intensive way to evaluate trade-offs between ecosystem services.

Landscape management is defined as the totality of all measures for the safeguarding, maintenance and development of natural habitats for indigenous species of plants and animals, and for the maintenance and renaturalization of ecosystems and landscapes in the event of damage (Jedicke, 1996). In this context, one important task is the preservation and development of the diversity of habitats and species as well as landscape elements. Landscape management is particularly concerned with the safeguarding and provision of general interest services for society (particularly regulation services and socio-cultural ecosystem services).

According to the Millennium Ecosystem Assessment (MEA, 2005), a landscape is typically composed of a number of different ecosystems, which then generate a whole cluster of different ecosystem services. Many ecosystem services are influenced by landscape structure and geographical context and therefore by the arrangement of landscape elements or land use units. After Willemen et al. (2012) the pattern of multifunctional landscapes is the basis for interactions, synergies or conflicts that may occur between landscape functions. Also the provision of services does not depend so much on the properties of the individual, small ecosystem patches, but rather on the spatial interaction, flows and fluxes between these patches and between patches and human elements (Termorshuizen and Opdam, 2009).

The agricultural landscape offers various points of approach with regard to restructuring (Syrbe and Grunewald, 2013). Firstly, the watercourses, including their accompanying structures, should be in a good ecological condition, so as to fulfill habitat functions and to contribute to a steady water and mass balance. Secondly, apart from the bodies of water, agricultural areas with low amounts of forest and water also need field trees, lines of trees, hedges and various sorts of linear or field margin structures (Ringler et al., 1997), in order to be able to provide cover, food and nesting opportunities to the organisms of our agricultural ecosystems, to enhance the landscape diversity, and to avert the dangers of erosion. The objectives of landscape management demonstrate that, among other tasks, the edges of forests are to be upgraded by means of staged boundary structures, a minimum proportion of wetland habitats are to be preserved in meadows, and terraces and clearance cairns/stone walls are to be secured or reconstructed in the mountains.

Measure programs for the EU Water Framework Directive (WFD), which are implemented by the river basin associations (Bastian et al., 2012b; Albrecht, 2013) exist in EU countries for water bodies with catchment areas (EoA) larger than 10 km². In this respect, water bodies with EoA < 10 km² without their own WFD measures are particularly relevant for the landscape management accounting system.

The focal points for the restructuring of these small running waters and bodies of standing water are (Syrbe and Grunewald, 2013):

1. During the period of the socialist collectivization of agriculture (predominantly after 1960), many small running waters and ditches were straightened or installed with pipes as a result of state-run improvement measures, thereby destroying habitats, habitat networks, and sometimes greatly impairing ecosystem services. Many pipe installations from the period before 1990 today display functional restrictions in wellsprings, wet spots or flooding. For cost reasons also, dismantling of the pipe installations with the restitution of an above-ground water course would often be very practical.
2. The planting of trees along the watercourses is intended to contribute to an increase in the quality of the habitat and water, using factors such as shade and diversity of riverbank structure.
3. As a result of an expansion of uses and restructurings in the environment of the water body, space is created for shelter habitats and stepping stones for the habitat network in the area of meadows, e.g. small/temporary bodies of standing water.

This paper presents a methodology developed for the elaboration of a regional landscape management accounting on the basis of the example of Saxony (Germany). Accordingly, those performances which display a specific relationship to the landscape can therefore be understood as landscape services (Termorshuizen and Opdam, 2009; Grunewald and Bastian, 2010; Hermann et al., 2011; Bastian et al., 2012a).

This type of landscape management accounting system is an aid to political decision makers in regard where to invest public money to maintain landscapes and protect biodiversity. The methodology as developed permits an estimation of the total extent of landscape management tasks for the coming years – in this example, for a German federal state, the Free State of Saxony – as well as harmonization of the multiplicity of requirements and measures. Complex methodological principles as well as differentiated cost-benefit analyses were necessary for this study “Landscape Management Assessment Saxony”. Even with the gradual improvement of relevant data sources, comprehensible calculation models with regard to the evaluation of landscape management performances are not yet very useable. However, a knowledge of the dimensions of the required financial resources is necessary in order to support agricultural land development which is in conformity with nature conservation, and to plan and guarantee additional expenditure for the use, maintenance and development of habitats and certain species of plants and animals.

The concern of the paper is to present, in addition to measures regarding the management and development of habitats, indicators and methodological approaches for the restructuring planning of the landscape. On the basis of the available specialist data, an explanation will be given as to how the current inventory of water, field margins and wooded structures in farmland can be determined and the need for measures for the creation or upgrading of natural landscape elements within intensively used areas can be derived.

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