

Towards an indicator-based assessment of cultural heritage as a cultural ecosystem service – A case study of Scottish landscapes

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ABSTRACT

The cultural heritage of landscapes makes an important contribution to people's local identity, which enhances the human-nature relationship and informs decision making. However, cultural heritage assessments in the context of cultural ecosystem services are still challenged by the lack of coherent methods to assess the spatial distribution of cultural heritage. This paper addresses the questions: how can complex cultural heritage be captured with objective indicators and how are cultural heritage values spatially distributed in Scotland? The aim of this paper is to develop an indicator-based framework for the mapping of cultural heritage, which will be tested for its applicability by assessing cultural heritage in a Scottish national level case study. The developed hierarchical framework includes both, indicators related to historic land uses (Time Depth) and historic elements (Historic Richness) that are aggregated to a higher methodological level for mapping the spatial distribution of cultural heritage value.

The application of the framework in the case study has shown its capability to assess the spatial and temporal distribution of cultural heritage in Scottish landscapes. The results identify landscapes that represent cultural heritage hotspots of Scotland (e.g. crofting landscapes, settlements shaped by early industrialisation or the Drumlin Lowlands). Different landscape units and classes are highlighted by either historic land use or elements, which underline the specific contribution of different indicators to the overall cultural heritage indicator. Land use-based indicators highlight landscapes with early-introduced, medium-dynamic land use patterns, while element-based indicators highlight landscapes with a long tradition of settlements.

The proposed framework emphasises the importance of systematic indicators for cultural heritage, which reflect both quantitative and qualitative aspects of human influence on land use and the built environment. These aspects are difficult to include in a single indicator. The findings can improve the integration of cultural heritage values in decision-making processes and the development of more objectively assessable indicators for other cultural ecosystems services.

1. Introduction

The Ecosystem Service (ES) approach of the *Millennium Ecosystem Assessment* (MEA, 2005) has become a widely applied scientific framework to study aspects of human well-being provided by the environment and ecosystems (Villamagna and Giesecke, 2014; Hausmann et al., 2016). The MEA has emerged from the demand by policy and decision makers for inclusion of non-monetary aspects of land use change. Cultural ecosystem services (CES) are one pillar in the CICES (Common International Classification of Ecosystem Services, Haines-Young and Potschin, 2013) and are defined as “[...] the non-material benefits people obtain from ecosystems through spiritual enrichment,

cognitive development, reflection, recreation, and aesthetic experiences [...]” (MEA, 2005, p. 40). Hence, some CES are intangible, partly subjective and normative, and they do not relate to objective assessable ecological or geographical factors like other ecosystem services, but rather human interaction with landscapes and societies’ value systems (Daniel et al., 2012; Milcu et al., 2013; Zoderer et al., 2016). Currently, the scientific discourse about CES is lagging behind that of other provisioning and regulating ecosystem services (Milcu et al., 2013; Malinga et al., 2015). Although this situation is changing rapidly, certain aspects of this CICES pillar, like cultural heritage and symbolic values, remain neglected (La Rosa et al., 2016). The development of objectively assessable indicators is needed to assess the spatial distribution of cultural

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heritage at different scales, which can be reproduced and applied in other studies (Hernández-Morcillo et al., 2013). This will facilitate their application in land use decision making and the preservation of cultural heritage for today's and future human well-being (Groot et al., 2010; Darvill and Lindo, 2015; Albert et al., 2016).

The development of indicators for cultural heritage within the CES context requires an understanding of how cultural heritage values arise in a distinct spatial context (Scholte et al., 2015). Cultural heritage consists primarily of specific features in the physical landscape associated with cultural meanings and related to histories of human use (MEA, 2005; UNESCO, 2017). Therefore, cultural heritage was assessed initially by the number of historic elements (i.e. monuments, such as castles, churches, memorial sites etc.) as a single proxy for complex historic values of a whole landscape (Bieling and Plieninger, 2013). However, there are limitations in this mono-dimensional view on cultural heritage, which ensue from the geographical distribution of either spatially dispersed or clustered historic elements (Tengberg et al., 2012). An additional challenge is that culturally historic elements may not be directly linked to ecosystems or specific ecosystem types, but rather to landscapes as defined by the European Landscape Convention (Art. 1 ELC, Council of Europe, 2000). Human impacts on interactions with the natural environment have shaped cultural landscapes and have established lasting features and structures that generate and contribute to today's tangible and intangible history of a landscape (Bürgi et al., 2015; Gould et al., 2015). Consequently, current landscapes record testimonial values from the historic environment (Schaich et al., 2010). A cultural heritage assessment, therefore, needs to include historic elements and land-use information, where ecosystem are an essential part of the landscape setting (Andersson et al., 2015).

By incorporating spatially explicit historic land-use information in cultural heritage assessments, it is possible to consider historically relevant interactions between humans and nature and their socio-cultural dimension in relation to the overall character of a landscape (Plieninger et al., 2014). Thus, complex cultural heritage values can be adequately described and assessed by different qualitative and quantitative attributes which represent historic elements and land use patterns from the ancient to the recent past which can still be recognised in the present landscape (Plachter and Rössler, 1995). The geographical diversity and long-term historical developments across European regions have led to different historical environments (Bürgi et al., 2017). The Scottish landscapes have experienced developments comparable to other European landscapes (Smout, 2000) and they are, therefore, well suited as an example for testing ecosystem service indicator development.

In this paper, we address the research questions: how can complex cultural heritage be captured with objective indicators and how are cultural heritage values spatially distributed in Scotland? The paper aims to develop a hierarchical framework of multiple indicators for the mapping of cultural heritage as a CES. This approach will contribute to the development of more systematic and robust indicators for the

assessment of cultural heritage and other CES at a national level. Our specific objectives are to present an integrative indicator approach with multiple indicators for the assessment of cultural heritage and to test the applicability of the indicator framework in Scottish landscapes and its historical context.

2. Materials and methods

2.1. Materials

The assessment framework is tested in a case study in Scotland where nationwide data about landscapes, historic land use and elements are available. The landscapes in Scotland are described through the Landscape Character Assessment (LCA). The LCA characterisation includes the physical landscape by landform, land cover (including settlements) and human interaction with the landscape through land use and appreciation of its beauty at 1:50,000 scale (Swanwick, 2002). A landscape character represents an area with distinct and recognisable patterns and perceptions. Overall, the LCA provides a detailed, systematic landscape inventory for the whole of Scotland with around 57 distinct landscape character types at Level 3 (Martin Associates and Swanwick, 2003). For this case study, we have used these Level 3 data (single part polygons) as the spatial unit of analysis and mapping rather than other commonly used ES assessments units (Syrbe and Walz, 2012). In the rest of the paper, these LCA units will be referred to as landscapes or landscape units.

The national Historic Land-use Assessment for Scotland (HLA) provides information about current land use as well as up to three recorded relict land uses with the time of their introduction per polygon (Herring, 2009). A relict land use is defined as the evidence of a different land use out of an earlier period than the current land use. The HLA is based on historic and current Ordnance Survey maps (1843–1895, 1962/65, 1992, 2008), aerial and site photographs (1920s to present), archaeological site maps (designated from the 1950s to present) and GIS data from Scottish research institutes as well as published sources and additional fieldwork studies (Historic Environment Scotland, 2013a). The 1:25,000 scale of the HLA data includes over 80 historic land use types and a list of 17 temporally partly overlapping historic land-use periods from prehistoric ages to present (Historic Environment Scotland, 2013a). The HLA periods are defined by distinct events or significant years in the historical development of Scotland or reflect periods in which a land use has been introduced or ceased to be adopted in Scotland (Historic Environment Scotland, 2013b).

2.2. Methodological approach

The framework presented in this paper conceptualizes and transfers at a basic level known attributes of cultural heritage into sub-indicators that are aggregated to main-indicators. These main-indicators are used

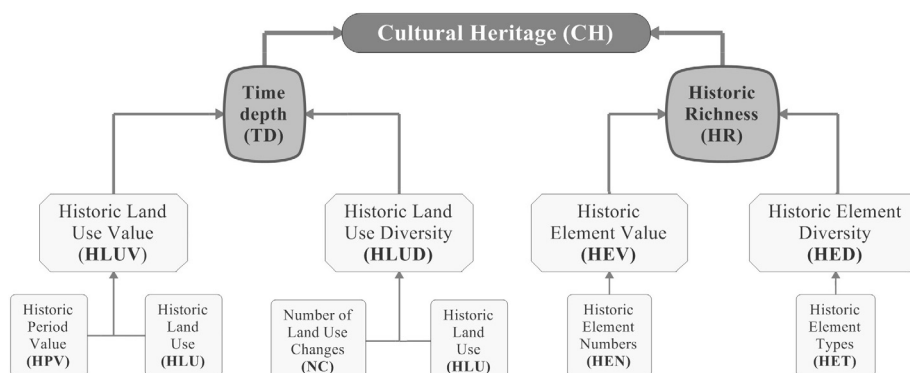


Fig. 1. Indicator scheme for the cultural heritage assessment framework.

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